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An Empirical Study of the Main Factors that Positively Influence Broadband Penetration Using International Comparisons

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Abstract: Telecommunications proliferation is seen as an empowering technology by policy makers and other stakeholders in many parts of the world .As a result, many researchers have investigated the main factors that positively influence telecommunications proliferation in the developing world in order to understand how social and economic benefits can be derived from these technologies. This paper is an empirical study of the main factors that positively influence specifically the aspect of broadband penetration using a data set containing a spectrum of developed and developing countries. In the process, the idea is to analyse international data from sources like the World Bank reports, ITU reports etc. to find correlations and relationships and to determine factors that affect the digital divide in order to come up with recommendations that might possibly help to narrow it. The empirical analysis entails some regression studies and applications of the linear response surface analysis technique (LRSA).

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Keywords: Telecommunications proliferation; Broadband penetration; Digital divide; Linear Response Surface Analysis (LRSA)

1. Introduction

With telecommunications proliferation seen as an empowering technology by policy makers and other stakeholders in many parts of the world ,many researchers have investigated the main factors that positively influence telecommunications proliferation in the developing world in order to understand how social and economic benefits can be derived from these technologies. The relationship between telecommunication technologies and these factors is poorly understood and remains a challenge especially in the developing world where there is a lack of adequate traditional fixed line telecommunications infrastructure and in these regions people think mobile phones and broadband can help “leapfrog” fixed line infrastructure to newer technology.

Many researchers have found evidence that the lack of fixed line infrastructure and access in developing countries have seriously reduced their opportunities and as a result mobile phones and broadband technologies may be attractive to alleviate some of their problems.

Telecommunications infrastructure offers untold benefits to many countries and the more signals it can transmit with a high bit rate, the more benefits it can bring. A broadband network is one such network and according to Lee and Marcu (2007) and Crandal (2005), broadband is defined as “communication technologies that provide high-speed, dependable connections to the Internet for

large numbers of residential and small subscribers. In the same work, the author highlights a number of benefits of affordable broadband development such as encouraging innovation, contribution to productivity and economic growth (ITU,2003).The ITU Standardization Sector in Recommendation 1.113 considers broadband as a transmission capacity that is faster than primary rate Integrated Services Digital Network(ISDN) at 1.5 or 2.0 Megabits per second(Mbits).The common types of broadband include Digital Subscriber Lines (DSL),Cable modems, fibre –optic cable,etc

Through application of multiple regression analyses and the interpretive linear response surface analysis technique, this paper is an empirical study of the main factors that positively influence broadband proliferation using a data set containing a spectrum of developed and developing countries. The data used are from sources like the World Bank reports, ITU reports and others. The paper examines whether and how factors such as innovation , efficiency , competition , availability of fixed line infrastructure, mobile lines , institutional environment, general infrastructure, economic freedom, trade freedom, freedom from corruption, number of mobile operators and gross national income per capita influence broadband proliferation from a global perspective. Policy implications of this empirical analysis will also be explored for effective broadband development strategies.

This paper begins with a brief review of related (background) followed by a description of the research methodology employed, an overview of the linear response surface analysis technique, empirical experiments (illustrative examples and interpretation of findings), conclusions and future work.

2. Background

Broadband penetration, both in fixed form or mobile form is seen as an important enabling factor for reducing the digital divide amongst countries. Empirical studies have become a popular way of investigating the diffusion of this technology.

One of the main differences in the growing body of investigations lies in the interpretation of the findings. Some researchers acknowledge that some factors play an enabling role and are not by themselves sufficient to guarantee broadband adoption and diffusion but play a role as a pre-requisite for adoption and meaningful penetration in a particular country. It is further often unclear whether a factor is a result of diffusion or the cause. The philosophy of this study is more on interpretive issues and for this purpose many of the analyses are based on a form of optimization analysis falling in the broad area of response surface analysis. In this approach, an estimated function relating broadband diffusion to some of the important factors are investigated using response surface analysis techniques.

In this paper only linear response surfaces are investigated over a certain domain. The first step to identify these relationships is to look at empirical studies in the literature to identify some important significant factors.

Researchers such as Kim et al.(2003),Distaso et al.(2006),Grosso (2006) and Lee et al.(2011) have carried out empirical analyses of the factors that significantly influence fixed broadband adoption while others such as Gruber (2001),Liikanen et al.(2001) and Koski and Kretschmer (2002),etc. have focused their attention on the drivers of mobile broadband diffusion.

Kim et al. (2003) empirically studied broadband adoption factors using data from 30 OECD countries and 30 observations and they discovered that the preparedness of a nation and population density is important drivers of broadband diffusion.

Through an empirical analysis of 14 EU countries and 150 observations over 15 time periods, Distaso et al. (2006) found inter-modal competition and the local loop unbundling price as significant factors in broadband adoption.

Grosso (2006) suggested that competition and unbundling positively influenced broadband

diffusion. In the same work, the researcher employed the generalized least squares multiple regression analysis and data from 30 OECD countries over 117 observations for the period 2001 to 2004 to identify these significant factors of broadband penetration.

Local loop unbundling is the process by which incumbent carriers lease wholly or in part, the local segment of their telecommunications network to competitors. Using data from OECD countries and a logistic diffusion model, Lee and Brown (2008) empirically analyzed the factors that affect both fixed and mobile broadband diffusion. In their study, these researchers had different findings in terms of significant factors affecting broadband diffusion. For fixed broadband, the significant factors were found to be LLU, income, population density, education and price while multiple standardization policy and population density were found to be the main drivers of mobile broadband. Their study was based on data from 30 OECD countries for fixed broadband for the period 2002 to 2008 and also 26 OECD countries for mobile broadband for the period 2003 to 2008.

Gruber (2001) used data from 140 countries to do an empirical study of mobile broadband diffusion and identified late mobile adoption, multiple operators, high fixed penetration as well as wait time as the most influential factors.

Gruber and Verboven (2001) attempted to determine the main factors that influence mobile broadband diffusion using a dataset of 140 countries. Their findings were that competition, a single standard, incumbent pre-empt sequential entry were important factors while Koski and Kretschmer (2002) found between and within standards, competition and low user cost to be the drivers of mobile broadband penetration.

Lehr et al. (2006) and Koutroumpis (2009) investigated the relationship between broadband penetration and the economic growth potential of a country. The reader is referred to the literature for a detailed analysis of this relationship. These and other researchers have amongst other findings empirically discovered that there is a strong and positive correlation between broadband diffusion and economic growth. In this paper, our focus is on fixed broadband adoption.

3. Material and Methods

The methodology used in this paper is an empirical investigation of data collected for 160 countries, of which 48 are from Africa. The paper describes some empirical analyses based on information published in World Bank, ITU reports etc. Some of the relationships explored are broadband subscribers per hundred (BSH) relative to factors like total fixed telephone subscribers per hundred

inhabitants (FLH), freedom from corruption (FC), Institutional reforms (INSTREFS), etc. for this sample of 160 giving the research a global perspective. The empirical analysis entails some regression studies and applications of linear response surface analysis techniques.

The LRSA method (Bruwer and Hattingh, 1985; Terblanche, 2001; Ncube et al., 2009) serves to interpret regression findings by looking at the space or region of experience defined as the convex hull of the data points (taking the independent variables). Thereafter, the regression function (linear in this case) is evaluated over this convex hull by linear programming applications. The objective is to find points in the convex hull where the regression function attains a minimum/maximum. These results are then displayed graphically.

3.1 Linear Response Surface Analysis

Linear response surface analysis (LRSA) is a subset of the statistical field Response Surface Methodology (RSM). RSM is a research field dedicated to the optimization and forecasting of linear and non-linear models (Terblanche, 2001). These models are presented in terms of various "independent" variables that influence a dependent (or response) variable. The feature that distinguishes LRSA from RSM in general is that LRSA can be applied to both planned and raw data compared to RSM that is applied mainly to planned data. The terms "planned" and "raw" are used to differentiate between data collected from a planned experiment and data for which the cases are collected randomly (e.g. observational studies) (Terblanche, 2001).

LRSA makes use of mathematical programming techniques to generate graphic representations of linear models and data (Bruwer and Hattingh, 1985; Terblanche, 2001).

3.2 Summary of the LRSA technique

The LRSA technique may be summarized as consisting of the following steps:

- Obtain a regression model that is "satisfactory".
- Determine the area of experience of the regression model by identifying the convex hull of the available points.
- Identify the variable (often a state variable) for which the influence on the dependent variable has to be investigated.
- Select a specific level for this variable.
- Optimize the regression function over the convex hull where this variable is at a specific level. Obtain maximum and minimum values. Select another level and repeat the procedure.

- Graph the optimum values (maximum and minimum) of the regression function against different levels of the chosen variable.

4. Results

Exploratory models that relate BSH (broadband proliferation) as a response variable to factors like trade freedom, institutional reforms, gross national income per capita and others were investigated.

A hypothetical linear function of the form:

$BSH = f(\text{INNOV}, \text{FLH}, \text{FC}, \text{INSTREFS}, \text{GNIC})$ was fitted to the data where the acronyms have the following meaning:

BSH: Broadband subscribers per hundred inhabitants

INNOV: Innovation

FLH: Fixed telephone lines per hundred inhabitants

FC: Freedom from corruption

GNIC: Gross National Income per Capita

INSTREFS: Institutional reforms

$INSTREFS = f(\text{Regulatory quality, Rule of law, Government effectiveness, Voice and Accountability, Political stability, Corruption})$.

A good fit characterized by an R-squared of 80.60% and an adjusted R-squared of 79.90% was obtained.

Applying the LRSA technique, the following graphs (Figure 1 to Figure 5) were obtained.

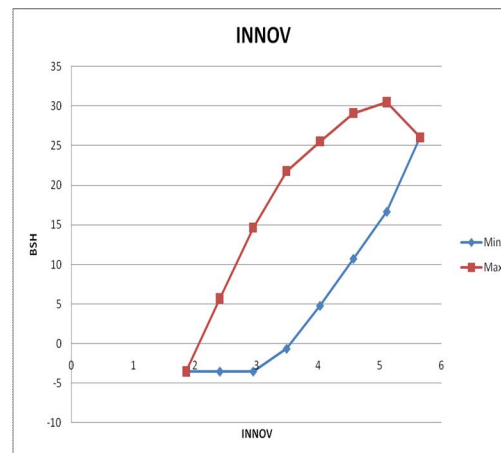


Figure 1 Graph of BSH versus INNOV where INNOV is the state variable

The graph shows the range of expected values of BSH over the range indicated for INNOV. Both the maximum expected values and the minimum expected values are indicated. The difference between the two curves in the graph may be attributed to the other factors in the model.

The graphs indicate a positive strong relationship between INNOV and BSH.

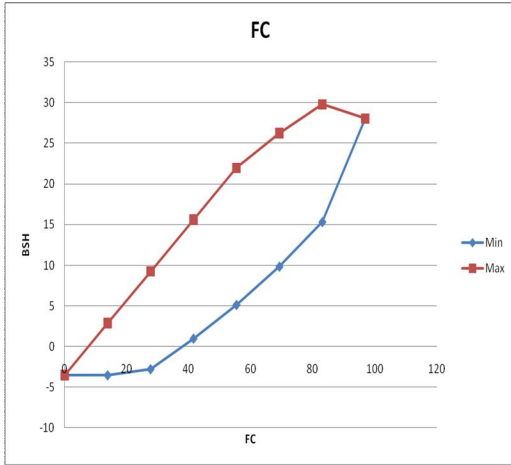


Figure 2 Graph of BSH versus FC where FC is the state variable

The graph shows the range of expected values of BSH over the range indicated for FC. Both the maximum expected values and the minimum expected values are indicated. The difference between the two curves in the graph may be attributed to the other factors in the model.

The graphs indicate a positive strong relationship between FC and BSH.

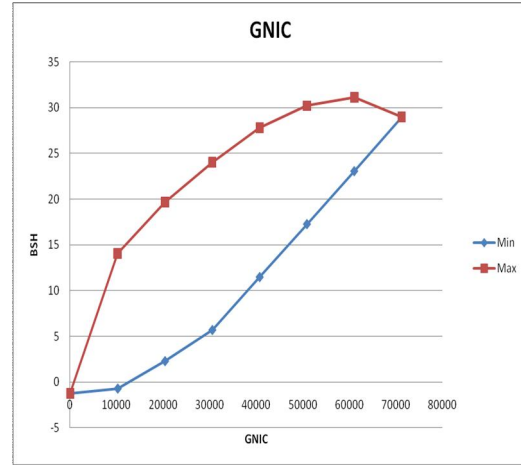


Figure 4 Graph of BSH versus GNIC where GNIC is the state variable

The graph shows the range of expected values of BSH over the range indicated for GNIC. Both the maximum expected values and the minimum expected values are indicated. The difference between the two curves in the graph may be attributed to the other factors in the model.

The graphs indicate a positive strong relationship between GNIC and BSH.

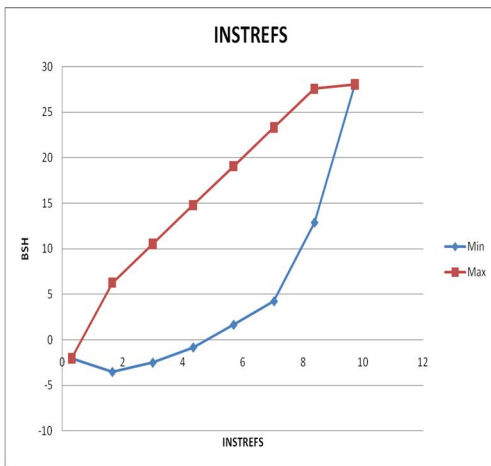


Figure 3 Graph of BSH versus INSTREFS where INSTREFS is the state variable

The graph shows the range of expected values of BSH over the range indicated for INSTREFS. Both the maximum expected values and the minimum expected values are indicated. The difference between the two curves in the graph may be attributed to the other factors in the model. The graphs indicate a positive strong relationship between INSTREFS and BSH.

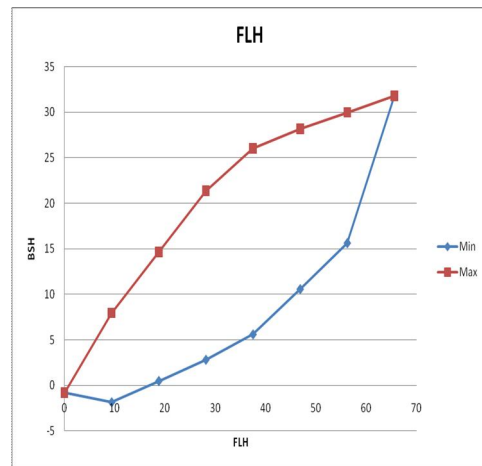


Figure 5 Graph of BSH versus FLH where FLH is the state variable

The graph shows the range of expected values of BSH over the range indicated for FLH. Both the maximum expected values and the minimum expected values are indicated. The difference between the two curves in the graph may be attributed to the other factors in the model.

The graphs indicate a positive strong relationship between FLH and BSH.

5. Interpretation of findings

The factors INNOV, FC, INSTREFS, GNIC and FLH are all important regressors that correlate highly with BSH.

One of the more interesting relationships is that displayed in the LRSA graph for INSTREFS versus BSH. From the shape of the max and min graphs it can be seen that for countries with low values of INSTREFS, broadband penetration (as measured by BSH) levels are relatively low (typical below 15). This suggests that when INSTREFS is at a low level (or absent), broadband penetration is mostly low (or absent). At higher levels of INSTREFS (7 or 8), there are both failures and success stories of broadband penetration suggesting that INSTREFS is an enabling factor but not sufficient for broadband diffusion.

6. Conclusions

From the empirical analyses carried out in this research, the main factors in broadband penetration are shown in the diagram below (Figure 6).

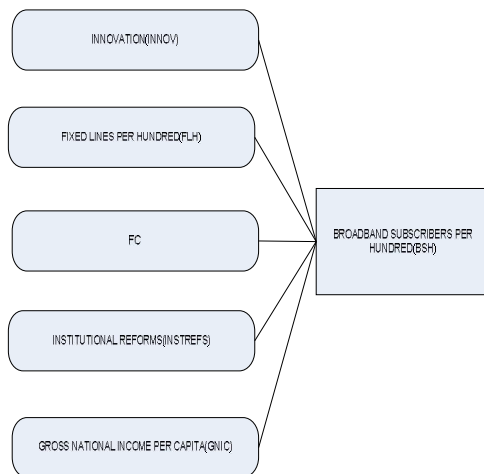


Figure 6 Main factors

6.1 Recommendations

The main findings are that developing countries should exercise special care to improve their performance on the following factors: INNOV, FC, INSTREFS, FLH and GNIC.

The empirical study carried out in this paper, illustrates that some of the main determinants of broadband penetration are INNOV, FC, INSTREFS, FLH and GNIC. Countries that better manage these factors tend to be more successful than others. The model of high broadband proliferation is characterized by high volumes of these factors.

6.2 Policy implications

There is need to root out corruption to achieve success with broadband diffusion. Although INSTREFS does not guarantee success with broadband penetration diffusion, it is an enabling factor in the sense that very few countries with low levels of INSTREFS manage to have good broadband penetration diffusion.

Generally speaking, countries with better infrastructure are more successful in BB diffusion.

7. Future Work

We are busy with extensions of the interpretive attributes of the methodology to also make it applicable to certain selected non-linear functional relationship classes. Some research to make specific recommendations for units (countries) is under consideration and will be refined in the near future.

There is need to investigate the substitution between fixed and mobile broadband.

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The review of Reciprocal rights of Tourism in Iran and France

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Abstract: The tourism industry is one of the largest and most diverse in the world. In most countries, this dynamic industry is as the main source of income, employment, infrastructure development and private sector development; especially in developing countries which is not affordable in economic activities such as manufacturing or extracting economically, or do not have very important role in trade and commerce, it is very important development of tourism. If we want to tourism as a source of income, the various organizations must support the development of tourism and Consider to the safety of tourists and proper advertisements. It has been considered legal rights and responsibilities for them in all systems. However, these rights and duties are different in different countries. So that, today, is very important tourism of legal aspects within the framework geography of Countries [Yousef Niyazi. **The review of Reciprocal rights of Tourism in Iran and France.** *Nat Sci* 2013;11(11):7-10]. (ISSN: 1545-0740). <http://www.sciencepub.net/nature>. 2

Keywords: Tourism, law, Iran, France

1. Introduction

Tourism has become one of the main organs of the newly emerging economies in world trade as the industry's new era (Gmelch, S. (Eds.). (2004). Today, the tourism industry is referred to as smokeless that it is important the process of globalization, so that many planners and movers referred to the development of tourism as a major component. Tourism is important dimensions that we need to consider the new laws (Alavi J and Yasin M, 2000).

1.1. The economic aspects:

Tourist's entry and residence make foreign exchange, strengthen the financial and economic. We need to be more active in this area and create more attractions bring get to the arrival of more tourists; they may have appropriate plans and ideas with their or we would be well clients for goods and Traders may decide to partnership with us.

The technical experts who can better evaluate the regard.

1.2. The cultural aspects:

The arrival of foreign nationals in Iran is the cultural exchange between Iranians and foreigners; they are familiar with the customs and traditions of the Iranian and expand the Iranian culture and civilization of positive and negative points throughout the world, So we have a decent relationship with them and be able to observe a good host and maintain the security and protection of tourists, This behavior can have very significant consequences.

1.3. The political aspects:

Iran can make noticed the minds of the world noticed itself at a low cost with respect to the following acts:

If the state and the rule to show the face of a more rational with appropriate and balanced legislation and indicate appropriate behavior for the government and express the repulsion of terrorism and is associated with the most logical states of the world and even provide necessary measures of welfare for foreign tourists, without regard to political stances of foreign governments

2. The Rights of Tourism industry:

In most countries of the world have enacted regulations regarding entry and accommodation of tourists who do not have a problem and this can be done easily and there are advantages in terms of foreign exchange services for tourists in some countries(Faghri R, 2007).

Legal regulation is one of the main factors in tourism development; this practice has prompted countries to guide it towards sustainability by adopting constraints and solutions;

Therefore, it is necessary to provide legislation and regulations to protect them and security for tourists:

2.1. Accessing to the resources on Earth is a right that is applicable to all inhabitants of the world equally. Participation in national and international tourism, it should be possible to continue growth as the best means of the leisure and should not be obstacles in its path.

2.2. Universal rights Tourism, should be Arising from the natural right of resting that Including

reasonable limitation of working hours and the Vacation pay that it's Economic, social and cultural rights is confirmed by Article 24 of the Universal Declaration of Human rights of and Article 7 of Universal Covenant.

2.3. Social tourism, which should be developed with government support, especially the union tourism that provides widespread access to the leisure, journey.

2.4. Tourist orientation: Tourist orientation: the kind of tourism should be supported for youths, students, the elderly and people with disabilities and disabled; respect of foreign and appropriate regulation has been considered respect of foreign appropriate regulation since ancient times in Rome. There was in Iran the law of the family.

3. The importance of the tourism industry of France in comparison to Iran

France has the worlds the first attracting tourists; to compare the situation in Iran with France has been based the data of 2007 that has been the attracted tourists, less than 70 million people in this country. Now, In France the attracting tourists have exceeded 80 million and the country attracts nearly 10 percent of worldwide tourists each year alone.

3.1. Detailed statistics of foreign tourists into the f France:

In 2007 visited approximately 1/69 million foreigner tourists from attractions and museums in France that is an increase of about seven million people in 2005 (10%).

Tourism in France in 2006 was about 79 billion Euros (double the revenue from oil sales, Iran). The tourism of revenue is formed this year, 70% of French GDP in France. Statistics of foreign tourists from of six major tourist center in France has been as follows:

1. Notre Dam Cathedral = 13 million,
2. Louvre Museum = 4.8 million people, with a 10.5 % increase over the previous year,
3. The Eiffel Tower = 7.6 million with 1.4 percent increase over the previous year,
4. Orsay Museum = 3 million, with a 2.7% increase over the previous year,
5. Natural History Museum = 1.3 million to 8.7% increase from last year,
6. Arc de Triomphe de l'Étoile: 1.3 million, an increase of 6 percent last year (Quoted tourist Minister, France).

These statistics indicate that has not been Iran's total amount of foreign tourists as well as foreign visitor one of six Hot Attractions in France and are not comparable to our income from tourist - Not specified by it - Even with revenue from visiting one attractive works in France; So that Has been

income from attract tourists more than doubled our revenues from oil But our inexhaustible resources have Small percentage and unspecified On absorbance of income.

3.2. Tourism on French law

Different countries are using various methods to determine its jurisdiction; some use of a system and some other integrated of multi-system, generally, there are the following systems:

1. Territorial system of criminal law,
2. Personal rules of the system,
3. System of global right to punish,
4. System of criminal code of Reality

In general, can consider the general principles of the constitution states that have many of similarities; these principles are: these rights are important from two aspects:

The duties and obligations of the community:

1. Respect to certain principles of the Constitution.
2. Observance of criminal laws and regulations
3. Observance of Traffic regulations
4. Non-interventionism on political affairs
5. Absence of malice toward national monuments and cultural heritage
6. Respect to national customs, cultural and religious

The rules are performed toward tourism On French society more or less.

3.3. The law and society of rights and duties toward Tourism

1. Physical security and finance
2. Provide amenities
3. The rights become familiar with the laws and customs of the host country
4. Prohibition of his unreasonable arrest

4. Tourism rights in Iran

There are two categories rights for Tourists: Probate law and public law. Private law has enacted for foreigners on our various rules. Thus, it can be concluded that most tourists rights as follows:

4.1.1. The right to plead and lawsuit:

Namely, tourists can take legal action, like all Iranians, for lost rights or to obtain himself legitimate right comfortably on Iranian courts and is not being led alienated to deprivation.

If it is more convenient for tourists litigation procedure increases their confidence in our judicial system and will feel safe.

Of course there are the rights for foreigners On Civil Procedure Code and Iranian penal code but

with special circumstances, In particular, on the interactive behavior of another country.

4.1.2. Prohibition of unreasonable him arrest

Tourists must feel in a state of peace and security; if the authorities are attempting to arrest an alien without legal reason cause to conceive others.

4.1.3. Right to respect for his personality

Tourist is this natural right that is about dignity as a human.

This natural right should not be molested no way, apart from these; he would have what language, religion, race and nationality, The host country is obliged to consider this issue.

4.1.4. Right to know with the laws and customs of the host country

Each the host country has a duty to provide a preliminary for tourists before entering the country become familiar with the laws and customs as well as important religious or national society; Because it does not create problems for the host country's by their entry;

So, to address this problem will publish a comprehensive booklet that it contains most the rules and customs of society and give to tourists when granting visas.

4.1.5. The right to enjoy of Timely and appropriate services

Again, the host government is duty bound to provide good facilities for this. If tourists are faced with problems as the Force Majeure Event is able to resolve them quickly, if the government perform worthy measures on the field, will be added to the number of guests. Thus, it is intended to protect the natural rights of tourists and helped to Him prompt on the necessary conditions.

4.2. Tourists Points in Iran rules

Anticipated Privileges to tourists and tourism in Iranian law is enacted in 1998,

A) Personal privileges or direct

B) Indirect Privileges to create proper tourism infrastructure

Considered Privileges for a tourist are as follows:

1. Personal is entering and leaving conventional According to Customs exemption
2. Exit of authorized handicrafts and products with observance relevant regulations;
3. Exit of Books and Press With preservation of its noncommercial
4. The use of customs facilities

According to related regulations, each tourist can take with them to exit described means of the country:

1. Personal jewelry
2. Photography camera; one number
3. Video camera or unprofessional filming
4. Eye camera; one number
5. Portable music device, one number
6. Caviar sealed by the Iranian Fisheries Company, 3 kg.

Generally, in accordance with article 6 of the law of the development and international tourism (approved in 1991) can enhance the personal, one or two Carpet maximum of 12 sq. rugs, handicrafts, musical instruments and other Iranian goods that it is not commercial, According to the law, are not permitted to leave a comment antiques, ancient coins, works of art, cultural, antique paintings, etc.

5. Tourists Rights in Islam

The Tourists who come to Muslim countries and should adhere to all agreements and until live as long as citizens and guests of both businessmen and tourists in the country and is not ended the contract period and stay, they are right in Islamic society that is incumbent of their rights upon the state and citizens; such as:

5.1. Overall safety and security of human, financial, and occupational prestige

Nobody has the right to attack and harassment to them, if it is offensive to them, the Islamic state is obliged to protect their rights and protection. It is forbidden to steal their property which must be returned their property and rights by the legal authorities. Equipment and tools for the research work and the location of economic activities which - by law are allowed to work - should be safe from any offensive

5.2. To enjoy freedom of religious perform the duties and national and religious celebrations;

Presence in temples and religious centers - the existence and survival of the Act is in force - such as synagogues and doing religious practices is free; However, compliance with Respect of Islamic Society.

5.3. Freedom, doing on Ordinances and personal acts according to religion;

like drinking wine, eating pork and the like; If it is as secretly and the their special Indoors; But if they do This Anomalous behavior As obvious in the society and Presence of Muslims, They will be dealt with in accordance with the provisions of the Islamic and they Are free on trade with the Muslim and

presence of Business and market. Any of their betrayal and the Fainting in the transaction is prohibited and forbidden.

5.4. It is prohibited to insult them and vituperation of the hole:

It is the respect accorded to the suits cause undue harassment and the humiliation of Muslims, of course is not right to respect them so that can cause Muslims upset.

5.5. In disagreements, quarrels, conflicts and grievances in the Islamic courts, are treated with equal justice

There is something that is within the Islamic government of the authority Such as the purchase and sale of land, or investment and the establishment of agricultural and industrial enterprises and construction the like of which depends on the discretion of the Islamic government and Ruling principle of all these efforts is to protect the honor of Islam and Muslim interests.

6. Discussions

In today's world, tourism has become one of the worlds largest and the most profitable economic sectors; the industry has affected the flow of capital, revenues, Costs, Balance of payment and investments that was unthinkable until a few decades ago And currently has been cause Movement of capital over the business and industrial world and contributed to grow countries which have realized the importance of the industry and one of the largest international incentive is for more investment. Some countries have monuments of ancient civilization and rich cultural diversity of climate and geographical scope, it is necessary for the rules to support tourism.

Other hand, Iran is thought to enhance the tourist industry; it is forced to make concessions to tourists and be successful in competing with other countries to attract more tourists; If it is determined the position of Iranian lawmakers and show its goodwill, this result is achieved quickly, But if you are going to be balanced, But they distinguish Enforcement powers for itself above the law is not hoped that the industry will grow, It is necessary for negligent tourists; Because we need that They should

come into our country. Other hand, if they do not feel are not willing to come to Iran.

So we have to do good work Good practice in moderating the Rules with appropriate expertise and logical.

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HIV-1 & -2 Co-Infections with Multi-Drug Resistant (MDR) Uropathogens in Port Harcourt, Nigeria

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ABSTRACT: This study was carried out to detect the presence of HIV-1 & -2 coinfections with MDR uropathogens among patients in Port Harcourt, Nigeria. Determine® HIV-1/2, HIV -1/2 Stat- Pak® Assay and Bi-Spot HIV-1 & 2 ImmunoConfirm test kits were used for the detection of HIV-1 and HIV-2 in serum samples. Urine samples were analyzed using standard techniques. Overall prevalence rate of HIV was 61.0%, HIV-1 (94.0%), HIV-2 (6.0%) and HIV-1/ HIV-2 coinfection (0.0%), urinary tract infection [UTI] (85.4%), and UTI/HIV (60.0%). It showed that of the HIV-negatives subjects, 28(43.7%) had UTI while of the 50 HIV-positive subjects, 42(84.0%) had UTI. Females had the highest prevalence of HIV (78.0%) and UTI (70.0%) compared to their male counterparts ($p < 0.05$). Only females (100.0%) were infected with HIV-2 and 36(76.6%) of the HIV-positive females were infected with HIV-1. HIV positive males were only infected by HIV-1. UTI was higher in HIV-positive subjects [48(70.6%)] than in HIV-negative subjects [20 (29.4%)]. Age groups (45-68 years) had highest prevalence of HIV (62.0%) and UTI (68.6%) at $p < 0.05$. Married individuals had highest prevalence of HIV (80.0%) and UTI (54.7%) than the singles ($p < 0.05$). *Escherichia coli* (39.3%) was most predominant in HIV-negative subjects while *Staphylococcus aureus* (66.7%) was most predominant among HIV-positive subjects (31.5%). Generally, the study showed that *Staphylococcus aureus* [37(54.3%)] was the most predominant uropathogen, followed by *Escherichia coli* (24.3%), *Klebsiella pneumoniae* (8.6%), *Proteus* sp (4.3%), *Enterococcus faecalis* (2.9%), *Streptococcus pyogenes* (1.4%) and a mixed infection of *S. aureus* and *E. coli* (4.3%). The antibiotic susceptibility screening and antibiograms of isolates showed presence of multi-drug resistance (MDR) uropathogens. Nalidixic acid, septrin, ampicillin, penicillin and augumentin are not likely a choice antibiotic for HIV and non-HIV patients while ciproflox, ofloxacin and streptomycin are good choice antibiotic for isolates from HIV, non-HIV and HIV/UTI infected patients. However, it was observed that antibiotic synergy is what makes these drugs effective. This study however, further confirmed the presence of HIV/UTI coinfections in Port Harcourt, Nigeria. It also showed that sex, age and marital status was significantly associated with prevalence of HIV, UTI and HIV/UTI. General surveillance and public health education to stop the spread of the infection from this group is advocated.

[Frank-Peterside N, Chukwugozim-Umejuru R, Okerentugba PO, Okonko IO. **HIV-1 & -2 Co-Infections with Multi-Drug Resistant (MDR) Uropathogens in Port Harcourt, Nigeria.** *Nat Sci* 2013;11(11):11-20]. (ISSN: 1545-0740). <http://www.sciencepub.net/nature>. 3

Keywords: Antibiograms, Antibiotic susceptibility screening, Co-infections, HIV, UTI, HIV/UTI, Multi-drug resistance (MDR), Uropathogens

INTRODUCTION

Urinary tract infection is one of the significant illnesses that cause burden on national exchequer (Jai et al., 2012). Due to widespread and injudicious use of antibiotics at community level we are encountered more and more resistance pattern of micro-organisms to common antibiotics (Jai et al., 2012). Urinary tract infection is not only common nosocomial infection but an important source of morbidity in community as well (Sharma, 1997; Acharya et al., 2011; Jai et al., 2012). It is the most frequent cause of illness in humans after respiratory tract infection (Liperky, 1989; Jai et al., 2012). It has been observed that *E. coli* is the sole causative agent in more than 80% of uncomplicated UTI (Rao-Bhau et al., 1987; Jai et al., 2012). Main cause of urinary tract infection is obstruction of urinary tract including stone disease, pelvi-ureteric junction obstruction, benign

prostate hyperplasia, vesico-ureteric reflux, urethral strictures and neuropathic bladder (Measly and Levison, 1991; Jai et al., 2012).

Urinalysis only indicates presence of bacteria and leucocytes in the urine, which is indirect evidence of UTI but it can only be confirmed on the basis of microscopy and microbial culture (Van Nostrand et al., 2000; Jai et al., 2012). To ensure appropriate therapy, current knowledge of the organisms that cause UTI and their antibiotic susceptibility is mandatory (Gupta et al., 2002; Jai et al., 2012). There are various reports available about changing pattern of pathogen and their susceptibility to routinely used antibiotics in last two decades due to extra chromosomal genetic elements, which simultaneously carry gene for resistance to number of antibiotics and this has made the situation miserable, especially in

gram negative bacteria (Ram et al., 2000; Jai et al., 2012).

HIV/AIDS is a major public health problem in Cameroon which had a prevalence of 5.1% in 2010 with 141 new infections per day (Nsagha et al., 2012). The fear of voluntary counseling and testing (VCT) is an obstacle to HIV prevention. The pandemic is dominated by HIV-1, which was discovered in 1983 (Nsagha et al., 2012). In 1987, HIV-2 was discovered which is very common in West Africa and has not shown any significant spread from there (Nsagha et al., 2012). HIV-2 is less easily transmitted than HIV-1 and the period between initial infection and illness is longer than with HIV-1 (Cheesbrough, 2006; Nsagha et al., 2012).

HIV-1 and HIV-2 co-infection in West Africa show 0.4% HIV-1 and 0.2% HIV-2 in northern Benin (Zanchette et al., 1990; Nsagha et al., 2012), 6.6% HIV-1 and 0.9% HIV-2 in central Benin (Chippaux et al., 1990; Nsagha et al., 2012), 25% HIV-2 and 5% HIV-1/HIV-2 in Mauritania (Baidy et al., 1993; Nsagha et al., 2012), 65% HIV-1, 24% HIV-2 and 11% HIV-1/HIV-2 in Senegal (Ndiaye et al., 2008; Nsagha et al., 2012) and 12.1% HIV-1, 0.5% HIV-2 and 1.6% co-infection in north western Nigeria (Abdulazeez et al., 2008; Nsagha et al., 2012).

HIV-1/HIV-2 co-infection studies revealed a difference in the progression to AIDS among HIV-1, HIV-2 or co-infection and their response to antiretrovirals (Cheesbrough, 2006; Nsagha et al., 2012). As the HIV/AIDS pandemic advances, VCT should be provided along with sensitization (UNICEF, 2009; Nsagha et al., 2012). VCT is important in improving care and support (UNAIDS, 2001; Nsagha et al., 2012) and many developing countries are instituting it as part of the primary health care package (Coovadia, 2000; Nsagha et al., 2012). Developments in cotrimoxazole prophylaxis (Wiktor et al., 1999; Anglaret et al., 1999; Nsagha et al., 2012) and tuberculosis preventive therapies (Mwingwa et al., 1998; Nsagha et al., 2012) for HIV people, antiretroviral (ARV) therapy and PMTCT, have expanded to VCT (Shaffer et al., 1999; Carpenter et al., 2000; Nsagha et al., 2012).

In 2008 WHO suggested that the use of presumptive clinical diagnosis in accordance with nationally defined algorithms would be required in settings with limited access to HIV virological testing (WHO, 2008; Nathoo et al., 2012).

This study is aimed to determine the prevalence of HIV-1 and HIV-2 among patients in Port Harcourt, Nigeria and to determine pattern of uropathogens isolated from HIV positive and HIV negative subjects and their resistance and sensitivity to different antibiotics so that the clinicians may suggest

more appropriate treatment regime at initial stage in benefit of patient as well.

2. MATERIALS AND METHODS

2.1. Study population

Samples were collected from the HIV clinic at University of Port Harcourt Teaching Hospital (UPTH), Choba Port Harcourt and Buguma General Hospital, Port Harcourt, Nigeria. Subjects were randomly selected for the study. Eighty-two subjects were used in this study. Fifty of the subjects were HIV infected patients while 32 were HIV negative. About 2ml of the subject blood were collected using a sterile syringe into a plain bottle. Suspicion of UTI was made on the basis of urinary symptoms, fever, purulent urine or hematuria. Their urine samples were sent to Medical Microbiology Laboratory working under supervision of qualified microbiologist. Specimen was collected by standard "clean catch" mid stream method in patients who had no catheter in place. Before collecting the sample, male subjects were asked to clean the genital part with soap and water while female patients were told to do the genital toilet using soap and water and the vulva was washed and the labia was carefully separated prior to voiding the urine in sterile bottle. Samples were tested for presence of white blood cells and cast.

2.2. Isolation and Identification of isolates

Samples were examined and processed on the blood agar, CLED and Mckonkey's medium by standard loop method and incubated for at least 24 hours at 37°C. Plates were observed for bacterial growth. Culture results were interpreted as significant and insignificant according to standard i.e. a growth of $\geq 10^5$ CFU/ml was labelled as significant bacteriuria.

2.3. Antibiotics sensitivity test

Antibiotic susceptibility test of antibiotics and their interpretation was carried out for bacterial isolates by Kirby-Baur technique as recommended by National Committee for Clinical Laboratory Standards (2000). Uropathogens were identified on the basis of Gram's reaction, colony morphology and standard biochemical tests. Antibiotic susceptibility was tested by disc diffusion method for all 1st and 2nd line antibiotics. First line antibiotics tested were Ampicillin, Augumentin, Co-trimoxazole (Septrin), Gentamicin, Nalidixic acid, Penicillin and Streptomycin. Second line antibiotics tested were Ceporex, Ofloxacin, Peflacin and Ciproflox.

2.4. Screening for HIV-1 and HIV-2 Antibodies

The Abbott Determine® HIV-1/2 Test cards (manufactured by Inverness Medical, Japan) and Chembio HIV -1/2 Stat- Pak® Assay (manufactured

by Chembio Diagnostic Systems, USA) which are single-use immune chromatographic, rapid screening test for the detection of HIV-1 and-2 antibodies. All tests were carried out according to the manufacturer's specification.

2.5. Confirmation and Differentiation of HIV- 1 from HIV-2

Bi-Spot HIV-1 & 2 ImmunoConfirm kits (manufactured by Orgenics Ltd., Israel) was employed to differentiate HIV-1 from HIV-2. The immunocomb II HIV 1 & 2 Bispot is an indirect solid-phase enzyme immuno-assay (EIA). This was also carried out according to the manufacturer's specification.

2.6. Data Analysis

SPSS 20.0 for Windows statistical package was employed in the analysis of the data generated. The normal distribution was tested by the kolmogororsmirnov test. The distribution was grouped into age, percentage detection, educational status and parity. The chi-square was used to test for goodness of fit between the percentage detection and percentage screened independency / dependence between parity and percentage detection and dependence between percentage positivity and educational status. An error probability (P value) <0.05 was considered significant.

3. Results Analysis

From the bio data of the subjects, ages ranged from 20-68 years. It also showed that 37(45.1%) were singles while 45(54.9%) were married. Forty-nine (59.8%) of the subjects were females while 33(40.2%) were males.

3.1. Overall HIV and UTI prevalence in the study population

Of the 82 samples tested, 50(61.0%) were positive with DETERMINE HIV-1/2. Among the 50 positive cases, there were 39(78.0%) and 11(22.0%) males ($P \leq 0.05$) (Table 1). Of the 50 positive cases tested with Biospot IMMUNOCONFIRM, 47(94.0%) were HIV-1, 3(6.0%) HIV-2 and 0(0.0%) HIV-1/HIV-2 coinfection (Table 2). No data on profession, religion, educational level, health area and the tribe of the participants was collected in this study.

Table 1 also shows the overall prevalence of urinary tract infection (UTI). It also showed that 70(85.4%) had urinary tract infection (UTI) while 12(14.6%) had no UTI (Tables 1). Of the 70 subjects who had UTI, 42(60.0%) tested positive for HIV. Of the 12 subjects who had no UTI, 8(66.7%) tested positive for HIV (Table 1). It showed that of the HIV-negatives subjects, 28(43.7%) had UTI while of the 50 HIV-positive subjects, 42(84.0%) had UTI.

Table 1: Overall HIV and UTI prevalence in the study population

Status	No. (%)	UTI coinfection (%)
HIV serostatus		
Reactive	50(61.0)	42(84.0)
Non-reactive	32(39.0)	28(87.5)
Total	82(100.0)	70(85.4)
HIV serostatus		
No. of HIV-1 positive cases	47(94.0)	40(85.1)
No. of HIV-2 positive cases	3(6.0)	2(66.7)
No. of HIV-1/HIV-1 coinfection cases	0(0.0)	0(0.0)
Total	50(100.0)	42(84.0)
UTI		HIV coinfection (%)
Positive	70(85.4)	42(60.0)
Negative	12(14.6)	8(66.7)
Total	82(100.0)	50(61.0)

3.2. HIV seropositivity and UTI coinfection according to gender among the seroprevalence cases

Table 2 shows the prevalence of HIV and UTI coinfection in relation to sex. It showed that females had higher prevalence of HIV [39(78.0%)] compared to their male counterparts [11(22.0%)]. Only females (100.0%) were infected with HIV-2 and 36(76.6%) of the HIV-positive females were infected with HIV-1. HIV positive males were only infected by HIV-1. It also showed that females [49(70.0%)] had higher prevalence of urinary tract infection (UTI) than their male counterparts [21(32.8%)]. There was significant difference in the distribution of HIV and UTI in the different sex group ($p < 0.05$).

Table 2: HIV seropositivity and UTI coinfection according to gender among the seroprevalence cases

Status	Total No. (%)	Males No. (%)	Females No. (%)
HIV			
Reactive	50(61.0)	11 (22.0)	39(78.0)
Non-reactive	32(39.0)	22(68.7)	10(31.3)
Total	82(100.0)	33(40.2)	49(59.8)
HIV serostatus			
No. of HIV-1 positive cases	47(94.0)	11(23.4)	36(76.6)
No. of HIV-2 positive cases	3(6.0)	0(0.0)	3(100.0)
No. of HIV-1/HIV-1 coinfection cases	0(0.0)	0(0.0)	0(0.0)
Total	50(100.0)	11(22.0)	39(78.0)
UTI			
Positive	70(85.4)	21(30.0)	49(70.0)
Negative	12(14.6)	12(100.0)	0(0.0)
Total	82(100.0)	33(40.2)	49(59.8)

3.3. HIV seropositivity and UTI coinfection according to age and gender among the seroprevalence cases

Table 3 shows the prevalence of HIV-1 and HIV-2 antibodies with and without UTI in relation to age. It showed that subjects within age groups 45-68 years [31(62.0%)] had higher prevalence of HIV than those in age groups 20-44 years [19(38.0%)]. Also, age groups 45-68 years had higher prevalence of HIV-1 [29(61.7%)] and HIV-2 [2(66.7%)] than those in age groups 20-44 years who had prevalence of 38.3% for HIV-1 and 33.3% for HIV-2 antibodies. It also showed that age groups 45-68 years had higher prevalence of UTI [48(68.6%)] than those in age groups 20-44 years [22(31.4%)]. There was significant difference in the distribution of HIV and UTI in the different age groups ($p < 0.05$).

Table 3: HIV seropositivity and UTI coinfection according to age and gender among the seroprevalence cases

Status	No. (%)	20-44years (%)	45-68 years (%)
HIV			
Reactive	50(61.0)	19 (38.0)	31(62.0)
Non-reactive	32(39.0)	11(34.4)	21(65.6)
Total	82(100.0)	33(40.2)	49(59.8)
Gender			
No. of positive males	11(22.0)	7(63.6)	4(36.4)
No. of positive females	39(78.0)	12(30.8)	27(69.2)
Total	50(100.0)	19(38.0)	31(62.0)
HIV serostatus			
No. of HIV-1 positive cases	47(94.0)	18(38.3)	29(61.7)
No. of HIV-2 positive cases	3(6.0)	1(33.3)	2(66.7)
No. of HIV-1/HIV-1 coinfection cases	0(0.0)	0(0.0)	0(0.0)
Total	50(100.0)	19(38.0)	31(62.0)
UTI			
Positive	70(85.4)	22(31.4)	48(68.6)
Negative	12(14.6)	11(91.7)	1(8.3)
Total	82(100.0)	33(40.2)	49(59.8)

3.4. HIV seropositivity and UTI coinfection according to marital status and gender among the seroprevalence cases

Table 4 shows the prevalence of HIV-1 and HIV-2 antibodies with and without UTI in relation to marital status. It showed that subjects who were married had higher prevalence of HIV [40(80.0%)], HIV-1 [37(78.7%)], HIV-2 [3(100.0%)] and UTI [35(54.7%)] than those who were singles. There was significant difference in the distribution of HIV and UTI in the different marital status ($p < 0.05$).

Table 4: HIV seropositivity and UTI coinfection according to marital status and gender among the seroprevalence cases

Parameters	No. (%)	Singles (%)	Married (%)
HIV			
Reactive	50(61.0)	10 (20.0)	40(80.0)
Non-reactive	32(39.0)	27(84.4)	5(15.6)
Total	82(100.0)	37(45.1)	45(54.9)
HIV serostatus			
No. of HIV-1 positive cases	47(94.0)	10(21.3)	37(78.7)
No. of HIV-2 positive cases	3(6.0)	0(0.0)	3(100.0)
No. of HIV-1/HIV-1 coinfection cases	0(0.0)	0(0.0)	0(0.0)
Gender			
No. of positive males	11(22.0)	2(18.2)	9(81.8)
No. of positive females	39(78.0)	17(43.6)	22(56.4)
Total	50(100.0)	19(38.0)	31(62.0)
UTI			
Positive	70(85.4)	29(41.4)	41(58.6)
Negative	12(14.6)	8(66.7)	4(33.3)
Total	82(100.0)	37(45.1)	45(54.9)

Table 5: Frequency of Occurrence of urine isolates among subjects

Isolates	No. (%)	HIV-Negative	HIV-Positive
<i>Klebisella pneumoniae</i>	6(8.6)	6(100.0)	0(0.0)
<i>Escherichia coli</i>	17(24.3)	11(64.7)	6(35.3)
<i>Proteus sp.</i>	3(4.3)	1(33.3)	2(66.7)
<i>Streptococcus pyogenes</i>	1(1.4)	0(0.0)	1(100.0)
<i>Enterococcus faecalis</i>	2(2.9)	0(0.0)	2(100.0)
<i>Staphylococcus aureus</i>	38(54.3)	10(26.3)	28(73.7)
<i>S. aureus & E. coli</i>	3(4.3)	0(0.0)	3(100.0)
Total	70(100.0)	28(40.0)	42(60.0)
Distribution of urine isolates among HIV-Negative Subjects			
Isolates	No. (%)		
<i>Klebisella pneumoniae</i>	6(21.4)		
<i>Escherichia coli</i>	11(39.3)		
<i>Proteus sp.</i>	1(3.6)		
<i>Staphylococcus aureus</i>	10(35.7)		
Total	28(100.0)		
Distribution of urine isolates among HIV-Positive Subjects			
Isolates	No. (%)	HIV-1	HIV-2
<i>Escherichia coli</i>	6(14.3)	6(100.0)	0(0.0)
<i>Proteus sp.</i>	2(4.8)	2(100.0)	0(0.0)
<i>Streptococcus pyogenes</i>	1(2.4)	1(50.0)	1(50.0)
<i>Enterococcus faecalis</i>	2(4.8)	1(50.0)	1(50.0)
<i>Staphylococcus aureus</i>	28(66.7)	28(100.0)	0(0.0)
<i>S. aureus & E. coli</i>	3(7.1)	1(50.0)	1(50.0)
Total	42(100.0)	39(92.9)	3(7.1)

3.5. Frequency of occurrence of uropathogens from isolated HIV-positive and HIV-negative Subjects

Table 5 shows frequency of occurrence of uropathogens isolated from HIV-positive and HIV-negative subjects. It showed that *Staphylococcus aureus* [38(54.3%)] was the most predominant bacteria. This was followed by *Escherichia coli* [17(24.3%)], *Klebsiella pneumoniae* [6(8.6%)], *Proteus sp* [3(4.3%)], *Enterococcus faecalis* [2(2.9%)], *Streptococcus pyogenes* [1(1.4%)] and a mixed infection of *Staphylococcus aureus* and *Escherichia coli* [3(4.3%)].

It showed that of the HIV-negative subjects, 28(40.0%) yielded growth of bacteria pathogens as follows: *Escherichia coli* [11(39.3%)], *Staphylococcus aureus* [10(35.7%)], *Klebsiella pneumoniae* [6(21.4%)] and *Proteus* sp [1(3.6%)]. Among the 50 HIV-positive subjects, 42(60.0%) yielded growth of bacteria pathogens as follows: *Staphylococcus aureus* [28(66.7%)], *Escherichia coli* [6(14.3%)], *Proteus* sp. [2(4.8%)], *Enterococcus faecalis* [2(4.8%)] and *Streptococcus pyogenes* [1(2.4%)].

3.6 Antibiotic Sensitivity and Resistance profile of urine isolates from HIV-positive and HIV-negative subjects

Table 6 shows antibiotic sensitivity and resistance profile of urine isolates from HIV-positive and HIV-negative subjects. Detailed results of the antibiotic resistance screening tests and the summary of the antibiogram profiles obtained are presented in tables 6 and 7 respectively. The results show that all isolates from HIV-negative subjects and *E. coli* isolates from HIV-positive subjects are multidrug resistant, i.e. are resistant to four or more antibiotics. All isolates are resistant to nalidixic acid (Table 6).

Table 6: Antibiotic Sensitivity and Resistance profile of urine isolates from HIV-positive and HIV-negative subjects

Isolates	PEN	AMP	CEP	OFL	NAL	PEF	GEN	AUG	GPR	SEP	STR
HIV Subjects											
<i>E. coli</i>	S	S	S	S	R	S	R	R	S	R	S
<i>S. pyogenes</i>	S	S	S	S	R	S	S	S	S	S	S
<i>E. faecalis</i>	S	S	S	S	R	S	S	R	S	R	S
<i>S. aureus</i>	S	S	S	S	R	S	S	S	S	S	S
<i>S. aureus</i> & <i>E. coli</i>	S	S	S	S	R	S	S	S	S	R	S
HIV-Negatives Subjects											
<i>K. pneumoniae</i>	R	R	S	S	R	S	S	S	S	R	S
<i>E. coli</i>	R	S	S	S	R	S	R	R	R	S	S
<i>P. mirabilis</i>	R	R	R	S	R	S	R	R	S	R	S
<i>S. aureus</i>	R	S	R	S	R	R	R	R	S	S	S

Key: R – Resistance; S – Sensitive; PEN-Penicillin; AMP-Ampicillin; CEP-Ceporex; OFL-Ofloxacin; NAL-Nalidixic acid; PEF-Peflacin; GEN-Gentamycin; AUG-Augmentin; CIP-Ciproflox SEP-Septrin; STR-Streptomycin

Table 7 shows the results of the percentage antibiotic sensitive and resistance of urine isolates. High sensitivity to ofloxacin (66.7-100.0%), peflacin (50.0-100.0%), streptomycin (66.7-100.0%), gentamycin (50.0-100.0%) and ciproflox (86.8-100.0%) was recorded. High resistance to penicillin (50.0-100.0%), ampicillin (58.8-100.0%), nalidixic acid (50.0-100.0%) and augmentin (50.0-100.0%) were observed.

Table 7: Percentage Sensitivity and Resistance to antibiotics

Isolates	No. (%)		PEN	AMP	CEP	OFL	NAL	PEF	GEN	AUG	CIP	SEP	STR
<i>K. pneumoniae</i>	6(8.6)	S	0(0.0)	0(0.0)	6(100.0)	5(83.3)	0(0.0)	6(100.0)	6(100.0)	0(0.0)	6(100.0)	0(0.0)	6(100.0)
		R	6(100.0)	6(100.0)	0(0.0)	1(16.7)	6(100.0)	0(0.0)	0(0.0)	6(100.0)	0(0.0)	6(100.0)	0(0.0)
<i>E. coli</i>	17(24.3)	S	6(35.3)	7(41.2)	14(82.4)	13(76.5)	5(29.4)	17(100.0)	17(100.0)	0(0.0)	17(100.0)	8(47.1)	17(100.0)
		R	11(64.7)	10(58.8)	3(17.6)	4(23.5)	12(70.6)	0(0.0)	0(0.0)	18(100.0)	0(0.0)	9(52.9)	0(0.0)
<i>S. pyogenes</i>	1(1.4)	S	1(100.0)	1(100.0)	1(100.0)	1(100.0)	0(0.0)	1(100.0)	1(100.0)	1(100.0)	1(100.0)	1(100.0)	1(100.0)
		R	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(100.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
<i>E. faecalis</i>	2(2.9)	S	1(50.0)	0(0.0)	2(100.0)	2(100.0)	1(50.0)	1(50.0)	1(50.0)	1(50.0)	2(100.0)	1(50.0)	2(100.0)
		R	1(50.0)	2(100.0)	0(0.0)	0(0.0)	1(50.0)	1(50.0)	1(50.0)	1(50.0)	0(0.0)	1(50.0)	0(0.0)
<i>S. aureus</i>	38(54.3)	S	14(36.8)	14(36.8)	13(34.2)	33(86.8)	2(5.3)	22(57.9)	20(52.6)	14(36.8)	33(86.8)	7(18.4)	30(78.9)
		R	24(63.2)	24(63.2)	25(65.8)	5(13.2)	36(94.7)	16(42.1)	18(47.4)	24(63.2)	5(13.2)	31(81.6)	8(21.1)
<i>S. aureus</i> & <i>E. coli</i>	3(4.3)	S	3(100.0)	3(100.0)	3(100.0)	3(100.0)	0(0.0)	3(100.0)	3(100.0)	0(0.0)	3(100.0)	0(0.0)	3(100.0)
		R	0(0.0)	0(0.0)	0(0.0)	0(0.0)	3(100.0)	0(0.0)	0(0.0)	3(100.0)	0(0.0)	3(100.0)	0(0.0)
<i>Proteus</i> sp.	3(4.3)	S	0(0.0)	0(0.0)	3(100.0)	2(66.7)	0(0.0)	3(100.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(33.3)
		R	3(100.0)	3(100.0)	0(0.0)	1(33.3)	3(100.0)	0(0.0)	3(100.0)	3(100.0)	3(100.0)	3(100.0)	2(66.7)

Key: R – Resistance; S – Sensitive; PEN-Penicillin; AMP-Ampicillin; CEP-Ceporex; OFL-Ofloxacin; NAL-Nalidixic acid; PEF-Peflacin; GEN-Gentamycin; AUG-Augmentin; CIP-Ciproflox SEP-Septrin; STR-Streptomycin

DISCUSSION

This study is examined the prevalence of HIV-1 and HIV-2 among patients in Port Harcourt,

Nigeria. It also aimed to determined pattern of uropathogens isolated from HIV positive and HIV negative subjects and their resistance and sensitivity to

different antibiotics. HIV/AIDS is a pandemic affecting the rich and the poor, the educated and illiterate, the married and single. It has its tentacles in all groups of people. However, the age range during this pandemic are the youths i.e. the sexually active group, this group range from 18–45 years. UTI is an infection that affects women as well as men but women are known to be more prone to it.

In course of this study, it was helpful finding out that sex, age and marital status of the subjects made a significant difference in the prevalence of HIV and UTI. This study confirmed that UTI is more prevalent in females than males and that HIV cuts across all age groups. It showed that females are more prone to HIV and UTI than males (UNAIDS, 2010).

In this study, there were more HIV-1 than HIV-2 which agrees with the findings of Nsagha et al. (2012) where there were more HIV-1 than HIV-2. It also agrees with the study of Abdulazeez *et al.* (2008), who found 12.1% and 0.5% for HIV-1 and HIV-2 respectively. Our finding contrasts the findings of a Malian study by Maiga et al. (1993) where there were more HIV-2 than HIV-1 and that of Ndiaye *et al.* (2008). This study also disagrees with that of Abdulazeez *et al.* (2008) who found 1.6% for HIV-1/HIV-2 coinfection. The absence of HIV-1/HIV-2 coinfection in our study disagrees with that of Abdulazeez *et al.* (2008) and Nsagha et al. (2012). Our finding however, does not rule out the possibility of more co-infection with the two virus strains. HIV-1/HIV-2 co-infection may lead to anti-retroviral resistance (Nsagha et al., 2012).

The 61.0% overall HIV seroprevalence was significantly high in the population as compared to the 4.1% prevalence in the Nigerian. The presence of many higher institutions of learning in Port Harcourt increases the youth population who are more vulnerable because of their sexual habits (Nsagha et al., 2012).

In this study, there was significant difference in HIV infection with age and sex ($p < 0.05$); hence females and older age groups have the likelihood of being infected with HIV. Our findings showed that the most infected were in the 45-68 age brackets which disagrees with results of UNAIDS (2009), that the HIV prevalence in Nigeria is more amongst people aged 15-49 years. Our findings disagree with that of the Nsagha et al. (2012) who reported that most infected were in the 20-29 and 30-39 age brackets. According to Nsagha et al. (2012), the HIV prevalence in Cameroon is also more amongst people aged 15-49 years. In line with other reports, during the early years of HIV infection in Nigeria, social stigma was very high and treatment was not easily available (Eboko, 2008; Nsagha et al., 2012). With the availability of

free HIV/AIDS drugs (Baggaley, 2001), many people are willing to go for VCT and treatment.

In this study, the overall prevalence of urinary tract infection (UTI) was 85.4%, UTI (66.7% and HIV/UTI (60.0%). Looking at our findings, significant numbers of middle aged (45-68 years) patients had highest incidence of UTI. Females had highest incidence of UTI may be due to the proximity of their bladder outlet to the vagina. Married individuals had highest incidence of UTI. Although definitive diagnosis is based on culture results but looking at the significant bacteriuria in 85.4% of samples shows good clinical co-relation between clinical and microbiological diagnosis (Das et al., 2006; Jai et al., 2012).

In this study, the frequency of occurrence of uropathogens showed that *Staphylococcus aureus* [37(52.9%)] was the most predominant microorganism. This was followed by *Escherichia coli* [18(25.7%)], *Klebsiella pneumoniae* [6(8.6%)], *Proteus sp* [3(4.3%)], *Enterococcus faecalis* [2(2.9%)], *Streptococcus pyogenes* [1(1.4%)] and a mixed infection of *Staphylococcus aureus* and *Escherichia coli* [3(4.3%)]. Presence of insignificant growth or sterile urine may be due to prior use of antibiotics or improper method of collecting samples (Jai et al., 2012).

Interestingly in the present study, most of the pathogens isolated were Gram negative rods. This disagrees with the findings of Akram et al. (2007), Yoon et al. (2011) and Jai et al. (2012) in which all detected organisms were gram negative. Gram negative bacteria have several properties to attach and invade urothelium in comparison to gram positive pathogens (Jai et al., 2012).

This study showed that *Escherichia coli* [11(39.3%)] was the most predominant organisms isolated from HIV-negative individuals. This was closely followed by *Staphylococcus aureus* [10(35.7%)], *Klebsiella pneumoniae* [6(21.4%)] and *Proteus sp* [1(3.6%)]. This is in agreement with Jai et al. (2012) who reported that *E. coli* (64.5%) was the most common isolate found in urine samples. High resistance (50.0-100.0%) of *E. coli* to antimicrobial agents tested was observed in this study. This is similar to what was observed by Aibinu *et al.* (2004) and Jai et al. (2012) who reported 100.0% resistance of their *E. coli* isolates to ampicillin. Densenclos *et al.* (1988) reported 53.0% of their *E. coli* isolates were resistant cotrimoxazole (septrin). Jai et al. (2012) reported 69.0% of their *E. coli* isolates were resistant cotrimoxazole. Their finding is in harmony with the report of this study, showing 50.0%. The reason for this high resistance to commonly used antibiotics may be due to widespread and indiscriminate use in our environment (Jai et al., 2012).

In our study, *Staphylococcus aureus* [27(64.3%)] was the most predominant organisms isolated from HIV-positive individuals. This was followed by *Escherichia coli* [7(16.7%)], *Proteus* sp. [2(4.8%)], *Enterococcus faecalis* [2(4.8%)] and *Streptococcus pyogenes* [1(2.4%)].

From the results, high sensitivity to ofloxacin (66.7-100.0%), peflacin (50.0-100.0%), streptomycin (66.7-100.0%), gentamycin (50.0-100.0%) and ciproflox (86.8-100.0%) was recorded. It also showed that high resistance to high resistance to penicillin (50.0-100.0%), ampicillin (58.8-100.0%), nalidixic acid (50.0-100.0%) and augumentin (50.0-100.0%) were observed. There are number of studies in which mentioned about resistance of micro-organisms to conventional antibiotics like ciprofloxacin (Srinivasa et al., 1999; Ehinmidu, 2003; Umolu et al., 2006). This observed resistance to these drugs is a probable indication of earlier exposure of the isolates to these drugs, which may have enhanced resistant development (Krumpermann, 1983; Ehinmidu, 2003).

In recent years, use of fluoroquinolones has increased in many countries and emergence of resistance of bacterial isolates to fluoroquinolones has been observed (Umolu et al., 2006). In this study, 100.0% of the isolates were sensitive to ofloxacin and peflacin. In previous years, *E. coli* was 100.0% susceptible to the fluoroquinolones. In 1996, Egri-Okwaji (1996) reported 100.0% susceptibility of *E. coli* isolates to ofloxacin. Umolu et al. (2006) reported 22.1% of ofloxacin resistance in their study, which is on the high side. Similar high resistance of *E. coli* to ofloxacin has also been documented by Alex et al. (2001); they observed that 24% of 189 *E. coli* isolates were resistant to ofloxacin.

In line with Umolu et al. (2006), the reason for the high resistance to most of the commonly used antibiotics observed in this study may be due to increasing an irrational consumption rate, transmission of resistant isolates between people and consumption of food from animals that have received antibiotics (Umolu et al., 2006). Self-medication and non-compliance with medication and sales of substandard drug may account for the rise in antibiotic resistance observed in this community (Umolu et al., 2006).

Detailed results of the antibiotic resistance screening tests in this study showed that all isolates from HIV-negative subjects and *E. coli* isolates from HIV-positive subjects are multidrug resistant (MDR), i.e. are resistant to four or more antibiotics. All isolates are resistant to nalidixic acid. Multiple drug resistance (MDR) among UTI isolates in USA was reported to be 7.1% in 2000 (Sahm et al., 2001; Umolu et al., 2006). Such multi drug resistance has serious implications for the empiric therapy of infections caused by *E. coli* and for the possible co-

selection of antimicrobial resistance mediated by multi drug resistance plasmids (Sherley et al., 2004; Umolu et al., 2006).

From the results of this study, multidrug resistant isolates i.e. isolates resistant to three or more antibiotics, were observed to be very common in the study area as 50.0% and 100.0% of isolates from HIV-positive and HIV-negative individuals respectively showed multidrug resistance. This is similar to what was observed by Umolu et al. (2006) who reported that 67.0% of the *E. coli* isolated from human clinical isolates in Lagos showed multidrug resistance. One of the limitations of this study is that we could not obtain some demographic information from participants because of logistic reasons. The fact that few numbers of subjects was used is another limitation to this study.

5. CONCLUSION

UTI is no doubt a prevalent infection in women and HIV infected individuals. Thus, attention should be giving to screening for UTI among HIV infected individuals. Eighty-five percent of samples showed significant growth. High yield of positive cultures showed good clinical co-relation in suspected cases of UTI. Organisms isolated in urine cultures were gram negative and gram positive bacteria. Study shows that pathogens causing urinary tract infections are developing resistance against commonly used antibiotics. Since antimicrobial resistant patterns are constantly evolving, and present global public health problem, there is the necessity for constant antimicrobial sensitivity surveillance. This will help clinicians provide safe and effective empiric therapies.

Also, we had a prevalence of 61.0% for HIV-1 and HIV-2, 47(94.0%) for HIV-1, 3(6.0%) for HIV-2 and 0(0.0%) for HIV-1/ HIV-2 coinfection. There were 39(78.0%) females and 11(22.0%) males infected giving a ratio of 3:1. The study further confirms that HIV-1 is the major cause of AIDS. HIV screening in Port Harcourt, Nigeria should test for co-infection; anti-retroviral resistance should also be investigated in Port Harcourt, Nigeria.

The antibiotic susceptibility screening of isolates from both HIV-infected and non-HIV infected individuals in this study showed that nalidixic acid, septrin and augumetin are not choice antibiotics for *E. coli*, *Staphylococcus auerus* and *Proteus* sp infection in HIV infected patients while among non-HIV infected, augumetin, ampicillin, penicillin and nalidixic acid are not choice antibiotics. Also, septrin is not likely a choice antibiotic for HIV and non-HIV patients while ciproflox, ofloxacin are good choice antibiotic for *E. coli*, *Staphylococcus aureus* and *Proteus* sp. This study showed that ceporex, ampicillin, streptomycin, septrin, ciproflex are good drug of choice for *Enterococcus faecalis* and

Streptococcus pyogenes infection in UTI/HIV infected patients. However, it was observed that antibiotic synergy is what makes these drugs effective.

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Thermo-Sensitive Flowering Behaviour of *Cajanus cajanifolius* (Haines) Maesen-A Threatened Wild Relative of *Cajanus cajan*

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Abstract: Impact of high temperature on the flowering behaviour of *Cajanus cajanifolius* (Haines) Maesen (Fabaceae), a wild relative of *Cajanus cajan* has been studied. Considerable effects on pollen viability, stigma receptivity, flowering, fruiting and reproductive phenology have been noticed. The study revealed tremendous flower bud fall as soon as the temperature reached above the 30°C during flowering. High temperature stress had also reduced duration of reproductive events.

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Keywords: heat stress; flower abortion; pollen viability; reproductive phenology; stigma receptivity

1. Introduction

The wild relatives of crops are a vital source of genetic diversity that can be used to develop the ability of plants to cope with or to adapt climate change. Reproduction plays an important role in adaptation and succession of plant life. The temperature highly regulates onset of flowering, fruiting, its duration and reproductive outputs. However, due to continuous rise in temperature, the survival of wild relatives of crops is itself under threat as heat stress severely effects their growth, reproductive phenology and yield. Heat stress due to high ambient temperatures is a growing threat to crops worldwide (Hall, 2001, Wahid *et al.*, 2007). Continuous increase in mean temperature can disturb the growth of various plants specially crops, by altering their phenology, resulting in early maturity (Porter, 2005). Sometimes, in many crop plants early maturation is closely correlated with smaller yield production and losses under high temperatures (Adams *et al.*, 2001a). However, plants exhibit a variety of response to high temperature. Such abiotic stress frequently limits the growth and productivity. The effectiveness of high temperature in reducing fruit production during hot summer has been studied by some earlier workers with the best example in Tomato (*Lycopersicon esculentum* Mill.) where fruit set is somewhat affected at day/night temperatures above 26/20 °C and severely affected above 35/26 °C (Barry and Raffiq-uddin, 1988). However, plant responses for heat stress vary species to species and among various phenological stages. Even a short period of heat stress can increase bud and flower abortion (Wahid *et al.*, 2007). Though flower drop is essentially as a result of lack of fertilization, can be influenced by number of factors including reduced gamete viability (Iwahori and Takahashi, 1964;

Iwahori, 1965, 1966) and lesser number of pollen (Abdalla and Verkre, 1968). Hence, bud drop and failure of pollination can lead to drastic loss of yield. Elongation of pollen tube into style may also be affected by high temperature which can disturb normal fertilization process (Smith, 1935; Smith and Cochran, 1935; Iwahori and Takahashi, 1964; Iwahori, 1967). Similarly stigma receptivity may also get affected due to considerable increase in temperature (Charles and Harris, 1972). In different crops the time taken up to fruit ripening varies and is probably affected by the varying temperature (Adams *et al.*, 2001b). In addition, high temperature can also inhibit the ripening process (Lurie *et al.*, 1966) as well as the rate of fruit growth (Adams *et al.*, 2001a). Pulse legumes are particularly sensitive to heat stress at the bloom stage; only a few days of exposures to high temperatures (30-35°C) can cause heavy yield losses through flower drop or pod abortion (Siddique *et al.*, 1999). Considering the above findings, the present study was carried out to determine the effect of rising temperature on the reproductive phenology of threatened (Ramanandan and Singh, 1997; Reddy *et al.*, 2006) *Cajanus cajanifolius*.

Among the wild relatives, *Cajanus cajanifolius* (Fabaceae), is the most probable progenitor of *Cajanus cajan* (Van der Maesen, 1986, 1990; Nadimpalli *et al.*, 1992) and it is speculated that *C. cajan* may have evolved through a series of gene mutations in *C. cajanifolius* (Pundir and Singh, 1985). However, *C. cajanifolius* has been proved as a valuable species as it has not only shown resistance against pod fly (Sithanathan *et al.*, 1980) and *Alternaria* leaf spot disease (Singh *et al.*, 1984) but also exhibits a protein content more than 30% (Singh and Jambunathan, 1980) and had been used in

hybridization programme to develop resistant characters (Pundir and Singh, 1987).

2. Material and Methods

The seeds of *Cajanus cajanifolius* with accession no. 15632 were procured from International Crops Research Institute for the Semi Arid Tropics, Patancheru, Hyderabad (ICRISAT), India. Plants raised from them at experimental plot of National Botanical Research Institute, Lucknow (India) and maintained in two different conditions. A group of five plants were kept in pots inside a net house while another group of five plants were transplanted in the soil- bed outside the net house. Fifty inflorescences from five plants with 539-549 flowering units were tagged randomly. The maximum and minimum temperature was recorded daily during the study. Various events of reproductive phenology including floral bud initiation, flowering peaks, bud and flower abortion, pod initiation, pod maturity and seed set were studied in detail. Maximum and minimum temperature of respective duration was also recorded on the daily basis. Floral buds of 1 day prior to open, 2 days prior to open, about to open and freshly opened flowers were collected for pollen viability and stigma receptivity through Benzidine test (Galen *et al.*, 1985).

3. Results

3.1 Pollen Viability and Stigma Receptivity:

Pollen viability ranged 10-50% in different stages of floral buds and open flowers at 30°C-35°C (Table 1). Similarly stigmas of the same were receptive with gradual loss. However, the floral units of the same stages lost pollen viability as well as stigma receptivity when the temperature increased beyond 35°C (Table 1).

Table 1. Status of Pollen viability and Stigma receptivity of *Cajanus cajanifolius* at 30 °C - 40 °C temperature

Sl no	Floral stage during analysis	Temperature range (30°C-35° C)		Temperature range (35°C-40° C)	
		Pollen viability y (%)	Stigma receptivit y	Pollen viabilit y (%)	Stigma receptivit y
1.	Bud (-2 days to germination)	35-50%	NIL	10-20%	NIL
2.	Bud (-1day)	30-40%	Receptive	NIL	NIL
3.	Bud (0 days) open)	10-30%	Receptive	NIL	NIL
4.	Open flower	10-20%	Receptive	NIL	NIL

Since, *Cajanus cajanifolius* showed two different flowering phases in one season, four flowering phases i.e. two of each season were monitored in detail during 2009-2010 and 2011-2012.

3.2 First Phase (2009-2010):

First phase of flowering started from 26th October 2009 with the opening of first flower and lasted with fruit maturation on 27th January 2010 thus took a total of 94 days. During the starting of flowering the maximum and minimum temperature was 31°C and 13°C respectively while it was 26.2°C and 8.8°C respectively at the end of flowering. However, peak flowering was noticed between 2nd and 4th weeks of November when maximum and minimum temperature ranged between 26.8°C to 31°C and 10.6°C to 14.4°C respectively. Maximum i.e. 68% bud and flower drop was recorded during last week of October to 2nd week of November 2009, when the minimum and maximum temperature ranged between 13.0°C to 15.6 °C and 30.4°C to 31.6°C respectively. Pod initiation started in the 4th week of October and took about 61 days for maturation. During this period maximum and minimum temperature ranged between 23.0°C to 31.0°C and 5.0°C to 13.0°C respectively (Figure 1).

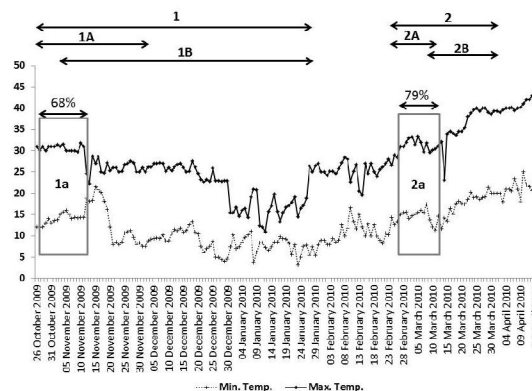


Figure 1. Figure showing fall in flowering units against the fluctuating temperature (Min. and Max.) during 2009-2010. 1. First phase, 1A. Flowering period, 1B. Fruiting and seed set period, 1a. Fall in flowering units at 30-35 °C. 2. Second phase of flowering, 2A. Flowering period, 2B. Fruiting and seed set period, 2a. Fall in flowering units at 30-35 °C.

3.3 Second Phase (2009-2010):

The second phase of flowering was started from 28th Feb when maximum and minimum temperature was 31°C and 15.4°C respectively. Flowering ended on 11th March when temperature was 30.4°C (max.)

and 11.4°C (min.). Thus the complete flowering period took 12 days with a peak flowering period from 6th March (32°C max., 16°C min.) to 9th March (29.6°C max., 13.8°C min.). Pod initiation was started from 9th March and took 22 days for maturation. It was less than half of the first phase of flowering, which was 61 days (Figure 1). Thus the complete duration of reproductive phenology of second phase of flowering was of 34 days. Interestingly most of the buds, which initiated healthy gradually shriveled, died and finally abscised. Thus the total drop was calculated as 97% (Figure 1). Such abscission of floral buds continued over the flowering period simultaneously with the initiation of new buds. During the abscission the maximum temperature was also above the 30°C like the first phase of flowering.

3.4 First Phase (2011-2012):

Flowering started from 3rd Nov. 2011 at 28°C maximum and 15°C minimum temperature and lasted up to 8th January 2012 at 18°C maximum and 11°C minimum temperature, thus took 67 days. However, peak flowering period exhibited between 2nd week of November and 3rd week of December at the temperature range-13°C to 30°C maximum and 4°C to 18°C minimum. A maximum i.e., 53.06% floral bud/flower drop was observed between 2nd and 3rd week of November when maximum and minimum temperature ranged 28°C to 30°C and 12°C to 16°C respectively (Figure 2). Pod initiation started from last week of November and took about 55 days for maturation. Thus total day's counts for flowering to fruit maturation were 73 days. During this period the maximum and minimum temperature ranged between 13°C to 28°C and 2°C to 14°C respectively (Figure 2).

3.5 Second Phase (2011-2012):

Flowering started from 17th February at 30°C maximum 14°C minimum temperature and ended up to 21st March at 32°C maximum 17°C minimum temperature with a peak flowering period from last week of February to 2nd week of March. The range of temperature during this period was 25°C to 32°C maximum and 7°C to 16°C minimum. A maximum i.e., 98.16% bud/ flower drop was recorded during 3rd week to 4th week of March when maximum and minimum temperature ranged 32°C to 36°C and 15°C to 19°C respectively. Pod initiation on remaining flowers was started from 2nd week of March and took about 20 days to be fully matured. During this period the maximum and minimum temperature ranged between 25°C to 37°C and 7°C to 19°C respectively. Thus the total duration from flowering to fruit maturation was scored as 33 days, which was 40 days less than the first phase.

According to the daily observations made on the drop of flowering units and their synchronous relation with rising temperature, though the drop in flowering units was a regular process during the entire flowering period of both phases, the maximum number of drops i.e., 48 and 82 units were recorded on the day when the temperature was 30°C max. /13°C min. and 36°C max. /16°C min. respectively. Similarly, minimum drop i.e., 3 and 1 flowering units were observed on that day when the temperature was 13°C max., 5°C min and 25°C max., 8°C min. in first and second phase respectively (Figure 2).

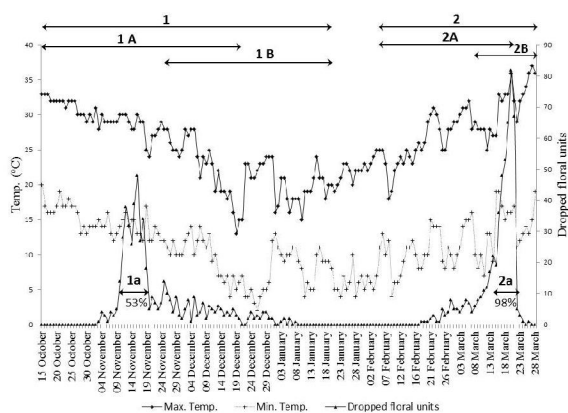


Figure 2. Figure showing fall in flowering units against the daily temperature (Min. and Max.) during 2011-2012. 1. First phase of flowering, 1A. Flowering period, 1B. Fruiting and seed set period 1a. Fall in flowering units between 28-30 °C. 2. Second phase of flowering, 2A. Flowering period, 2B. Fruiting and seed set period. 2a. Fall of flowering units at 32-36 °C.

4. Discussions

Plant reproduction is highly vulnerable to temperature especially when the extremes coincide with flower initiation or during reproductive events. However, in accordance to many other reports (Konsens *et al.*, 1991; Reddy *et al.*, 1992; Guilioni *et al.*, 1997; Siddique *et al.*, 1999; Sato *et al.*, 2006) a short duration of high temperature i.e., above 30°C could significantly increase the frequency of floral bud/flower or pod abortion and caused heavy yield losses in *Cajanus cajanifolius*. Though different reproductive phenological stages differ within sensitivity to high temperature, it is most deleterious during flower initiation. In the first phase of both the years, the bud abortion was observed when the maximum temperature crossed the limit of 30°C. However, in the second phase of flowering of the same years, the maximum temperature was always above the level of 30°C just from the beginning of flowering phase, hence the bud abortion continued

till the end of the flowering simultaneously with the development of new buds. Most of the young buds gradually shriveled in this process, resulting in considerable loss of flowers. Similar types of results were also reported in wheat plant, where temperature raised above 30°C during floret formation caused complete sterility (Owen, 1971; Saini and Aspinall, 1982). A slight rise and fall of temperature even for a short duration can affect plants vegetative as well as reproductive life cycle and many other physiological processes (Singla *et al.*, 1997) as revealed by the present study. Flowering and fruiting stage of any plant species is highly vulnerable to temperature stress though the degree of stress may vary species to species. Though, high temperature is most deleterious when flower start to initiate, different reproductive events differ within its sensitivity. Due to wide fluctuation in temperature, crops are becoming a high risk crop mainly in northern plains. Both abrupt rise and fall in atmospheric temperature lead to flower drop, abortion of pod and poor seed set. Among pulses, *Cajanus* is very sensitive to abrupt fluctuation of temperature leading to massive bud/flower drop as observed in the study. In addition, rising temperature may also lead to alter reproductive phenology as it reduced the duration of different reproductive events. The total duration of bud initiation to pod maturity got reduced up to 1/3 of the duration of first phase, i.e., from 94 days to 32 days. The peak flowering period was also reduced to four days in comparison to 10 days of first phase and the effective pod maturation phase drastically reduced to 31 days in comparison to 61 days of first phase. Due to abrupt and constantly high temperature plant may become physiologically stressed and imbalanced in the biochemical constituents, which can damage pollination, fertilization and seed production process. The study also revealed that not only the rise of maximum temperature responsible for the drop of flowering units but abrupt fall in minimum temperature had also enhanced the number of drops. In addition, during the first year (2009-2010) of study, the flowering remained suspended from last week of January to second week of February, when the maximum and minimum temperature ranged 22°C to 28°C and 5°C to 16°C respectively. Similarly in 2011-2012, flowering was also absent from 3rd week of January to 1st week of February when the maximum and minimum temperature ranged 19°C to 25°C and 4°C to 13°C respectively.

According to the detailed study of both the flowering phases of two consecutive years i.e. 2009-10 and 2011-12 it was concluded that a few days exposure to the temperature beyond 30°C or 35°C during reproductive event is a threat to reproductive

output consequently survival of *Cajanus cajanifolius*. Further studies will definitely not only help to understand the necessary requisites for adapting the changing environment but will also provide some lead to the breeders to develop better varieties for maximum yield even under stress during climate change.

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Low Serum Magnesium Level is one of the contributing factor in development of Type-I Diabetes Mellitus

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Abstract: Magnesium deficiency has been proposed as a novel factor implicated in the pathogenesis of diabetic complications. Hypomagnesaemia can be both a consequence and a cause of diabetic complications. The aim of our study was to know the relationship between serum magnesium levels in type-I diabetes mellitus as compared to the control subjects Eighty (80) cases from which 40 cases of type-I diabetic patients and 40 non diabetic patients were taken as controls. All the patients were evaluated in detail and serum magnesium levels were estimated using Atomic Absorption spectrophotometer. The mean serum Magnesium levels were decreased in type-I diabetes as compared to the control subjects. There was significant reduction in serum magnesium levels in type-I diabetics compared to the controls. So hypomagnesaemia and uncontrolled glycemic index one of the risk factor for development of retinopathy.

[Ali Raza Memon, Muhammad Yousuf Memon, Hafeez-ur-Rehman Shaikh, Rafiq Jalbani, Shakeel Ahmed Shaikh Abdul Sattar Khan. **Low Serum Magnesium Level is one of the contributing factor in development of Type-I Diabetes Mellitus.** *Nat Sci* 2013; 11(11):26-28]. (ISSN: 1545-0740). <http://www.sciencepub.net/nature>. 5

Keywords: Magnesium, Type- I diabetes, Atomic Absorption Spectrometer.

1. Introduction

The chronic hyperglycemia that results may eventually lead to dysfunction, especially the heart, kidneys, blood vessels, nerves and eyes (1). The prevalence of diabetes is on the rise. Besides multiplying the risks of coronary heart disease, diabetes enhances the incidence of cerebrovascular strokes. Moreover it is the leading cause of acquired blindness and accounts for over 25% of cases with end stage renal failure as well as 50% of non-traumatic lower limb amputations. Hypomagnesaemia is a common feature in patients with type-I diabetes. Magnesium is a necessary cofactor for several enzymes that play an important role in glucose metabolism. Some short-term metabolic studies suggest that magnesium supplementation has a beneficial effect on insulin action and glucose metabolism (2). Hypomagnesaemia has long been known to be associated with diabetes mellitus. In diabetics there is a direct relationship between serum magnesium level and cellular glucose disposal that is independent of insulin secretion. This change in glucose disposal has been shown to be related to increased sensitivity of the tissues to insulin in the presence of adequate magnesium levels (3). Magnesium deficiency has been found to be associated with diabetic micro vascular disease. Low serum magnesium level correlated positively with the velocity of regaining basal vascular tone after hyperaemia. Hypomagnesaemia has been demonstrated in patients with diabetic retinopathy, with lower magnesium levels predicting a greater risk

of severe diabetic retinopathy (4). Magnesium deficiency has been found to be associated with diabetic micro vascular disease. Low serum magnesium level correlated positively with the velocity of regaining basal vascular tone after hyperaemia. Hypomagnesaemia has been demonstrated in patients with diabetic retinopathy, with lower magnesium levels predicting a greater risk of severe diabetic retinopathy (5) Magnesium depletion has been associated with multiple cardiovascular implications: arrhythmogenesis, vasospasm, and hypertension and platelet activity.(6)

In this study evaluation of serum magnesium was carried out in patients of type-I diabetes and a correlation of these values with the Controls.

2. Materials and Methods

Sample collection: Forty patients of type-I diabetes admitted or visited to Liaquat University Hospital were included in the study and also 40 non diabetic patients visited due to other problems without diabetes during the same period were included under the control group. Five (5) ml of blood collected from each patient included in study by venipuncture using plastic disposable syringes under aseptic measures. **Analytic method** Serum magnesium level was analyzed by polarized Zeeman atomic absorption spectrophotometer HLA-4S hollow cathode lamp Hitachi series no.2000 magnesium kit by Hitachi at 285.2nm wavelength.

Principle: Magnesium is determined by AAS after diluting the specimen 1:50 with a standard solution of lanthanum hydrochloride to eliminate

interference from anions including phosphate and protein and metal oxides. The dilution also reduces viscosity ensuring that absorption rate for aqueous calibrators and specimens are comparable. The specimen is aspirated into an air acetylene flame in which the ground state magnesium ions absorb light from a magnesium hollow lamp (285.2nm). Absorption at 285.2 nm is directly proportional to the ground state magnesium atoms in the flame (7). The statistical software SPSS version 16 were used for data analysis, student t-test and Chi-square test were used to find out the significant proportions of serum magnesium and levels between patients and controls. Microsoft word and excel have been used to generate the graphs and tables etc.

3. Results and Discussion:

The present study was carried out on 80 subjects. The cases were divided into two groups, 40 were normal persons which is control group 40 cases of Type I Diabetes Mellitus. The present study analyses the correlation between serum magnesium levels in type-1 diabetes these results were compared with the controls.

Table No: 1 Serum magnesium levels in type-I Diabetes

Magnesium levels	Type-I Diabetes	Controls
Mean± SD	1.93±1.06	2.11±1.13

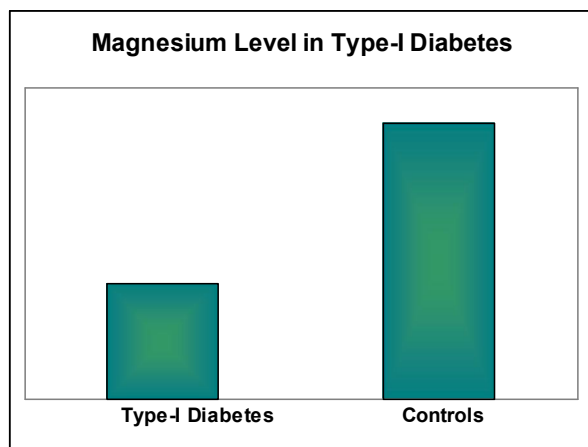


Figure No: 1 Serum magnesium levels in type-I Diabetes as compared to the controls

This current study significantly shows that serum magnesium level decrease in diabetic and more decrease in diabetic retinopathy. Our findings correlate with the study done by: Ishrat kareem et. al. (2004), have shown the presence of hypomagnesemia in diabetic retinopathy (8) Zélia Maria da Silva

Corréal et al (2003), also have shown that low magnesium level is one of the risk factor of diabetic retinopathy.(10) Cristiane Hermes Sales et al (2006) have shown that low magnesium level cause the macro vascular and micro vascular complication in diabetes. (11) The exact cause of hypomagnesemia in diabetes mellitus is not known. Poor dietary intake, impaired absorption of magnesium, increased urinary loss due to hyperglycemia and osmotic diuresis may be the contributory factors. Magnesium is necessary for several enzymes that play an important role in glucose metabolism. (9) Not only has hypomagnesemia been associated with diabetes, but also numerous studies have reported an inverse relationship between serum Mg levels (12-16) Although many authors have suggested that diabetes may induce hypomagnesemia, others have reported that higher Mg intake may confer a lower risk for diabetes (17, 18). Hence change in magnesium states with respect to improvement or worsening of diabetic state in the long run was not studied. This study focuses on evaluate magnesium levels in type-I diabetics at a given point but not on therapeutically correcting hypomagnesemia in the future course of the disease and its outcome.

4. Conclusion

Serum magnesium levels were lower in type-I diabetic patients as compared to controls. Hypomagnesemia is a factor in type-I diabetes mellitus patients leading to various complications.

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Effect of Storage Period on Microbiological Quality of Whole and Low-fat Pasteurized Cow Milk

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Abstract: This study was conducted to determine the effect of storage period on whole and low-fat pasteurized cow milk. Milk samples packaged in plastic containers were collected from four factories and stored in temperature 4°C for 1, 3 and 8 days of production. The samples were analyzed chemically for Acidity as lactic acid% & pH, and microbiologically for bacterial counts, yeasts & mold counts, coliform counts, *Staphylococcus aureus* and salmonella. The significant difference was conducted at ($p \leq 0.05$). The results showed that acidity of milk increased in all whole-fat milk samples during 3rd & 8th day of storage comparing to 1st day. Sample (2-A) was the highest value of acidity with mean and standard deviation (0.14 ± 0.035), the lowest value for pH (6.70 ± 0.012), and the highest value for bacterial counts (6.0×10^4). Also, the results showed that the acidity increase in all low-fat milk samples during 3rd & 8th day of storage comparing to 1st day. Sample (3-B) was the highest (0.14 ± 0.035) in acidity, lowest pH (6.68 ± 0.017), and more bacterial counts (7.0×10^7). Yeast & mold counts in some milk samples was less than < 10 and Zero in others. Coliform counts, *Staphylococcus aureus* and salmonella were Zero in all samples. This study suggests that storage period has a strong influence on the quality of whole and low-fat pasteurized milk, and it is recommended to consume milk on the 1st day of storage.

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Keywords: Cow Milk, Pasteurization

1. Introduction

Milk is a white liquid with high nutrition value for human & animals growth. The people awareness of milk importance raises its consumption and encourages dairy companies to expand production that change consuming method of this product (Buzzola *et al.*, 2001; Sheet, 2010; Looper, 2012).

Saudi Arabia achieved self-sufficiency in raw milk production by five main companies producing 85% of total milk production (AlSuhaibani and AlJnobi, 2004).

Milk quality is affected by many factors like cow hygiene, environment, milking techniques, packaging, transportation and storage's period & temperature (Rizwan *et al.*, 2011; Batool *et al.*, 2012). Many preserving techniques apply on milk to extent its shelf-life including pasteurization and cooling storage to reduce bacterial (European Commission, 2006).

Researchers studied effect of commercial-scale, high-temperature, short-time pasteurization at 73°C on viability of *Mycobacterium paratuberculosis* in naturally infected cow's milk. They found that this process was no more effective at killing *Mycobacterium paratuberculosis* bacteria if they are present in raw milk in sufficient numbers. Dairy industry needs to keep this subject under review, because *Mycobacterium paratuberculosis* causes Johne's disease in cattle and that the bacteria may pass

into the human food chain via cows' milk. Also the bacteria may or may not cause or contribute to Crohn's disease in humans, even though it has been reported that *Mycobacterium paratuberculosis* has been detected more commonly in patients with Crohn's disease than in the general population (<1.0%) (Grant *et al.*, 2002; Food safety authority of Ireland, 2000). But Millar *et al.* (1996) and Keswani and Frank (1998) insisted that extending the pasteurization process for more than 25 second was effective to kill this bacteria.

Rouvinen (2010), and Savescu *et al.* (2009) mentioned that storage practices and periods of raw milk and processed milk products had important role in bacterial growth, and some bacterial community is able to thrive in cold conditions. Also, a study of the effect of frozen storage on the survival of probiotic microorganisms found in traditional and commercial Kefir concluded that the traditionally produced kefir was shown to have significantly ($P < 0.05$) higher counts of bacteria and yeast at each sampling (O'Brien, 2012).

Therefore, the aim of this study is analyzing to study the effect of different storage periods on the acidity, pH, and bacterial counts on the pasteurized whole and low-fat milk.

2. Materials and Methods

Pasteurized whole and low-fat milk samples packaged in 2 Liter plastic containers were collected from four factories in Riyadh city. They were stored in temperature 4°C for 1, 3 and 8 days of production. Samples 1- 4 A for whole fat milk, 1 -4 B for low fat milk.

The samples were analyzed chemically and microbiologically as the following:

Chemically:

Acidity:

Acidity value was estimated according to AOAC (2005) as Lactic acid % by weight, and calculated as the following:

$$1 \text{ mL } 0.1N \text{ NaOH} = 0.0090\text{g lactic acid}$$

pH:

pH was determined according to AOAC(2005) by Digital pH meter to read the concentration of titratable hydrogen ions in milk samples.

Microbiologically:

Bacterial counts:

Bacterial counts was estimated according to AOAC (2005) by colony counts of bacterial culture plates of dry medium incubated at 32°C.

Yeast & Mold:

Yeast & Mold was estimated according to AOAC (2005) by dry rehydrated film (Petrifilm™ Method).

Coliform:

Coliform counts was determined according to AOAC (2005) using Petri film Coliform Count Plates® incubating 24±2hrs at 32±1°C.

Staphylococcus aureus:

The presence of *Staphylococcus aureus* was detected in milk samples according to (Wehr & Frank ,2004) which depends on incubation at 35 ±2°C for 30 to 48 hours.

Salmonella:

Detection of Salmonella based on incubation at 35±2°C (Wehr&Frank ,2004).

Statistical Analysis:

All study results were subject to statistical Analysis of Variance (ANOVA) of SAS (SAS, 1998) to study the significant differences at $p \leq 0.05$ among the milk samples, storage periods, data charts and different comparing.

3. Results and Discussion

Figures (1, 2) below shows the storage periods effect on the acidity level of whole and low-fat pasteurized cow milk. Measuring milk acidity is an important test used to determine milk quality physically, chemically and microbiologically (Batool *et al.*, 2012). Acidity is an important factor for microorganisms growth and survival in food (UNIFEM, 1995). The results in this study show the increase of milk acidity in 3rd & 8th day of storage comparing to the 1st day. The high-acidity level for the Whole-fat milk was Sample (2-A) with mean and standard deviation (0.13±0.035) & (0.14±0.035), respectively. For the Low-fat milk, sample (3-B) has the high-acidity level with (0.13±0.035) and (0.13±0.035), respectively. The high-acidity during storage periods support what AlKanhal *et al.* (1994) and Looper (2012) mentioned about the significant effect of storage time and temperature on Acidity level and consequently on milk quality. Also, a study conducted on chemical & physical quality of soya milk stored in different temperatures showed the increase of acidity-level according to the storage periods. The statistical significance was large ($P < 0.05$) in soya milk acidity during storage in room temperature and refrigerating (Odu and Egbo, 2012). Pesta *et al.* (2007) studied the effects of storage conditions on 20 raw milk samples which were stored at 20-25°C, and 20 at 2-8°C, for 168 hours, the pH was lowered by an average of 1.19 units, which indicate an acidification process such as bacterial spoilage.

pH value is an important indicator to test milk quality (Goff, 2009). Some studies mentioned that knowledge of the initial pH prior to heating alone was not sufficient for predicating the changes that occurred during heating and storage (Chandrapala *et al.*, 2010). Figures(3,4) shows the increase in pH level in 3rd & 8th day of storage comparing to the 1st day. In regards of Whole-Fat milk, sample (2-A) was the lowest pH level with mean and standard deviation (6.75±0.017) & (6.72±0.035), respectively. Sample (3-B) was the lowest pH level in Low-Fat milk with (6.72±0.035) for 3rd day & (6.70±0.012) for the 8th day of storage. This decrease was mentioned by (Hassan *et al.*, 2009) that pH level decreases as long as the storage period. Also, The results show a reverse correlation between acidity level and pH in milk, when acidity level increases pH level decreases. This correlation was discussed in some studies that found the pH of milk powders stored at room temperature decreased, and milk powder that has deteriorated extensively as a result of poor storage conditions, appears to have an unpleasant, acidic taste (Farkye *et al.*, 2001).

Table (1) shows the compares between mean bacterial counts and storage periods in whole-fat 1

milk. It shows all samples' increase of bacterial counts during 3rd & 8th Day of storage comparing to 1st Day. The highest mean bacterial counts was sample (2-A) (1.9×10^3) CFU/g (Colony-Forming Units per gram). Also it was the highest in 3rd & 8th Day (2.9×10^3) & (6.0×10^4) CFU/g, respectively. For Yeast & mold counts, some samples contained less than < 10 , and this was mentioned by Agarwal *et al.* (2012) that yeast and molds were detected in the samples of unpasteurized as well as pasteurized milk. 3 and 4 A samples have zero of Yeast & molds. In all milk samples have no *E. coli*, *Staphylococcus aureus* and *Salmonella* were detected. Also, this increase of bacterial counts during storage was studied by AlRakabi *et al.* (2010) who mentioned that bacterial counts after milk drying process during storage was high. This high level was significant at $P \leq 0.05$, with maximum increase after (90) days of storage (150×10^2) & (110×10^3) CFU/g at 5°C & 25°C, respectively. El-Prince & Korashy (2003) studied the bacterial counts at (1.3×10^2) CFU/g in some baby formula powders. *Mycobacterium avium* subspecies paratuberculosis cultured from 244 bottles and cartons of commercially pasteurized cow's milk obtained at random from retail outlets throughout the Czech Republic were investigated by Ayele *et al.* (2005). They cleared that the dynamic changes in the bacterial population in milk samples before and after 24-h conservation at 4°C were monitored, and a considerable evolution of bacterial populations occurred during conservation.

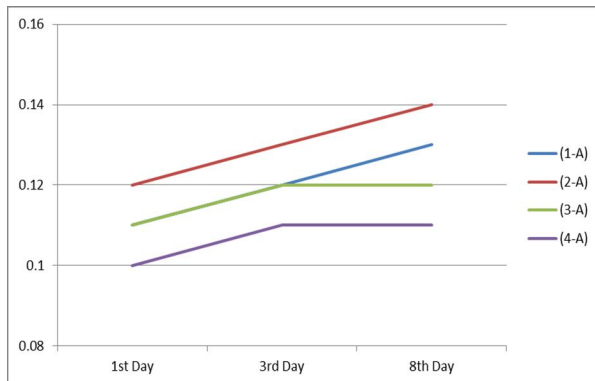


Fig (1): The effect of storage periods on total acidity level of Whole - Fat Milk Samples

Table (2) shows the comparison of mean bacterial counts and storage periods in low-fat milk. The bacterial counts increase in all samples during 3rd & 8th Day of storage comparing to 1st Day. The highest mean bacterial counts was sample (3-B) in 1st, 3rd & 8th day of storage by (3.6×10^3), (2.2×10^5) & (7.0×10^7) CFU/g, respectively. In this study there is a correlation between microbiological quality of milk and its level of Acidity & pH, which agreement with AOAC, (2005) who mentioned that as long storage period as the increase in the acidity and bacterial counts in milk. Clare *et al.* (2005) concluded that when the storage period was long the acidity and bacterial counts increased, but pH decreased. Some bacteria like *Streptococcus* causes milk to curdle and become acidic taste by decreasing pH level (North, 1918). A study by Alkanhal *et al.* (1996) discussed the impact of year seasons on raw milk quality, since pH increased and bacterial counts decreased in winter samples comparing to summer ones.

In regards of yeast & mold, coliform counts, *Staphylococcus aureus* and *salmonella*, none of the milk samples contain any type of these microorganisms. AlRakabi *et al.* (2010) mentioned that these type of bacteria did not contaminate milk powder samples stored for (30/60/90) days. But, other study showed cow milk storage at 4°C for 10 hours led to increase the acidity level, their contents of bacterial counts and Yeast & Mold during storage periods (Eid, 2009).

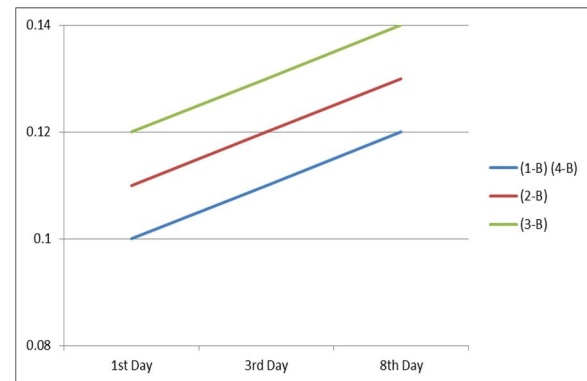


Fig (2): The effect of storage periods on total acidity level of Low - Fat Milk Samples

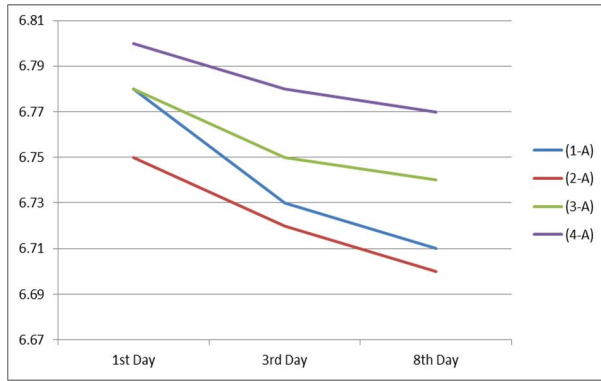


Fig (3): The effect of storage periods on pH level of Whole - Fat Milk Samples

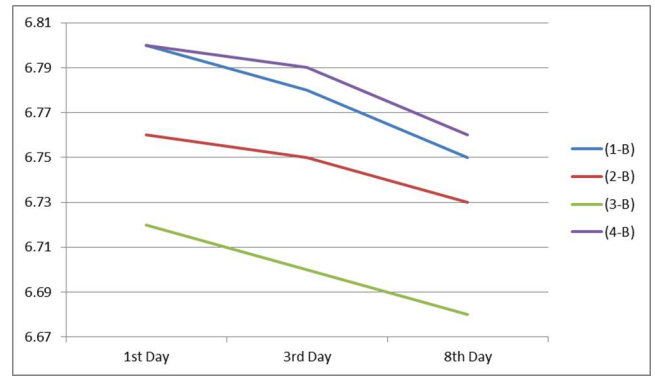


Fig (4): The effect of storage periods on pH level of Low - Fat Milk Samples

Table (1): Comparison of Mean Bacterial Counts and Storage Periods in Whole-Fat Milk*

Samples	Storage Period	Bacterial Counts	Yeast Mold	& Coliforms / <i>Staphylococcus Aureus</i> / Salmonella
(1-A)	1 st Day	<10	<10	-
	3 rd Day	3.4×10 ²	<10	-
	8 th Day	6.4×10 ²	<10	-
(2-A)	1 st Day	1.9×10 ³	<10	-
	3 rd Day	2.9×10 ³	<10	-
	8 th Day	6.0×10 ⁴	<10	-
(3-A)	1 st Day	<10	<10	-
	3 rd Day	2.2×10 ³	-	-
	8 th Day	3.5×10 ³	-	-
(4-A)	1 st Day	<10	-	-
	3 rd Day	<10	-	-
	8 th Day	2.5×10 ²	-	-

*Mean ± Standard deviation

Table (2): Comparison of Mean Bacterial Counts and Storage Periods in Low-Fat Milk*

Samples	Storage Period	Bacterial Counts	Yeast Mold	& Coliforms / <i>Staphylococcus aureus</i> / Salmonella
(1-B)	1 st Day	1.3×10 ²	-	-
	3 rd Day	1.1×10 ³	-	-
	8 th Day	6.4×10 ³	-	-
(2-B)	1 st Day	2.6×10 ³	-	-
	3 rd Day	3.2×10 ⁴	-	-
	8 th Day	3.0×10 ⁵	-	-
(3-B)	1 st Day	3.6×10 ³	-	-
	3 rd Day	2.2×10 ⁵	-	-
	8 th Day	7.0×10 ⁷	-	-
(4-B)	1 st Day	1.3×10 ²	-	-
	3 rd Day	1.0×10 ³	-	-
	8 th Day	3.2×10 ³	-	-

*Mean ± Standard deviation

Conclusion

Cow milk is a fast damage product. This study concludes that storage period has a significant impact on full and low fat milk's microbiological quality. When pH decreases the acidity & bacterial counts increase as long as the storage period since production, which limits shelf life of milk.

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Effect of Probiotic Fermented Soy Milk and Gamma Radiation on Nitrosourea-Induced Mammary Carcinogenesis

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Abstract: Background and aim of the work: Antioxidants can reduce damage produced by low doses of radiation on living cells. This study was designed to investigate the effects of fermented soy milk (FSM) and low dose of gamma radiation on carcinogenic effect of N-methyl-N-nitrosourea (MNU). **Material and methods:** Female rats were divided into 8 groups: group (1): control, group (2): injected with MNU, group (3): whole body exposed to low dose of gamma radiation (0.5 Gy), group (4): given FSM orally, group(5): given FSM and MNU, group (6): received MNU and exposed to gamma radiation,, group (7): given FSM, MNU and exposed to gamma radiation. **Results:** Fermented soy milk exerted significant, ameliorative effect on glutathione peroxidase, superoxide dismutase and catalase activities, lipid peroxidation and TNF- α level in rats injected with MNU. Combined treatment of FSM and low dose of gamma radiation markedly elevated GSH level, ameliorated MNU effect on cell cycle phases Go/1, S, G2/M and induce apoptosis via activation of caspase-3.**Conclusion:** FSM consumption with exposure to low doses of gamma radiation reduced carcinogenesis and oxidative stress effects induced by MNU in the mammary tissues.

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Key words: fermented soy, N-methyl-N-nitrosourea, mammary gland, cell cycle, TNF- α , gamma radiation, antioxidant state.

1. Introduction:

Breast cancer is the most frequently diagnosed cancer and the leading cause of cancer death in female worldwide. The significance of nutrition in protecting living organisms from the toxic effects of environmental carcinogens has gained increasing attention due to less toxicity and high efficacy against various diseases. The intake of soy and soy-based products is associated with a lower risk of several types of cancers, including breast cancer. There are many functional ingredients contained in soy foods such as soy protein, isoflavones, saponins, phytic acid, phytosterol, and phenolic acid. The chemopreventive effects of soybean and soy containing food products may be related to genistein, daidzein and glycitein(1).

Human have always been exposed to various natural sources of ionizing radiation emitted by the isotopes present in the earth's crust, air, water and biosphere, and also originating from the outer space. In some parts of the globe the level of this natural background radiation is significantly higher than the world average with no adverse health effects. Today, people can be additionally exposed to "man-made" radiation delivered at high doses (e.g., during radiotherapy and radiation accidents as well as after detonations of nuclear weapons) or low doses (e.g.,

during production and distribution of radioactive materials and use of radiation sources for industrial and medical purposes). The low-level environmental and occupational exposures are much more common and distributed over much larger populations than the high-level exposures(2).

Soybean fermentation by a system of *Lactobacillus* and yeast consists of a mixture of soybean extracts and the secondary metabolites of these microorganisms. In addition fermentation increased the bioactive isoflavoneaglycone than its unfermented counterpart. It has been used in clinical trials to prevent cancer and cardiovascular disease progression due to its antioxidant activity (3), antimutagenic effect also for the reduction of chemotherapy side effects (4).

The lactic acid bacteria have cancer chemopreventive properties and act through diverse mechanisms, including alteration of the intestinal microflora, enhancement of the host's immune response, and antioxidative and antiproliferative activities(5). Some reports also claim that soymilk fermented with probiotic bacteria has some advantages: a reduced content of oligosaccharides, enhanced antioxidant activities, and improved flavor and sensory characteristics (6,7). There is evidence suggesting that combining several probiotic bacteria

will achieve stronger effects than single-strain probiotics (8).

Fermentation of Soy products using different types of microorganisms changes chemical components of soy and increase the soluble nitrogen compounds such as riboflavin, niacin, pantothenic acid, biotin, folic acid and nicotinic acid(9,10).

This work aim is to investigate the protective role of FMS and low dose of gamma radiation in reducing tumor incidence and progress induced by N-methyl-N-nitrosourea (MNU).

2. Material and method:

Animals

Rats used in this study were Virgin female Sprague-Dawley at 42 days of age, with body weight of 130-150g. Rats were purchased from the Egyptian Holding Company for Biological Products and Vaccines (Cairo, Egypt). Animals were housed under standard conditions of light and temperature and allowed free access to standard pellet diet and tap water. Animals were randomly divided into eight groups (n=8).

Fermented soy milk (FSM)

Soy milk was purchased from Soy factor, food technology institute Agricultural Research Center, Giza, Egypt. The fermented soy was prepared using microorganisms: *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Streptococcus lactis*, *Bifidobacteria* (11). FSM was diluted with distilled water to 2% and administrated orally at dose equivalent to 0.2 ml/kg body wt daily.

Gamma radiation

Irradiation of rats was carried out using a Canadian Gamma cell-40(137 Cs) at the National Center for Radiation Research and Technology (NCRRT), Cairo, Egypt. Rats whole body were exposed to gamma rays and received a dose rate of 0.461Gy/minute, calculated according to the Dosimeter department in the NCRRT.

Experimental design and sample collection

The N-methyl-N-nitrosourea (MNU) (Sigma-Aldrich, Disenhofen, Germany) was injected intraperitoneally (I/P) twice (50 mg/kg/body weight each), between postnatal days 10 and 30.

Female rats were divided into 8 groups at the beginning of the experiment: group (1): served as negative control and orally received saline, group (2): Rats were injected with MNU, group (3): Animals were exposed to whole body gamma radiation (0.5 Gy), group (4): Rats were given FSM orally via gastric tube (20ml/kg), group(5): rats were given FSM and injected with MNU, group (6): Rats were received FSM (20ml/kg) and exposed to (0.5 Gy) gamma radiation, group(7):Rats were injected with MNU and exposed to (0.5 Gy) gamma radiation, group (8): Rats were given FSM, injected with MNU

and exposed to gamma radiation (0.5Gy). At the end of the experiment (13 weeks) animals were anesthetized and sacrificed, Heparinized blood samples were collected from the heart. And mammary glands tissues were dissected.

Evaluation of tumor necrosis factor- alpha (TNF- α)

TNF-alpha concentration in rat mammary gland was measured using the "Assay Max Rat TNF-alpha ELISA kit of murine monoclonal antibody". (ASSAYPRO, 41 Triad South Drive St. Charles, MO 63394, USA).

Evaluation of apoptosis and cell cycle analysis by flow cytometry

Flow cytometric analysis was performed for cell cycle analysis and evaluation of apoptosis. Mammary glands were cut into small pieces and fixed in 70% ethanol in phosphate buffer saline for 1 h on ice, incubated with 50 μ g/ml RNase A at 37°C overnight, stained with 50 μ g/ml propidium iodide and subjected to flow cytometric analysis using FACS Calibur. Cells were then analyzed for green (FITC, indicating DNA fragmentation detection) and (PI, allowing DNA quantification) red fluorescence by flow cytometry using a Becton Dickinson® FAC Star Plus flow cytometer. Apoptotic cells were identified in a DNA histogram as a sub-G1 hypodiploid population were obtained with a computer program for Dean and Jett mathematical analysis(12).

Antioxidant parameters

Lipid peroxides content was determined using 1,1,3,3-tetraethoxypropane as a standard, (13). GSH contentdetermination was according to, (14). Glutathione peroxidase determination was according to, (15) and Catalase activity was estimated following the method of, (16).

Pathological study:

Rats mammary gland tissues were fixed in 10% neutral formalin buffer, and then embedded in paraffin wax. Specimens were dehydrated through graded alcohol, cleared in xylene and embedded in paraffin. Sections of 5 μ m-thickness were cut and stained with Heamatoxylin and eosin (H&E), (17).

Statistical analysis:

Experimental data were analyzed using one way analysis of variance (ANOVA) using SPSS (statistical package for social sciences, 1999; ver.10.0), and the significance among the samples was compared at $P \leq 0.05$. Results were represented as mean \pm SD (n =8).

3. Results

In the present study, MNU intoxication induced significant biochemical alterations in the blood, causing a significant increase in the GSH content and GPx and CAT activities compared to that of control. Oral administration of fermented soy milk(FSM)

after MNU injection, caused significant reduction in antioxidant enzymes GPx and CAT compared to MNU treated group. Whole body irradiation with low dose of gamma radiation (0.5 Gy) markedly ameliorated GPx, and CAT while increased SOD activities with significant increase in GSH level

compared to MNU. Combined treatment of both FSM and gamma radiation to MNU treated group significantly increased GPx, SOD and GSH compared to MNU and significantly reduced CAT, Table (1).

Table I: The effect of fermented soy milk and and / or γ -irradiation on glutathione peroxidase, superoxide dismutase, catalase activities and glutathione (GSH) level in the blood.

Groups	GPx (mU/mL)	SOD (U/ml)	Catalase (U/L)	GSH (mg/dl)
Control	6.4 ± 0.78	24.3 ± 2.9	644 ± 77.3	5.0 ± 0.6
FSM	2.3 ± 0.2 ^{ab}	22.7 ± 2.7	595 ± 71.2 ^b	5.8 ± 0.7
Radiation(Rad)	2.1 ± 0.2 ^{ab}	21.1 ± 2.5	507 ± 60.4 ^{ab}	4.9 ± 0.6 ^b
MNU	9.9 ± 0.8 ^a	19.5 ± 2.3 ^a	732 ± 87.4	6.6 ± 0.8 ^a
MNU+Rad	5.0 ± 0.6 ^{ab}	32.0 ± 3.8 ^{ab}	477 ± 56.9 ^{ab}	8.9 ± 1.08 ^{ab}
MNU+FSM	4.7 ± 0.5 ^{ab}	20.6 ± 2.5	461 ± 55.1 ^{ab}	6.5 ± 0.79 ^a
MNU+Rad+FSM	8.1 ± 0.16 ^{ab}	27.9 ± 3.4 ^b	311 ± 37.2 ^{ab}	10.3 ± 1.24 ^{ab}

^a significant compared to control, ^b significant compared to MNU.

3.2. Effect on lipid peroxidation and tumor necrosis factor alpha

Oral administration of FSM to MNU treated groups caused a significant increase in TNF- α , which was ameliorated via exposure to gamma radiation or FSM. Treatment with FSM accompanied with exposure to low dose of gamma irradiation markedly reduced TNF- α levels compared to control, fig.1.

Lipid peroxidation was significantly increased by MNU or gamma radiation. On the other hand, FSM significantly reduced MDA level caused by MNU, fig.2.

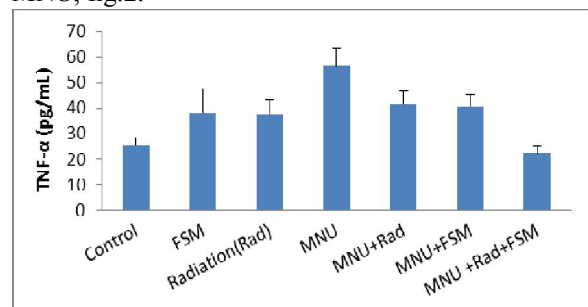


Fig (1): Effect of fermented soy milk and low dose of gamma radiation on TNF- α

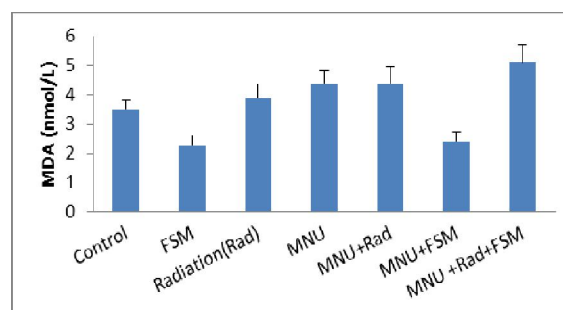


Fig (2): Effect of fermented soy milk and low dose of gamma radiation on lipid peroxidation.

Effect on cell cycle

Cell cycle analysis of mammary gland via flow cytometry clearly shows that, FSM treatment caused significant alterations in cell cycle analysis as it caused cell cycle arrest at Go/1 appeared in increased cell population at Go/1 with significant decrease in cell population at S and G2/M phases compared to control. Rats of MNU group treated with FSM and gamma irradiation showed, amelioration in cell percentage of Go/1, S and G2/M phases compared to control and tumor groups.

Table II: The effect of fermented soy milk and or γ -irradiation on cell cycle analysis in the mammary gland tissue.

Groups	Go/G1%	S%	G2/M%
Control	15.2 ± 1.8	37.2 ± 4.4	5.6 ± 0.7
FSM	37.8 ± 4.5 ^{ac}	14.3 ± 1.7 ^{ab}	2.04 ± 0.3 ^{ab}
Radiation(Rad)	13.7 ± 1.6 ^b	2.7 ± 0.3 ^a	0.38 ± 0.1 ^a
MNU	72.8 ± 8.7 ^{ab}	18 ± 2.2 ^{ab}	9.1 ± 1.1 ^{ab}
MNU+Rad	4.3 ± 0.5 ^{ab}	0.98 ± 0.1 ^a	0.42 ± 0.04 ^a
MNU+FSM	33.7 ± 4.0 ^a	3.2 ± 0.4 ^a	0.59 ± 0.1 ^a
MNU+Rad+FSM	14.7 ± 1.7 ^b	7.5 ± 0.1 ^{ab}	1.35 ± 0.2 ^{ab}

*Legends as in table 1

Effect on caspase-3 and apoptosis

Apoptosis and caspase-3 analysis by flow cytometry results in fig.3. shows the inducing effect of FSM and gamma radiation on apoptosis along via caspase-3 mechanism. Combined treatment with FSM and gamma radiation markedly enhanced apoptotic cell number and caspase-3 mechanism.

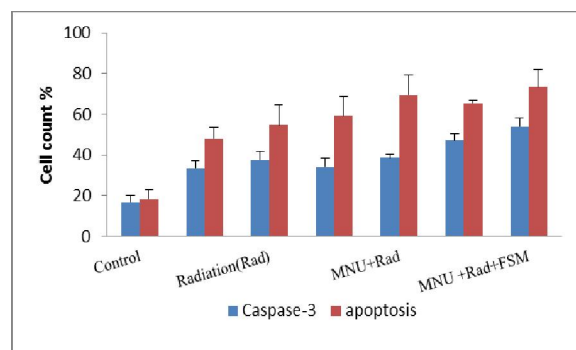


Fig (3): Effect of fermented soy milk and low dose gamma radiation on of caspase-3 and apoptotic cell count %.

Histopathological study

Histopathological study by light microscope of female rat mammary glands showed several marked changes with different treatments (Fig.4). Mammary gland in the control group was distinguished with lactiferous duct and acini embedded in adipose tissue. Oral administration of FSM revealed normal histological structure, also, mammary gland of irradiated rats with or without FSM administration showed healthy histological structure with no structure alterations. Rats treated with MNU showed anaplastic hyperchromatic lining epithelium with lose of basement membrane (carcinoma). MNU group received FSM showed hyperplasia in lactiferous duct with polyformation and cystic dilation, while treatment with FSM for 15 days before MNU injection markedly ameliorated MNU effect. Female rats treated first with FSM and exposed to gamma radiation then injected with MNU showed normal histological structure.

4. Discussion

In a continuing effort to improve cancer therapy, it was found that ultra-low doses of radiation are capable of enhancing the efficacy of chemotherapy. The clinical results of this combined treatment approach have proven to be so effective, it is now frequently employed for advanced abdominal and head and neck cancers. Combined chemotherapy and radiotherapy regimens have become the standard approach because they allow one to reduce toxicity while maintaining high overall efficacy, since

antioxidants can reduce damage produced by both low and high doses of radiation. antioxidant treatment before and after radiation exposure are essential for a maximal reduction in radiation damage. Prevention of immediate radiation-induced genotoxicity requires that an antioxidant be present at the time of irradiation (18).

Fermentation consists of modifying food by microorganisms(bacteria, molds, and yeasts) that grow and reproduce and consume part of the substrate and enrich it with the products of their metabolism. It is an ancient technology that remains one of the most practical methods for preserving foods and enhancing their nutritional qualities (19,20). Fermented soymilk, unlike fermented milk or yogurt drinks, contains no lactose or cholesterol and have the health benefits from both soy itself and the fermentation(21).

In the present study, MNU in female rats caused significant changes in antioxidant parameters: increase in GSH level accompanied with significant decrease in GPx, CAT and SOD activities, this effects were ameliorated with administration of FSM or combined treatment of FSM +radiation exposure. oxidative stress caused by MNU increased free radicals production result in significant increase in lipid peroxidation (22). Antioxidant enzymes are capable of eliminating reactive oxygen species and lipid peroxidation products, thereby protecting cells and tissues from oxidative damage. Superoxide dismutases convert superoxide radicals to molecular oxygen and H₂O₂, and catalase decomposes H₂O₂ to molecular oxygen and water. FSM administration was able to normalize SOD and GPx activities which reduced in the tumor tissue(23) in MNU groups due to the presence of soy isoflavonesaponin and *lactobacillus* sp. which exerts potent antioxidant activity and free radical scavenging capability exerting its activity via several anti-oxidative mechanisms: catalase, glutathione-system-related compounds and Mn-SOD, decreasing the risk of ROS accumulation also degrade the superoxide anion and hydrogen peroxide (24,25). N-methyl-N-nitrosourea transforms mouse mammary epithelial cells to proneoplastic and neoplastic states in rat, however, malignant tumors appeared earlier and at a faster rate than the benign tumors (26).

Fermented soy and low dose of gamma radiation enhanced GSH levels, which protect vital organs from damage via free radicals through free-radical scavenging, restoration of the damaged molecules by hydrogen donation, reduction of peroxides, and maintenance of protein thiols in the reduced state (27). It was reported that, Soy(1) and exposure to low dose irradiation (0.5 Gy)

significantly enhanced GSH content within 24 hrs post-irradiation(28). The presence of 3-hydroxyanthranilic acid (3-HAA) a by-product of soy fermentation in FSM and *Lactobacillus* markedly combat oxidative stress and reduced lipid oxidation *in vivo*(29). *Lactobacillus*,attenuate proliferation (30) and reduce NO levels (31).

Exposure to low doses of ionizing radiation may stimulate cellular detoxification and repair

mechanisms leading to reduction of the DNA damage even below the spontaneous level and decreasing the probability of neoplastic transformation (32,33), such exposures may also enhance immune reactions of the organism and attenuate harmful effects of higher doses of radiation (34,35),significantly delayed the tumor growth, enhanced GSH content in the spleen within 24 hrs post-irradiation (28).

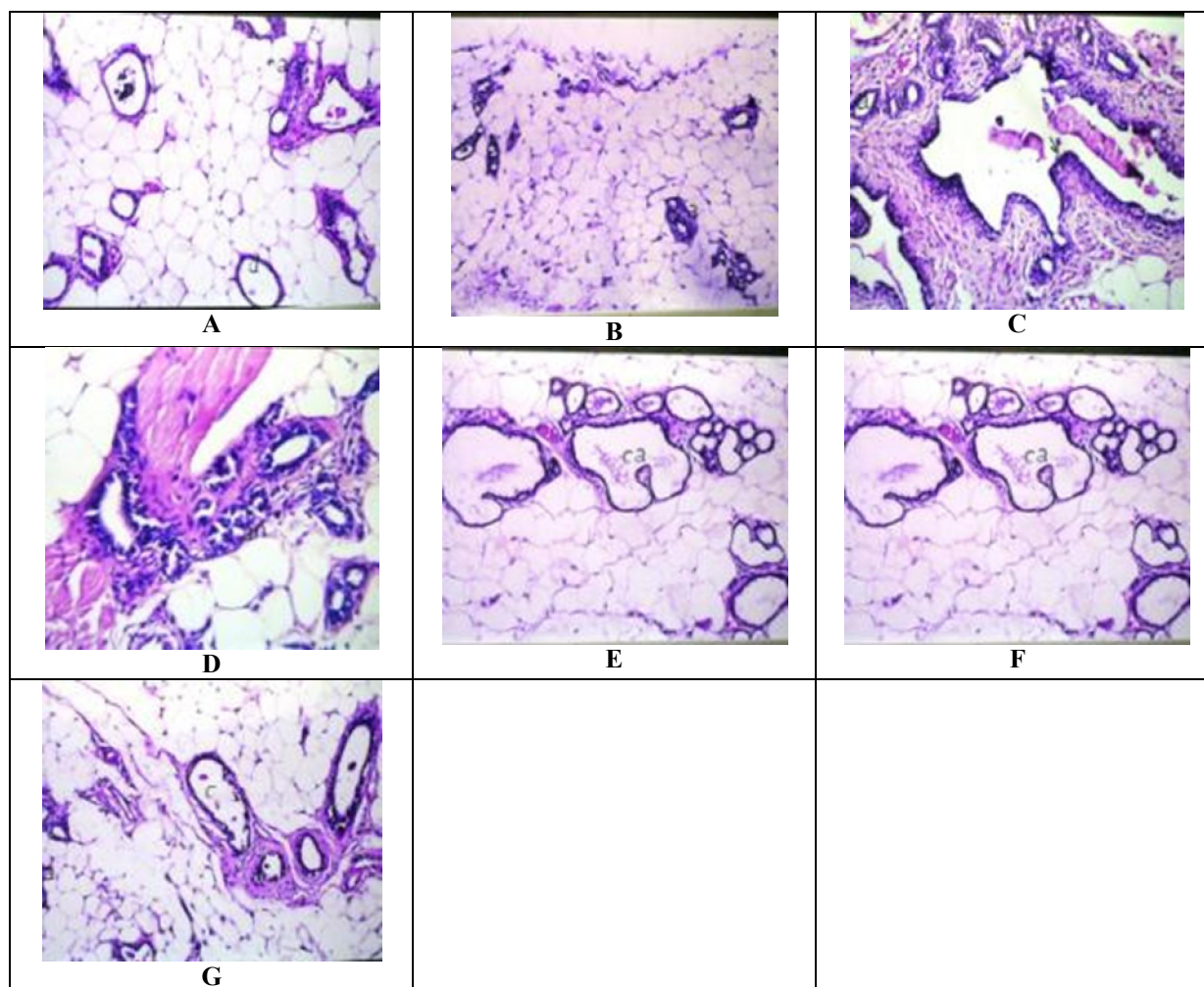


Fig.(4): Light microscopic photos of rats mammary gland showing: (a) In control group histological structure of the lactiferous duct (d) and acini (a) embedded in adipose tissue. (b) In FSM treated group: no ultrastructural changes in the structure of the lactiferous duct (d) and acini (a). (c) In irradiated group: no ultrastructural changes in the structure of the lactiferous duct (d) and acini (a). (d) In MNU group: showing anaplastic hyperchromatic lining epithelium of the acini (a) with lose of basement membrane (carcinoma). (e) In FSM+ irradiation group: showing normal histological structure of lactiferous duct (d) and acini (a). (f) In MNU+FSM group; showing mild systicidalation of the intact duct and acini. (g) In MNU+FSM+Radiation: showing normal histological structure of the duct (d) and acini (a).

The inhibition of cytokine production or function serves as a key mechanism in the control of inflammation(36). In this study, FSM ameliorated the elevation in TNF α caused by MNU, may referred to the presence of genistein which reduce the production of TNF- α , IL-6, IL-1 via its effect on nitric oxide and COX-2 gene expression(37,38). The components of lactic acid bacteria or bifidobacterium cells and peptides formed during the fermentation have been reported to affect the production of cytokines (39,40).

Cell cycle analysis of female rat mammary tissue via flow cytometry showed disturbance in cell cycle in MNU group observed in all phases with accumulation of cell count at G1, this disturbance was significantly ameliorated by FSM treatment and combined treatment of FSM and gamma radiation decreasing MNU effect on cell cycle and apoptotic cell count compared to the control.

The presence of isoflavone, particularly genistein in soy, exerts its antioxidant effects to protect cells against reactive oxygen species by scavenging free radicals and reducing the expression of stress-response related genes. Genistein is a tyrosine kinase inhibitor, induce apoptosis in different types of cancers including breast cancers through both NF- κ B dependent and independent pathways. It activates caspases, apoptosis and inhibits DNA-binding activity of NF- κ B in various cancer cells. Furthermore, its pre-treatment abrogated the activation of NF- κ B stimulated by H₂O₂ or TNF- α (41). Although soy extract induced higher percentage of cells undergoing apoptosis than genistein or daidzein(42). Accompanied treatment of FSM and low dose of radiation induce more inhibitory effect on tumor cell, since low dose of gamma radiation also able to delaye tumor growth in Ehrlich solid tumor bearing mice (28).

The histological observations indicate that FSM accompanied with low dose of gamma radiation has great efficiency as anti-inflammatory and antitumor treatment against MNU carcinogenesis. The ameliorative effects of FSM upon the structural alterations could be explained by the role of FSM in regulating vital cellular functions, including cell proliferation and differentiation and its potent antioxidant activity and free radical scavenging capability.

MNU has an impact on the expression of regulatory genes triggering apoptosis and directly development toxicity followed by accumulation of mutations either in somatic cells or blood cells(43). The proposed antiproliferative effects of FSM reflect the primary protective action on damaged cells. Induction of apoptosis may be considered in case of failure of reparative mechanisms lead to cell death

and is also important for protection of the entire organism.

This study demonstrates that soy antioxidants and microbial components accompanied with low dose of gamma radiation can reduce the harmful mutagenic and oxidative stress effect of MNU in inducing mammary tumors.

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Economics of Use Low-Quality Water for Irrigation in the Cultivation of Wheat

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Abstract: The total cultivated area in 2010 with wheat crop was about 3.147 million feddans, including 2.654 million feddans in old lands representing 84.33% of the total cultivated area. While, in the new land is 493 thousand feddans representing 15.67 % of the total area. The cultivated wheat crop area in Nubaria reached about 1.404 million feddans in 2010 /2011. The total production in the new land was about 7.679 million ardabs (productivity 15.57 ardabs (\approx 150kg) / feddan), and the total production totaled about 56.82 million ardabs (productivity 18.06 ardabs / feddan). The average cost of the production per feddan of wheat crop is about 3459 pounds, and net return per feddan 2190 pounds. It is clear from the study that the cultivated varieties are characterized by its ability to tolerate the adverse condition such as salinity. The farm crop irrigated by agricultural drainage water was higher in the average of physical output of farm crops irrigated with fresh water and mixed with water. It has been shown that the increase of the overall production flexibility by 1.2, which represents increased earnings capacity. It turns out that the pound spent in the production process of the sample irrigated with fresh water and mixed is obtained at 2.9 pounds after the submitting the total costs, followed in the profitability of the sample which irrigated with fresh water and agricultural wastewater at 1.3, 1.2 pounds, respectively. The increased economic efficiency of the mixed water sample 6.13% LE of the net production, followed by the sample irrigated with fresh water and agricultural drainage water.

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Introduction

The state is in a policy of re-expansion of the use of agricultural drainage water and treated wastewater for irrigation in order to achieve the horizontal agricultural expansion policies. The formal estimation of agricultural drainage water re-use is about 4.37 billion m³/year for the average period (2001/ 2011), about 1.77 billion cubic meters in the area of East Delta, about 1.92 billion cubic meters in the downtown area of the Delta and about 0.68 billion meters in the area of the western Delta.

The re- use in an informal way is estimated at about 2.76 billion cubic meters in the period (2009/2010), of which 1.11 billion cubic meters in the east of the Delta, about 1.02 billion cubic meters in the middle of the Delta and about 0.63 billion cubic meters in the west of the Delta.

Thus it should be mentioned that there is an existence of technical standards for judging the quality of agricultural drainage water suitability for irrigation. Also, the crops vary in the degree of tolerance of salinity and its impact on productivity, and also the problem of water pollution which is the most important key in determining of expansion in the re-use of water due to the adverse effect.

Nevertheless, there are obstacles and determinants of limiting the expansion in the use of agricultural drainage water in the future, of these determinants of how wastewater required to maintain normal life in

northern lakes and maintain the salt balance of the territory of the Delta in addition to the expected negative impact of surface irrigation development program.

As well as, the expected impact of the Toshka project on the quantity and quality of wastewater as for the amount of water from the sewage is estimated at about 2.28 billion cubic meters and distributed about 37% of this amount in the agricultural drains after secondary treatment. While, about 13% are drained in the northern lakes after primary treatment, about 2.5% are drained in the Suez Canal after primary treatment, and about 47 % of the design capacity of the treatment plants drained to the nearby land after secondary treatment.

The expansion in the reclamation and cultivation of new land is a major agricultural object of Egypt in 1954, which focused on the state through successive five-year development plans to add about 3.50 million feddans until 2007, about 78 % of them has been growing (2002/2003- Five Year Plan - 2006 /2007) targeted reclamation of about 803 thousand feddans will rise to about 825 thousand feddans during the next five-year plan (2007/2008- 2011/2012) and then to about 855 thousand feddans during the five-year plan (2012 /2013 - 2016 /2017).

The total productions of fruit and vegetables have increased from around 3.9 million tons in 1976 to about 13.7 million tons in 2000 as a result of increasing the

area under cultivation of vegetables and fruit as well as, from about 58 thousand feddans to about 156 feddans between the above two years.

The agricultural investments directed to the horizontal agricultural development programs are considered of the most important means of implementing agricultural development programs in Egypt, where they play an active role in achieving a high growth rate in the agricultural sector. Increasing the rate of investment in agricultural projects, contribute to achieve the objectives of development increase income and provide the requirements of food and raw materials to drive the development process. Generally, farm income represents about 55% of the main income in rural Egypt, while other entry represents the percentage of 45%.

Problem of the study: -

As is well known agricultural waste-water containing a high amount of salt as it contains the pollutants from the remnants of fertilizers and pesticides. Also, the treated waste-water contains chemical and pathogenic pollutants, in addition to the content of organic manure and nitrogen. The research problem include in the negative and positive impact for the re-use of those kinds of irrigation water on the production and supplies to the productivity and total income.

Objective of the study: -

The main goal is to estimate the parameters of the relations water productivity for the qualities of the different irrigation water and efficient economic performance and productive used to irrigate wheat crop. In addition to flexibility, productivity of water for irrigation and inputs other productivity, as well as flexibility total which reflects the return of the capacity in the quality and quantity of irrigation water for wheat crop in the sample the Nubaria area. As well as, the evolution of the cultivated area, productivity, and total production of wheat crop in the study area.

$$Y_H = AX_{1H}^{b1} \cdot X_{2H}^{b2} \cdot X_{3H}^{b3} \cdot X_{4H}^{b4} \cdot X_{5H}^{b5} \cdot X_{6H}^{b6}$$

YH = (H) physical production for the crop

X1H = (H) ground-feddan expense in viewing

X2H = (H) the amount of irrigation water(m³) used in the sample

X3H = (H) net amount of nitrogen(kg) in Views

X4H = (H) capital (the monetary value of seeds, chemical fertilizers and pesticides except nitrogen)

X5H = (H) of human labor(man/ day) in the viewing

X6H = (H) automation(watch) watch

Methodology and data sources: -

The study relied on methods of descriptive and quantitative analysis and estimate the production function (cup - Douglas) for the wheat crop. As well as, some indicators of economic efficiency as the study relied on published and unpublished data from the

Ministry of Agriculture and Land Reclamation to show the current status of the use of those qualities low of water for irrigation. Also, the study relied primarily on preliminary data field to achieve the goal, which has been collecting from field data for three hits of irrigated water re-use of those brands of irrigation water for wheat crop during the season (2010/2011) of the questionnaire in the Nubaria area.

Indicators of agricultural production of wheat in (2010 / 2011): -

First: - area, productivity, average production costs and net return per feddan of the most important winter wheat field crops: -

The evolution of wheat area of 1.3 million acres in 2009 and productivity about 16.8 ardabs (~150Kg) to the same year, the total cultivated area in 2010 wheat crop of about 3.147 million feddans, including About 2.654 million feddans of the old lands represent 84.33% of the total cultivated area, and about 493 thousand feddans of new land accounted for 15.67 % of the total area planted with wheat. As well as, wheat production is estimated at old lands About 49.141 million ardabs (productivity 18.52 ardabs / feddan), while in the new land, the Production has reached about 7.679 million ardabs (productivity 15.57 ardabs / feddan), and production totaled about 56.82 million ardabs (productivity 18.06 ardabs / feddan). The average cost of wheat crop production per feddan at about 3459 pounds, and net return per feddan was 2190 pounds.

The total cultivated area in 2010 from wheat crop in Nubaria about 1.404 million acres in 2010 / 2011, the North Al-Tahrier represents the 3202 thousand feddans with productivity estimated at 13 Ardabs. While, the sugar beet area was about 42.3 thousands feddans with productivity estimated by about 14.6 ardabs and West Nubaria region represent 29.11 thousand feddans with productivity estimated by about 13.9 ardabs. As well as, Bustan area accounts for about 18.4 thousand acres with productivity estimated at 12.4 ardabs and South Tahrir area of about 12.4 thousand acres with productivity estimated about 14.7 ardabs. The El-Nahda and Marriott represent about 37.73 thousand feddans with productivity estimated at 15.3 ardabs. The cultivated varieties characterized by the high cropping production and high resistance to genetic disease and feedbacks as Egypt 1, Egypt 2, Sakha 93, Sakha 94, Gemmeiza 9, Gemmeiza 7. The total of the Republic of Sakha 93 at about 1.13 millions feddans. The total production of about 20.22 million ardabs 17.86 ardebs productivity /feddan. The total state production of Sakha 94 at about 3.8 millions feddans, and production totaled about 71.17 million ardabs (productivity 18.41 ardabs / feddan). The total state production of Gemmeiza 9, about 46.14 thousand feddans and production totaled about 9.05 million

ardabs (productivity 19.6 ardabs / feddan). The total state production of Gemmeiza 7 at 26.5 thousand acres and production totaled about 4.88 million ardabs. The estimated production of the Noubaria area from Sakha 93 is about 49.15 thousand feddans and production totaled about 7.69 million ardebs, with productivity of 15.65 ardabs / feddan. While for the variety Sakha 94 to the same area (Noubaria) estimated about 37.92 thousand feddans and production totaled about 6.36 million ardabs (productivity 16.79 ardabs / feddan). The variety Gemmeiza 9 in the Noubaria is estimated by about 6.39 thousand acres and production totaled about 1.056 million ardebs (productivity 16.51 ardabs / feddan). Variety Gemmeiza estimated 7 in the same area of about 4.11 thousand feddans and production totaled about 6.904 ardabs of productivity (16.7 ardabs / feddan).

The most important crop structure in the region in the season 2010/2011 wheat, faba- bean, alfalfa, barley,

sugar beet, flax, onions, garlic, alfalfa Hijazi, rapeseed, and sugar cane. Where the estimated feddans are by 1.4 million acres, 25.2 thousand feddans, 58.7 thousand feddans, 1.4 thousand feddans, 18.6 thousand feddans, 0.25 thousand feddans, 5.2 thousand feddans, 0.980 thousand feddans, 849 thousand feddans, 0.078 thousand feddans, 0.400 thousand feddans respectively.

Second: - The production capacity of the new lands in the Arab Republic of Egypt:-

As shown in Table (1) cultivated areas of basic food crops in the new land ratio to the total cultivated areas nationwide. The datatable shows that the share of total new land varies from one crop to another, where the share of new land a maximum of upto 73% of the cultivated area in the barley crop, while up to a minimum of 0.33% in the soybean crop.

Table (1) shows the cultivated areas of important food crops in the new land and its share of the acre age at the level of the Republic (season 2010/2011).

Crop	Area /feddan	Area % to the total area of the country
Wheat	2.221 million	18.12
Beans	212000	31.3
Lentil	1875	1.81
Barley	83000	72.13
Rice	1.770 million	3.72
Maize Corn	1.643 million	9.79
Ground nut	146173	72.22
Sesame	66354	59.13
Soya bean	20699	0.33
Sunflower	826	8.35
Potatoes	148969	14.74
Tomatoes'	537206	29.57
Winter onion	101000	21.89

Source: - The Ministry of Agriculture and Land Reclamation - Central Department for Economic Affairs - Bulletin of the agricultural economy - in 2012

Third: - the size of the food gap: -

The strategy for agricultural development in Egypt targeted to achieve food security, consistent with the goal of maximizing the value of agricultural production. However, those policies has failed for pursuing due to the increasing rates of demand for food, leading to increase reliance on the outside in the

provision of food needs. As well as, the subsequent risk of dependency States that control the major food markets, increase financial allocations needed to finance the increased imports of food commodities. While, during the period 2000-2010 has not been achieved self - sufficiency in Egypt only from white

meat the rest of the essential food commodities have the same food gap, where it is as follows:-

For the wheat crop, one of the most important strategy food commodities, the average production during the period 2009/2010 was about 7.5 million tons, with an average consumption during the same period reached 12.6 million tons, and therefore the average size of the food gap of wheat, about 5.1 million tones, representing approximately 40 % of our wheat, are managed by imports from unsuitable wheat for human consumption. The annual consumption of wheat per capita has increased to about 165 kg per annum. The problem lies in the cultivation of more than 3 million feddans per year in Egypt, which is one-third of the total agricultural area.

The volume of the food gap of maize 36%, and 51% of municipal beans, lentils is about 97 %, oil about 77%, and red meat, 27 %, fish 13%, sugar 24%.

Fourth: - the deficit in the balance of trade and agriculture: -

Despite the intensive efforts made by the State in order to boost exports both in terms of simplification of export and give investors and exporters multiple incentives, but the volume of agricultural exports is still low and does not represent only a small percentage

of the total Egyptian exports reaching 13.9% in 2010, after that was reached to 19.3% in 1992. Where agricultural exports amounted to about 21092 million pounds and total exports about 151125 million pounds in 2010. As food exports represent about 40% of food imports.

In contrast, agricultural imports have seen an increase amounting in 2010 to 51 223 million pounds, also saw the balance of agricultural and food deficit of 58239 million pounds which represents about 39.1 % of the total trade deficit, which amounts to about 149 219 million pounds during the same year.

Discuss the results of the use of productive inputs: -

Data shown in Table (2) illustrates the most important various agricultural operations of sample cultivated by different irrigation water qualities in the agricultural season(2010-2011). As shown in Table(3) geometric mean of the amount used in the input farming and the resulting physical wheat crop depending on the quality of irrigation water used in the season (2010/2011), where mounting noticed an increase in the average amount of irrigation water, nitrogen net, the current capital, human labor, and automatic working the case of the use of water.

Table 2 shows the different agricultural operations and the physical output of the sample cultivated with different qualities of irrigation water for the agricultural season (2010/2011) in Noubaria region.

Agricultural operations	Agricultural drainage water	Fresh water (feddan)	Agricultural drainage water (feddan)	Mixed fresh and drainage water
Management	200	476	476	476
Superphosphate fertilizer	135	321.3	321.3	476
Seeds	280	666.4	666.4	321.3
Labor for seedling	50	119	119	666.4
Labor for preparation of the land for irrigation	75	187.5	178.5	119
Pesticides	130	309.4	309.4	178.5
Nitrates fertilizers	500	595	1190	309.4
Maintenance of irrigation machine	200	1100.75	476	396.6
Herbicides	55	130	130.9	1100.75
Irrigation labors	400	476	952	130
Plowing	100	238	238	317.3
Fuel	250	-	595	238
Gear	25	-	59.5	-
Harvesting labor	200	476	476	-
Wheat harvest	300	714	714	476
Total costs	3100	5800.35	7378	714
Output Basic	16.43	6.139	7.473	4453.2
Byproduct /totestraw	8	16.66	19.04	5.044
Byproduct value	2000	4165	4760	3570
Basic byproduct	-	11.6641	14.99	9584.3
Irrigation water quantity	2752	4445.8	5791.76	4998

Source: - collected and calculated from the study area Noubaria, the data in the growing season (2010/ 2011).

Maintenance annually guns =?= 925 + 2.38 = 220.5 pounds

Maintenance of the crop sprayers =?= 1100.7 pounds

Irrigation with different water qualities like agricultural drainage directly, and then fresh water, and agricultural drainage water blended, while increasing the rate of irrigation to wash impartial from any salts trailing a possible presence of water may affect crop growth with soil. As well as, the productivity of the crop and the consequent increase component of the work human and auto-work for various agricultural service operations.

The increase and clear mounting in the capital, when irrigation by agricultural reused water drainage directly compared to irrigation with fresh water is due to the increase in the rate of seed and amounts of nitrogen, phosphate fertilizers. In addition to the rate of pesticides used in the resistance to disease and weeds was observed. In the case of fresh water use directly in irrigation, it noticed that not use farmyard manure and decrease the amount of nitrogen added. While, maintaining those farms on the recommended average phosphate fertilizer to help in the process of flowering crop and the amount of irrigation water fresh hardly be less. It was found during the study that the farms that use agricultural water drainage reduced human labor and increase automated work hours compared to farms in the sample that with fresh water or mixed together due to the increase of automatic work as a substitute for the shortage of human labor was also observed to increase the rate of seeds to those farmers fear the risk of those seeds fungal Stoic created by the soil as a result of the use of agricultural drainage water. In addition to increase the rate of pesticides, because of the spread of fungal infection in some farms and the growth of unwanted weeds and the spread of insects.

Table 3 shows the geometric mean of the used quantity of production elements and the physical output of hectares of wheat crop farms sample depending on the quality of the amount of irrigation water used in the agricultural season (210 / 2011).

Item	Fresh water	Fresh and drainage water	Agricultural drainage water
Average of cultivated area (fed.)	1 FEDD.	1 FEDD.	1 FEDD.
Average of irrigation water (m ³ /feddan)	4445.8	4760	5791.86
Average of net nitrogen quantity (kg)	595	396.6	1190.30
The current average capital	5800.35	4453.2	7378.39
Human average working (man / day / feddan)	42.1	42	45.60
Average working hours automated user	48.79	65.25	63.18
Average physical product per (feddan)	6.139	5.044	7.473
Average gross byproduct / straw (feddan)	16.66	14.28	19.04
Byproduct price LE.	4165	3570	4760
Physical product price LE.	1.6641	9.5843	14.199
Total cost LE.	5800.35	4453.2	7378

Source: - collected and calculated from the study area Noubaria, the data in the growing season (2010/ 2011).

It has been found to be significant in all types of irrigation water used and all reflect the status of the marginal production decreasing. The sense that it increase the amount of irrigation water used by 1% of

As can be seen from Table (3) The average physical output of the crop implanted in the sample and Irrigated with agricultural drainage come in the first place, while comes in second average physical output implanted sample irrigated with fresh water while irrigated mixed at 1 : 1 comes in the third rank.

Relations of water productivity for estimated wheat crop:

Seen from the table (4) Estimates of water production function parameters according to the model is estimated in the form of (Cobb - Douglas), as well as flexibility in the wheat crop productivity for the study sample according to the model is estimated depending on the quality and quantity of irrigation water used. It is seen from the parameters estimated for the study sample of the output physical wheat and independent variables significant relationship at the level of 0.01. This confirms supply only the value of the coefficient of determination, which amounted to 0.86, 0.92, 0.97, respectively, any changes in the independent variables explain about 86 %, 92%, 97% of the changes that occur in the physical output according to the quality of irrigation water used is fresh water mixed and agricultural drainage water, respectively.

Studying the productivity of irrigation flexibility by water quality in the study sample were found to be approximately 0.393 % for wastewater agricultural, (-0.752) fresh water, and (-0.040) water mixed with any, it is positive in the case of irrigation Agricultural water drainage and negative in the cases of irrigation water mixed and fresh water, all less than one.

the level of the current use leads to increased total output physical wheat crop by an estimated 393 % in the case of irrigation water agricultural drainage. The negative value for flexible production of fresh water

for use excess water to wash salt in soil where the consequent increase damage user of irrigation water rates 1% for the years of the current usage sample which gives a total output physical wheat crop by an estimated 752 % portion, 0.40 % when using fresh irrigation water and mixed with irrigation water and fresh. studying the flexibility overall productivity found that about 1,211 in the case of irrigation water exchange agricultural direct manner of 0.743 in the case of irrigation with fresh water and about 921 % in the case of irrigation water mixed (fresh and Exchange Agricultural).

This means that the flexibility of productivity (GDP) of the state of irrigation water agricultural drainage represent a yield increasing productive capacity in the sense 1 % which increase in the level of resource use when studying the combined increase in total physical output achieved by the largest.

In the case of irrigation with fresh water or mixed water (agricultural drainage and fresh), the overall production flexibility represent a diminishing yield of the capacity of productivity because it is less than one correct. That means to increase productivity

input as a whole by a certain lead to increased physical output less as illustrated in Table (4).

Due to the importance of the relationship between the quality of irrigation water used and the nitrogen element, the statistical analysis has made it clear that overuse in the nitrogen element in the case of irrigation with fresh water or mixed represent production flexibility for both about (0.455), about (0.193), respectively, which is reflected the lack of physical total output by the same percentage.

Basic Accounting for irrigation water:

* **Irrigation efficiency:** - reflect the pound profitability obtained by the unit of water used.

* **Nonprofit economic efficiency of production:** - reflect pound spent in the production process for pounds obtained with the efficiency of farm management.

* **Microeconomic efficiency:** - reflect the profitability pound obtained after the cost of the water used.

* **Overall economic efficiency:** - reflect the pound obtained in the production process after the total costs.

Table (4) Estimates of parameters of water production functions of the type of cup - Douglas under varying conditions of irrigation water for crop quality product on the level of the sample farms of agricultural research for the season (2010/2011).

water quality	The number of Triangles	absolute limit A	ground X ₁	water irrigation X ₂	amount of nitrogen X ₃	the capital X ₄	human labor X ₅	X ₆ working robot	total elasticities	r ²	r	F Calculated	the moral
Agricultural drainage water	4	5.1381(28))	0.704)4.47(	0.393)3.20(	0.263)1.86(	-0.034)-0.95(	-0.160)-2.10(	0.045)0.45(	1.211	0.87	0.86	16.26	***
Fresh water	4	2.466)1.03(	1.842)2.57(	-0.752)-2.27(	-0.455)-1.07(	-0.555)-1.15(	-0.179)-0.97(	0.841)2.35(	0.743	0.94	0.92	35.23	***
Disbursement of agricultural + fresh water mixed)	4	0.197)0.490(	0.126)0.180(	-0.040)-0.38(	-0.193)-0.36(	0.712)5.71(	0.377)1.33(	-0.061)-0.33(	0.9211	0.89	0.97	141.67	***

Source: Compiled and calculated from data in the study area NUBAREYA agricultural season (2010/2011)

Values between brackets represent the standard error of the regression equations

*** Significant at the level of moral (0.01)

Mixed water (fresh water + wastewater by agricultural (1: 1).

Table 5 shows the Total costs. Net profit. Economic efficiency and the Basic Accounting for irrigation water of feddan of wheat crop farms sample depending on the quality of the amount of irrigation water used in the agricultural season (2010 / 2011) from the study area Noubari.

Item	Fresh water	Agricultural drainage water	Fresh and drainage water
Total cost per (fed.)	5800.75	7378	4453.2
Average of irrigation water (m³/feddan)	4445.8	5791.76	4760
Net Profit (wheat /feddan)	5784	7359	8700.8
Total irrigations cost per (season)	1576.75	2023	1418.05
Irrigation cost	394.18	505.7	354.62
Total Net Profet	15.8391	18.959	13.154
Overall economic efficiency	2.7	2.5	2.9
Irrigation efficiency	1.3	1.2	1.8
Nonprofit economic efficiency of production	0.02	0.9	1.8
Microeconomic efficiency	3.7	3.6	6.13
Production efficiency of water	1.3	1.29	1.05

Source: - collected and calculated from the study area Noubaria, the data in the growing season (2010/ 2011).

* Production efficiency of water: - (average production of water) and reflect the use of an additional unit and one of the water resource to maximize production within the farm.

As seen from Table (5) that the pound spent in the production process irrigated with fresh water and mixed obtained from the 2.9 pounds after the total costs, followed in profitability pound spent in the production process irrigated with fresh water and agriculture wastewater around 2.7, 2.5 pounds, respectively, after the total costs. As can be seen that each unit of water used is obtained from the 1.8 pounds profitability of pounds spent for irrigation of agricultural wastewater and fresh, followed in second place unit of water used in the production process irrigated with fresh water and agriculture wastewater at 1.3, 1.2 pounds, respectively.

As for the profitability of production shows that the pound spent in the production process, reflects an increase in net profit by about 1.8 pounds for irrigation agricultural drainage water, followed in ranking the third irrigation with fresh water at about 0.9, 0.02, respectively. For economic efficiency reflects pound spent per unit of mixed water with about 6.13% pounds in net production followed in second place with fresh water irrigation and agricultural drainage water for irrigation of about 3.7, 3.6 pounds in net output. Regarding the efficiency of water resource productivity shows that the use of an additional unit of water resource to achieve an increase in farm output at 1.3, 1.29, 1.05, respectively, for irrigation with fresh water and waste water and agricultural irrigation water mixed fresh.

Main and branch canals in Noubaria area at the most important villages: -

The field sample shows that the Nubaria Canal is the main branch of the branching area including sub Nubaria Canal and Nasare branch and Behara branch and the lake and the canal Solimaniya, canal Abu Masoud and Mariot Canal. It was found that the Naser Canal irrigates area and conquest of Baghdad and the El-Rowad, Badr and the Umm Saber.

As it turns out that the canal Nubaria sub-irrigated area of El-Tahady, El-Nagah and the investors. Also, it is shown that the canal Salmaniya irrigate El-Bustan area and expansion of the graduates, beneficiaries, companies, investors and includes the villages of Abbas El Akkad, She'shaie, Tawfiq al-Hakim, Naguib Mahfouz, Alharoa, Abdel Moneim Riad, Mohamed Refaat, Hussein al-Ghazal, Ahmed Rami, Ali ibn Abi Talab, police supervision and El-Reqaba.

For Al-Nasr Canal branching from the Nubaria canal irrigates West Nubaria area which includes the villages of Al-Shagaa, Bilal bin Rabah, Mohamed Abdel Wahab, Elisha, Prophet Solomon, Mohammed Azzam and Adam and Hussein Abu Yousr, Abdel Halim Mahmoud Shaltout, El-wafaa, Besar, Abdul

Rakeep, Mohammad Azzam, Ahmad Badawi, El-amal and Othman Ibn Affan. For Abu Masoud Canal irrigate Elnahda area and agricultural Mariot area. Regarding the Mariot Canal irrigate area of the Burg Al Arab.

The most important recommendations in the field of economics of modern irrigation methods:

The study concluded the following recommendations:

- 1 - the need for a modern irrigation methods in the reclaimed lands and modern reclamation due to limited water element.
- 2 - The study recommends the need to overcome the problems that cause a reduction of the use of modern irrigation methods. As well as made the availability of the modern technology at economical prices.
- 3 - The study recommends exempting modern agricultural machinery from customs duties and taxes in order to reduce cost prices while, the availability of the possibility of local manufacturing.
- 4 - The need education, training and media attention guided farmers of the importance of modern irrigation methods.
- 5 - To take measures for the introduction of irrigation water in the framework of economic accounting, which the consequent saving of about one billion cubic meters / year.
- 6 - The real and actual supervision of continuous irrigation engineers to deliver water to the land owners.
- 7 - Study the crop structure optimization which gives the greatest return for the water unit.
- 8 - Selection of salinity - tolerant crops in the land where it is used agricultural drainage water.
- 9 - Care drainage of surface and subsurface drainage to maintain the productivity of the new land.
- 10 - Taking into account the economic lifting accounts In such as the use of groundwater sources.

Special considerations circulate benefit from the study:

- 1 - The obtained results represent a sample of the study should be reservation in the cases where the circular requires that increase the sample size to represent the different types of soil, crops, locations and modern irrigation methods for reclaimed areas.
- 2 - Important study of behavior and common means of raising water use under Egyptian conditions and it is located on the technological aspect to the different irrigation methods and suitability for the types of soil.

3 - The study see that the need for integration between different disciplines on the study of water resources - land reclamation and how to rationalize water use and conservation of loss.

From the previous display shows the importance of the study of modern irrigation methods in the reclaimed land to maintain the amount of water lost in irrigation and agriculture new spaces by different crops and vegetables to meet the population increase expected and work to reduce the gap between consumption and production, and reduce the deficit in the balance of payments of Egypt.

Most important problems in the field of study:

- 1 - The high cost of irrigation supplies.
- 2 - Counting of experience and benefit agricultural farm tours.
- 3 - The difficulty of transportation.
- 4 - Irregular irrigation shifts and the lack of irrigation water in a timely manner.
- 5 - The high costs of production inputs.
- 6 - Lack of specialized labor wages rise.
- 7 - The emergence has cultivated in some areas.
- 8 - The difficulty of agricultural drainage water mixing in fresh water for irrigation.
- 9 - Drainage water containing a high amount of salts, pollutants, fertilizers and pesticides residues.
- 10 - The negative impact on acres productivity and then the total revenue of the crop in the case of the direct use of agricultural drainage water.

Summary:

The state in a policy of re-expansion of the use of agricultural drainage water and treated wastewater for irrigation in order to achieve the horizontal agricultural expansion policies. The estimated re-use water in a formal way of agricultural drainage water about 4.37 billion cubic meters / cubic / year. For the amount of sewage water is estimated at about 2.28 billion cubic meters, the average period (2001 / 2011). It should be noted the existence of technical standards for judging the quality of agricultural drainage water suitability for irrigation and crop vary in degree of tolerance of salinity and its impact on productivity, although the water pollution problem banks, which represent most major determinants of horizontal agricultural expansion.

The total cultivated area in 2010 wheat crop of about 3.147 million acres, including about 2.654 million acres in the old lands represent 84.33% of the total cultivated area, and about 493 thousand acres of new land accounted for 15.67 % of the total area planted with wheat. The wheat production is estimated in the old lands by about 49.141 million ardebs (productivity 18.52 ardebs / acre), while in the new land Production has reached about 7.679 million

ardebs (productivity 15.57 ardebs / feddan), and production totaled about 56.82 million ardebs (productivity 18.06 ardebs / feddan). The average cost of production per feddan of wheat crop at about 3459 pounds, and net return per feddan 2190 pounds. The total area planted with wheat crop Nubaria about 1.404 million feddans in (2010 / 2011), the Shamal Al-Tahrier area represents 3202 thousand feddans with productivity estimated at 13 Ardabs. While, sugar beet area about 42.3 thousand feddans with productivity estimated by about 14.6 ardebs and West Nubaria region represent 29.11 thousand feddans with productivity estimated by about 13.9 ardebs. As well As, Bustan area accounts for about 18.4 thousand feddans with productivity estimated at 12.4 ardebs and South Tahrir area of about 12.4 thousand feddans with productivity estimated about 14.7 ardebs. For El-Nahda and Marriot about 37.73 thousand feddans with productivity estimated at 15.3 ardebs.

The cultivated varieties characterized by its ability to tolerate the adverse effect of using low quality water such as salinity effect. It is clear seen from the study that farms which fed Agricultural drainage water has the average gross of physical was higher than the farms irrigated with fresh water and mixed water. Also, it has been shown that the increase of overall production flexibility about 1.2, which represents increased earnings capacity.

The statistical analysis showed that the excessive use of nitrogen element reflects a lack of gross physical product for each of the three types of irrigated sample. It turns out that the pound spent in the production process of the irrigated with fresh water sample and kinds obtained from the 2.9 pounds after the total costs, followed by profitability pound spent in the production process of the sample, which irrigated with fresh water and agricultural wastewater at 1.3, 1.2 pounds, respectively. While increasing profitability of production of the sample irrigated by agricultural drainage at about 1.8 pounds, has increased economic efficiency of the water sample mixed 6.13% of the net production, followed by the sample irrigated with fresh water and agricultural drainage water. The study was completed to some of the recommendations, including: - the need for a modern irrigation method in the reclaimed lands and modern reclamation due to limited water element. To take measures for the introduction of irrigation water in the framework of economic accounting, which the consequent saving of about one billion cubic meters / year. Choose salinity - tolerant crops in the land that used the agricultural drainage water. For the universal access to the study: that the obtained results represent a sample of the study should be reservation in cases where the circular requires that increase the sample

size to represent the different types of soil and crops. The most important problems in the field of the study is the high cost of irrigation supplies and the high cost of production inputs. As well as, lack of specialized high labor wages and agricultural drainage water containment a high amount of salts, contaminants fertilizers and pesticides residues, which has had a negative impact on the acres productivity and overall crop income.

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No Acceleration in Gravity !

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Abstract: The familiar acceleration concept $\frac{V^2}{R}$ or $\frac{R}{T^2}$ means the constant deviation from traveling in a straight

line caused by inertia to falling towards the center of gravity where the resultant is the circular motion around this center, but this concept is not a correct explanation of gravitational motion, the correct one is simply the squared

circular motion $\frac{4\pi^2 R^2}{T^2} = V^2$ determined by the distance R from the center of gravity, because: 1-It is

impossible mathematically to analyze Kepler's third law on acceleration basis. 2- In the case of artificial satellite orbiting the Earth the dependence is on the circular motion not on the acceleration in calculating the demanded position of the satellite. 3- In the case of falling objects toward the Earth's center, what increases is its squared circular motion, and not its changing velocity with the squared time.

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Key words : Kepler thid law, Gravitational constant, acceleration, artificial satellites

Introduction:

The Great Men like Galileo and Newton paved the way to understand the nature of motion in our universe, from their aspect of views they corrected some concepts of the past about the nature of motion, and this is our duty to day, This is a natural development in the history of science. The acceleration concept was one Galileo reached to experimentally on the Earth and Newton applied it on the sky, but it is not the correct one for describing the nature of motion here and there, we are going to say why in this paper.

The circular motion and not the acceleration is the right concept:

The conflict between the motion in straight line or in circular path is a very old conflict although everything in the universe moves in a circular path: the Moon around the Earth, the Earth around the Sun the electron around the nucleus, (using π in describing this motion means simply the perfect circular motion) even the blood in our bodies moves its circular motion between its two equal halves. Galileo and Newton stated that if no force acts on a body, then it travels in a straight line at constant speed, its acceleration is zero till it is acted upon by a force. The straight line as the origin of the motion and falling of objects affected strongly the thought of the great thinkers. Galileo to calculate the rate of falling things used an inclined level over which an object rolled, from here he came to that the objects accelerate towards the center of gravity of the Earth where the distance R is divided by the squared time indicating that the velocity itself changes along the path! This is not correct because what changes

here is the squared velocity of the object towards the center of gravity where $V^2 R = \text{constant}$ in every gravitational system as we are going to prove by analyzing Kepler third law⁽¹⁾ and in the case of artificial satellites. Newton extended Galileo's acceleration from the Earth to the sky stating that an orbit is the balance between inertial and gravitational forces, the Moon is continually "falling" towards the Earth, the Earth toward the Sun, in the same time inertia wants them to move in a straight line, the balance between these two forces results in the stable orbit of the Moon and Earth⁽²⁾. Since more than a century Einstein reached to the idea that the space itself is bent around the Sun causing the Earth and other planets to move their orbital motions. Here the circular motion received a complete different explanation on the basis of space- time deformation caused by the Sun⁽³⁾, but Einstein proved this bent of the space on the basis of the same gravitational terms where the squared orbital velocity of an object passes at the surface of the Sun is simply divided by the squared velocity of a beam of light where the Einstein formula in 1911 was as follows

$$a = 2 \frac{GM}{c^2 R} \quad (4)$$

Only Einstein changed the integer 2 to 4 in 1916. Here we are not before the pull of gravity and the resistance of inertia but before the bent of the four dimensions of space-time expressed by the ordinary terms of gravity !

Gravity is a circular motion:

Now let us see the matter in the light of Kepler's third law where gravity is the squared velocity $\frac{4\pi^2 R^2}{T^2} = V^2$ an object moves with at a distance R from a gravitational center, where $\frac{4\pi^2 R^3}{T^2} = V^2 R$ is a constant of a certain gravitational system, differing from a system to another. This is Kepler's third law which is the most correct and accurate law describing the motion of solar planets, and can be applied successfully to any planet with its satellite. The most real validity of this law is that dividing it by the central mass of any gravitational system gives the gravitational constant G ⁽⁵⁾ Let us getting G by dividing the numerical value of Kepler third law of any planet by the mass of the sun, all in Mks system :

$$\frac{1.32 \times 10^{20}}{1.99 \times 10^{30}} = 6.63 \times 10^{-11}$$

Now, Writing Kepler third law according to the acceleration of planets corrupts this law entirely,

as the acceleration takes this form: $\frac{2\pi R}{T^2}$, and we must multiply it by the following incorrect amount $2\pi R^2$ to get the complete law! The appearance of π never could be escaped in writing the third law of Kepler because without it the law is simply incorrect. Therefore there is no acceleration in gravity but squared circular motion inversely proportional to the distance R from the center of gravity.

Even in the case of artificial satellite that orbits the Earth, we are obliged when using the acceleration of the Earth g to multiply it by R in

\sqrt{gR} to determine the demanded orbital velocity of the satellite, because simply

$g = \frac{GM_E}{R^2} = \frac{V^2}{R}$. Therefore no acceleration is dealt with in the case of artificial satellite,

because if it accelerates and not moves in circular

motion why writing \sqrt{gR} or $\sqrt{\frac{GM_E}{R}}$ ⁽⁶⁾ ?

Then acceleration of gravity $\frac{V^2}{R}$ or $\frac{R}{T^2}$ is not a correct concept at all although we are familiar with it and consider it as a fact never being a subject of discussion!

Different masses:

Now, let us move to another point concerning the different masses. The Moon is governed by the same constant $V^2 R$ of the Earth just as the famous apple on the surface of the Earth, no matter the huge difference in mass between them, only the distance R from the center of gravity determines the squared velocity V^2 of each of them. The differences among the masses of the solar planets are very great, but the squared orbital velocity of each of them is determined *only* by the distance R from their centre of gravity. Any object on the surface of the Sun obeys the mentioned constant as the orbital velocity of a supposed object at the hydrogen surface of the Sun moves with the velocity of an electron at the fifth level of hydrogen atom where R is the radius of the Sun

$$\frac{GM_{Sun}}{R} = 1.89 \times 10^{11} \frac{m^2}{t^2} \quad (8)$$

In fact the very slight value of the gravitational constant $G = \frac{V^2 R}{M} = 6.67 \times 10^{-11}$ means the

very sensitive nature of gravity, where M is the central mass of a gravitational system, and $V^2 R$ is a constant due to this system. As everything is a multiple of hydrogen atom according to Prout's theory ⁽¹⁰⁾. Two objects at the same distance R from the center of gravity Q_2 and Q_1 where Q_2 contains double numbers of hydrogen atoms more than Q_1 , then Q_2 has double number of hydrogen atoms moving with V^2 (and not with $\frac{V^2}{R}$) towards the center of gravity than Q_1 , here

the *whole energy* of Q_2 towards the center of gravity is double that of Q_1 , therefore the weight is **the number** of hydrogen atoms of an object moving with certain velocity V^2 towards the center of gravity. Putting the two objects in a balance, then Q_2 will have double the distance

R toward the center than Q_1 , therefore Aristotle was right in his statement that the heavier reaches the ground than the lighter! Galileo did not take this fact into consideration when he proved that the heavier reached the ground in the same time as the lighter in his historical experiment putting the two different masses at the same distance from the center of gravity.

On the other hand, when the two objects are at different distance R from the center of gravity

then the value of V^2 itself towards this center differs and gravity deals with the two objects regardless the number of hydrogen atoms forming them. From here the huge difference of the number of hydrogen atoms forming the apple and the Moon is of no importance in their orbital velocity V^2

No need for centrifugal force:

As has been passed Newton considered the circular motion of the Moon as a continuous falling from the straight line to the curve of its circular motion as the result of balance between gravity and inertia, therefore the Moon falls constantly from the straight line towards the Earth or it *accelerates* towards the center of gravity just as the apple *accelerates* towards the same center. Here we need to suppose the existence of two forces one against the other to keep the Moon in its orbit, where its natural tendency to move in straight line prevents it from falling on the Earth, and this inertia prevents the electron from falling on the nucleus. In fact, only the mentioned distance R from the center of gravity governs and determines V^2 according to the mentioned constant, there is no acceleration and accordingly no squared distance, in addition to that no need to other force to balance the gravitational force, also the gravity is between every object and the center of gravity in one gravitational system according to $V^2 R$. Newton made incorrect generalization by stating that every object in the universe attracts every other object with a force that is proportional to the product of their masses and inversely proportional to the square of the separation between them. In fact the relation between two objects on the Earth, for example, is through their relation with the center of gravity, no one of them attracts the other.

Conclusion:

Gravity is a circular motion $\frac{4\pi^2 R^2}{T^2} = V^2$ determined by the distance R

from the center of gravity, where $V^2 R$ is a constant governing all gravitational systems and differing in its value from one system to other, dividing it by the central mass of the system gives the universal constant G , and this confirms the correctness of $V^2 R = \text{constant}$ which is Kepler's Third law. On this basis there is no need to any centrifugal force to balance the gravitational force which considered a constant deviation from the straight line to the curve of the circular motion according to the concept of

acceleration $\frac{V^2}{R}$ that had been established by

Galileo on the Earth and used by Newton in the sky. In forming the gravitational law Newton considered the moon falling in every moment from the straight line it ought to persuade to the curve of its circular motion according the force of attraction due to the Earth like any thing on it falling towards its center. The constant $V^2 R$ explains the difference in weight between two masses as the number of hydrogen atoms forming the mass move with V^2 velocity to the center of gravity at a certain distance R from that center, this number distinguishes between different masses, but at different values of R the gravity deals with V^2 of the objects regardless the number of hydrogen atoms forming them.

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Sandy Soil Management to Secure Yield Productivity, Profitability, Efficiency of Nitrogen & Energy Consumption and Environment

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Abstract: A field experiment has been conducted at Ismailia agriculture research station “Typic Torriorthents, sandy, mixed, hyperthermic” to examine the impact of suggested management practices package; drip & sprinkler irrigation systems, application of slow release N-fertilizer (SRNF) & conventional N-fertilizer, compost and rhizobia inoculation on productivity of wheat-peanut cropping sequence, nitrogen use efficiency, energy consumption efficiency (supplying for such practices) and potentiality of emitting CO₂ gas owing to combustion of used-fossil fuel to obtain such energy and causing global warming or avoiding or mitigating it according to suggested-practices. Also, economic feasibility has been evaluated. The experimental work has been carried out in split split plot design with treatments replicated four times. Treatments have been (a) drip & sprinkler irrigation systems (DIS & SIS) as main plots (b) N-fertilizers as sub-plots. N-fertilizers have been urea in one rate (120Kg Nfed⁻¹) added to soil as 5 allocations & 15Kg N fed⁻¹ as an activating dose for N-fixer and ureaform fertilizer (UF) in 3 rates (60,120,180 Kg Nfed⁻¹) added to soil in one dose at planting wheat crop as a N-fertilization for wheat-peanut cropping sequence and (c) compost which have been added in 3 different rates as sub sub-plots. Rhizobia inoculation has been mixed with peanut seeds. The results show that: (1) Yield: wheat grain and straw yields under DIS have been 1.04 and 2.56 ton.fed⁻¹ while under SIS, they have been 0.79 and 1.94 ton.fed⁻¹ respectively. Peanut seeds and straw yields under DIS have amounted 1.15 and 2.36 ton.fed⁻¹ while they have been 1.17and 2.73 ton.fed⁻¹under SIS respectively. The averages of grain and seeds yield of both wheat and peanut crops of UF-treatments have insignificantly increased comparing to those of urea treatment. However, the UF-high rate treatments have given wheat grain & Peanut seeds yields greater than those of urea treatment either under DIS or SIS. Values of the relative increase of compost alone and UF-treatments yield calculated of urea-treatment yield have ranged from -63.3% to 63.29 % for wheat under DIS and from -20.85 to 33.59% under SIS. They have also ranged from -12.67% to 77.05 % for peanut, under DIS and from 0.37% to 129.85%, under SIS. In all treatments, the gradually increasing compost rates have resulted in effective increasing in both wheat and peanuts productivity. (2) NPK concentration: Applying DIS, UF-fertilizer and associated-compost has almost had positive effect on N, P and K% concentration for both wheat and peanut crops comparing to that of SIS and urea fertilizer. (3) N, P and K uptake: such uptake for wheat fertilized with UF-fertilizer under DIS have significantly preferred to SIS. For peanut, no significant difference between DIS and SIS has been seen. However, total N-uptake under DIS has been superior to that under SIS. (4) N-recovery & N-use efficiency: N-recovery values from the used N-fertilizers for wheat have ranged from 9.75 to 32.54 Kg N fed⁻¹ under DIS and from 13.31 to 18.76 Kg N fed⁻¹ under SIS. These values for peanut have ranged from 11.11 to 32.79 Kg N fed⁻¹under DIS and from 18.17 to 20.33 Kg N fed⁻¹ under SIS. Total N-recovery values of the cropping wheat-peanut sequence have amounted 42.98 under DIS and 34.68 Kg N fed⁻¹under SIS. Such values, for sub-treatments have ranged from 10.33 to 81.69 Kg N fed⁻¹under DIS and from 17.33 to 60.23 Kg N fed⁻¹under SIS.N-recovery values of peanut from air have ranged from 10.56 to 66.72 Kg N fed⁻¹ under DIS and from 9.95 to 52.45 Kg N fed⁻¹ under SIS. N-use efficiency values of DIS have slightly been surpassed to those of SIS. Such values (on average) of UF-treatments have been also surpassed to those of urea treatments under both DIS and SIS. (5) Energy consumption and CO₂ gas emissions evaluation: The data in this section reveal that total consumed energy value under DIS has been less than that under SIS, averaged consumed energy value to operate DIS has been less than that of SIS. Consumed energy value necessitated to irrigate wheat crop has been less than that for peanut crop. The emitted-CO₂ gas values referred to combustion of the used diesel fuel to obtain the previous mentioned energy have amounted 1248.79 Kg CO₂.fed⁻¹ under DIS and 1431.92 Kg CO₂.fed⁻¹ under SIS. Then, using DIS comparing to SIS has saved 169.08Kg CO₂.fed⁻¹, in relative reduction of 13.55%. For sub-treatments, they have also ranged from 866.68 to 1583.13 Kg CO₂.fed⁻¹ under DIS and from 1046.61 to 1763.00 Kg CO₂.fed⁻¹ under SIS respectively. The energy values from sun (estimated) required to fixing nitrogen from air (by rhizobia) have amounted 2365.4 MJ.fed⁻¹ for DIS and 1672.3 MJ.fed⁻¹ for SIS. Also, its values for sub-treatments under DIS have ranged from 991.3 to 2926.5 MJ.fed⁻¹ and from 1375.3 to 1869.8 MJ.fed⁻¹ under SIS in the same order. These values in diesel fuel form have amounted 57.8 and 45.43 liter fed⁻¹ under DIS and SIS respectively. Also for sub- treatments, they have ranged from 16.8 to 106.1 liter fed⁻¹ under DIS and from 15.8 to 83.4 liter fed⁻¹ under SIS respectively. Therefore, CO₂ emissions which have been already avoided to release and emit to the atmosphere has amounted 154.33 Kg CO₂ fed⁻¹

¹ under DIS and 117.21 Kg CO₂.fed⁻¹ under SIS. Also they have ranged from 70.76 to 208.97 Kg CO₂.fed⁻¹ for sub-treatments under DIS and from 109.38 to 133.41 Kg CO₂ fed⁻¹ for their corresponding under SIS. Averaged value of energy consumption ability (ECA) for DIS has been less than that for SIS. Its values for sub-treatments have ranged from 3413.4 to 9202.1 MJ ton⁻¹ dry matter, under DIS and from 4572.4 to 6311.3 MJ ton⁻¹ dry matter under SIS. The emitted CO₂ values corresponding to the previous mentioned energy quantities have amounted 389.10 Kg CO₂ ton⁻¹ dry matter under DIS and 396.64 Kg CO₂ ton⁻¹ dry matter under SIS. Also, they have ranged from 274.43 to 656.93 Kg CO₂ ton⁻¹ dry matter for sub-treatments under DIS and from 326.43 to 446.18 Kg CO₂ ton⁻¹ dry matter for those under SIS. Using UF-fertilizer (on average) comparing to other treatments (on average) has contributed to save 66.51 Kg CO₂.ton⁻¹ dry matter. (6) Economic evaluation: the gross return value of DIS has been greater than that of SIS. Gross return value of UF treatments (on average) has been greater than other treatments either under DIS or SIS. The net return (NR) and investment factor (IF) of DIS has been much more than that of SIS. Both UF-fertilizer at N-rate of 120 Kg fed⁻¹ under DIS and urea under SIS have had the maximum profitability. The economic optimum rate of compost has mostly been 5 ton fed⁻¹ under DIS or SIS. The higher value of the avoided CO₂ revenue has been belonging to DIS and UF-fertilizer.

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Key words: drip, sprinkler, urea, ureaform, compost, rhizobia, wheat, peanut, energy, CO₂ emissions

1. Introduction

Sandy soil in Egypt comprises most new reclaimed soils (about 2.5 feddans). It is generally poor in plant nutrients and the nutrients applied to it are subject to loss by irrigation water. Also it is often considered as soil with physical properties of no structure, poor water retention and high permeability. Moreover, it is much more sensitive to climatic fluctuation than other soil types, because of the high variance in its status is associated with the fact that it is highly prone to droughts even during the wet season (Philip *et al.*, 1990). It therefore requires proper management to offer optimum productivity of any cultivated crop, especially for the studied cropping sequence here, which has been wheat (*Triticum aestivum* L.) followed by peanut (*Arachis hypogaea* L.). Wheat mainly characterized by high sensitivity to water stress throughout its different growth stages (Abdel-Mawgoud *et al.*, 2007). Peanut can grow in many arid and semiarid regions during dry seasons and needs irrigation to produce economic yield. However, its vegetative preflowering growth stage and the late stage of pod maturation were shown to be sensitive to water stress (Rao *et al.*, 1988; Meisner and Karnok, 1992; Reddy and Reddy, 1993 and *et al.*, 2003).

Both wheat and peanut crops need to be fertilized especially, nitrogen fertilization taking into consideration the ability of peanut to associating with some inoculation to fix some atmospheric nitrogen. Therefore, the suggested soil management practices package has included micro irrigation systems, slow & fast-release nitrogen fertilizers, rhizobia inoculation and organic matter application. Drip and sprinkler irrigation systems facilitate delivering irrigation water to plant root zone in slow continuous manner. Drip

system is a method to uniformly spread moisture throughout the soil medium which also reduces the amount of drain-off with a peak water utilization rate of 95%. Sprinkler system is designed for crops that require irrigation of an entire area or field. It achieves a water utilization rate of 70%-80% (FAO, 2004). Both drip and sprinkler systems offered efficient coverage for small or large areas and were found to be frequently suitable for almost all kinds of crops including vegetables, cotton, soybean, wheat, onion, etc.

Many conventional nitrogen fertilizers have already been available for use on sandy soils. However, any applied N-fertilization program should take into account the environmental considerations related to losses of nitrogen which occur mainly through release of gaseous nitrogen such as nitric oxide (NO) and nitrous oxide (N₂O) through biological denitrification and nitrate (NO₃⁻) leaching which has both negative economical and environmental implication (Abbady *et al.*, 1991 and Merchan-Paniagua, 2006).

The used slow release nitrogen fertilizer in this work was ureaform (UF) fertilizer (condensed urea molecules) developed by Abbady *et al.* (1992). It supplies nitrogen in a slowly available form to root zone depending on microbial activity for two successive growth seasons. This compound is especially effective for crops grown on coarse textured soils (Abbady *et al.*, 2008 and, Abd El-Aal, 2008). Abbady *et al.*, 1997, Hegazy *et al.*, 1998 and Abbady *et al.*, 2003 found that the productivity of UF-fertilizer for many crops, for example sweet, corn, rice, onion, soybean, wheat, was 20-30% more efficient than urea.

The third point in this management practices package has been the application of organic matter to improve the aquatic properties of sandy soil and accelerate UF-molecules breaking down for better nitrogen releasing. Thus in this work, N-nutrient and irrigation water have been slowly and right delivered to plant roots. Moreover, using rhizobia inoculation as a routine work for peanut seeds has been done.

For economical and environmental reasons, it is extremely important to mentioning about consumed energy in N-fertilizers production process as indirect energy in agriculture process. Bhat *et al.*, 1994 stated that nitrogen fertilizer indeed increased crop productivity and subsequently food supply for the world' ever-increasing population. However, the recovery of N-fertilizers is always low. It would reflect on increasing lost-energy which translated to CO₂ emissions. Such emissions are the major causing for global warming. The consumed energy in both micro irrigation systems as direct energy on farm was also taken into consideration.

The main objective, therefore, is to shed the light on the impact of applying previous mentioned soil management practices package on the productivity & profitability of wheat-peanut cropping sequence and the efficiency of nitrogen use & energy consumption. In addition, demonstrating such impact on environment, especially that respecting global warming has been put into account.

2. Materials and Methods

A field experiment has been conducted at Ismailia agricultural Res. Station, Agric. Res. Center "Typic Torriorthents, sandy, mixed, hyperthermic" (USDA, 2006) to study the effect of suggested management practices on growth outputs of wheat-peanut cropping sequence (Wheat, *Triticum aestivum* L., cv Giza 168 and Peanut, *Arachis hypogaea*, L., cv Giza 5). Some physical and chemical characteristics of the soil have been shown in Table 1. The soil analysis has been performed according to Jackson, 1958.

A split split plots design has been used in this experiment:

(A) Treatments of main plots have been drip and sprinkler irrigation systems.

(B) Treatments of subplots have come as follows:

- 1- Control (not received N-fertilizer).
- 2- Urea fertilizer, 120 kg N fed⁻¹ at fertilizing first crop and 15 kg N fed⁻¹ at fertilizing second crop (activating dose for rhizobia).
- 3- UF fertilizer, 60 kg N fed⁻¹
- 4- UF fertilizer, 120 kg N fed⁻¹
- 5- UF fertilizer, 180 kg N fed⁻¹

(C) Treatments of sub-subplots have come as follows:

- 1- Compost, 2.5 ton fed⁻¹
- 2- Compost, 5.0 ton fed⁻¹
- 3- Compost, 7.5 ton fed⁻¹

Every treatment has been replicated three times. Then the experiment has consisted of 90 treatments.

UF-fertilizer (40%N) (Table,2) has been added as side banding before planting first crop (wheat) in one dose, second crop (peanut) has been planted after harvesting wheat on the same plots without adding any N-fertilizer for those of UF- treatments and adding an activating dose for those of urea treatments. Urea fertilizer (46.5%N) has been applied for wheat (winter season), in rate of 120 kg N fed⁻¹ distributed in five equal doses after 2, 4, 6, 8, 10 weeks from planting and for peanuts (summer season) as an activating dose of 15 kg fed⁻¹. Peanut seeds have been mixed with the rhizobia inoculum and allowed to adhere to the seeds by rinsing with a liquid Arabic gum and then left to air drying for one hour.

The produced compost locally in the experimental station and whose chemical analysis presented in table 2 has been incorporated in surface layer of soil (0 -15 cm depth) for two weeks before first crop cultivation (wheat). Its analysis has been carried out according to standard method described by Page 1982. All plots have received P & K fertilizers as follows: Super phosphate (15.5 % P₂O₅) and potassium sulphate (48% K₂O) at rates of 200 and 50 Kg fed⁻¹ of P₂O₅ and K₂O, respectively, for wheat-peanut cropping sequence. They have been added before planting wheat crop. In summer season, peanut has been planted after 20 days from wheat harvesting. All fertilizers whether N or P or K have been used as soil application.

Table 1. Some Physical and Chemical Characteristics.

Particle size distribution %	
Coarse sand	76.68
Fine sand	14.89
Silt	6.34
Clay	2.09
Texture class	sand
Chemical properties	
CaCO ₃ %	1.60
pH (1:2.5 soil- water suspension)	7.74
EC dS/m (at 1:5 soil- water extract)	0.37
Organic matter %	0.50
Cation me. L ⁻¹	
Ca ⁺⁺	0.97
Mg ⁺⁺	0.87
Na ⁺	1.51
K ⁺	0.45
Anion me.L ⁻¹	
CO ₃ ⁻	0
HCO ₃ ⁻	1.42
Cl ⁻	1.02
SO ₄ ⁻	1.36
Available nutrients (mg.kg ⁻¹) soil	
N	85
P	25
K	125

Table 2. Chemical Analysis of Compost and Ureaform Fertilizer

Compost		Ureaform	
Character	Value	Character	Value
pH (1:10 water suspension)	8.7	Nitrogen Content	40%
EC (dS/m, 1:10 "soil: water extract")	4.2		
Organic carbon%	16.7		
Organic matter %	28.8		
Available nutrients:		Activity index	63%
NO ₃ (mg.kg ⁻¹)	160		
NH ₄ (mg.kg ⁻¹)	253.5		
P (mg.kg ⁻¹)	827		
K (%)	0.76		
Total nutrients:		Water soluble nitrogen	22.35%
N (mg.kg ⁻¹)	5452		
P (mg.kg ⁻¹)	4563		
K (mg.kg ⁻¹)	6217		

The recommended practices of cultivation have been carried out till wheat-peanut cropping sequence maturity. Plant samples have been taken from each plot at harvesting stage for both wheat and peanut crops. The yield components (grain and straw) of each plot have been recorded. Plant samples of wheat and peanut have been collected from bulk plot weighed, oven dried at 70°C, ground and prepared for digestion using H₂SO₄ and H₂O₂ method described by Page, 1982. The digests have been then subjected to measurement for N, P and K using procedures described by Chapman and Pratt 1961. Obtained results have been subjected to statistical analysis according to Snedecor and Cochran 1980 and the treatments were compared by L.S.D at 0.05 level of probability.

To verify the impact of suggested management practices on the outputs of studied cropping sequence, some appraisal means would be pursued; N-recovery, N-use efficiency, energy consumption ability, emitted carbon dioxide, total cost of energy, Net return and investment factor. They have been calculated using the models: from 1 to 7.

1-N-recovery fed⁻¹ = (N-uptake fed⁻¹ for treatment) - (N-uptake fed⁻¹ for control)... (1)

2-N-use efficiency = N-recovery fed⁻¹/ N-rate fed⁻¹ x 100... (2)

3-Energy consumption ability = consumed energy, MJ.Fed⁻¹/yield increased, ton fed⁻¹.... (3)

4-Emitted carbon dioxide = consumed energy in diesel fuel liter x carbon coefficient liter⁻¹... (4)

5-Total cost of energy = total consumed energy x price of energy unit... (5)

6-Net return = gross return - total cost... (6)

7-Investment factor = gross return / total cost... (7)

Where:

Gross return = yield increase, ton fed⁻¹ x sale price of ton crop.

Yield increase, ton fed⁻¹ = yield, ton fed⁻¹ for treatment- yield, ton fed⁻¹ for control

Energy of N fed⁻¹ = N-rate fed⁻¹ x energy required to manufacture 1 kg of N-fertilizer (59.5MJ)

Energy of compost.fed⁻¹ = used compost rate in ton fed⁻¹ x 538.56 MJ (energy amount to produce 1 ton)

Energy from sun.fed⁻¹ = N-fixed from air fed⁻¹ x 59.5MJ

Energy consumed of irrigation system.fed⁻¹ calculated according to Shelke, 2010

The energy content of one liter of diesel fuel = 37.4 M Joule

American barrel = 158.984 Liters

Carbon coefficient of one gallon of diesel fuel = 10.0926 kg CO₂

Gallon of diesel fuel = 3.78 liter

Carbon coefficient of one liter of diesel fuel=2.67 kg CO₂

M Joule =10⁶ Joule

3. Results and Discussion

This study has devoted to determination the outputs of soil management practices package; ureaform (UF) as a slow release nitrogen fertilizer under micro-irrigation systems in existence of compost comparing to soluble nitrogen form (urea) and with using rhizobia inoculation. The discussion will therefore have the effect of irrigation systems, type & rate of N-Fertilizer and compost application on yield and N, P & K content of successive crops (wheat and peanut).Also, both energetic and economic evaluations as well as environmental impact (CO₂ emissions) have been taken into consideration.

3.1. Yield

Data in Table 3 show that regardless of N-fertilizer form or rate, the drip irrigation system (DIS) has had significant positive effect on grain and straw yield of wheat crop, while it has not significantly affected seeds and straw yield of peanut crop comparing to sprinkler irrigation system (SIS). Also, all fertilization treatments have significantly increased the yield of both crops either under DIS or SIS comparing to control treatment. Such increments have been more clearly under DIS than did under SIS. This result may be attributed to that DIS has an advantage of water distribution uniformity and less percolated water. This result has been in agreement with findings of Abdel-Mawgoud *et al.*, 2007.

As for the effect of fertilizer form, in general, the yield values of all N-fertilizer treatments have been significantly superior to those of compost treatments. Such effect was expected because of poor nitrogen content of used compost (Table 2). This result has been in accordance with findings of Bobby *et al.*, 2006.

Regarding the effect of N-fertilizer form, it is found that: firstly, the averages of grain yield of wheat and seed yield of peanut of UF-treatments have insignificantly increased comparing to those of urea treatments (Table, 3).Moreover, the UF-low rate treatment (60 N-kg) has given grain or seed yield less

than that of urea treatments either at DIS or SIS. Secondly, the averages of wheat straw yield of UF-

treatments have been significantly inferior to that of urea treatment.

Table 3 Yield and its Components of Both Wheat and Peanut Crops as Affected by Different Treatments

Irrigation (A)	Treatments		Wheat (ton fed ⁻¹)			Peanut (ton fed ⁻¹)			
	N-form Kg fed ⁻¹ (B)	Compost ton fed ⁻¹ (C)	Grains	Straw	Harvest index	Seeds	Pods	Straw	Harvest index
Drip system	0.0	0.0	0.46	1.07	0.43	0.48	1.67	1.00	0.48
		2.5	0.59	1.32	0.45	0.55	1.69	1.51	0.36
		5.0	0.82	1.46	0.56	0.81	1.80	1.60	0.51
		7.5	1.05	2.74	0.38	0.85	1.85	2.00	0.43
	Mean		0.73	1.85	0.39	0.68	1.75	1.53	0.45
	Urea, 120+5	0.0	0.82	2.34	0.35	0.79	1.40	2.13	0.37
		2.5	1.06	3.34	0.32	1.02	1.83	2.60	0.38
		5.0	1.42	3.54	0.40	1.47	2.15	2.68	0.50
		7.5	1.27	2.98	0.43	1.53	2.42	2.89	0.53
	Mean		1.14	3.05	0.37	1.20	1.95	2.65	0.45
	UF, 60	0	0.41	2.00	0.21	0.77	1.64	1.36	0.57
		2.5	0.76	2.20	0.35	0.92	1.85	1.63	0.58
		5.0	1.02	2.57	0.40	1.15	2.02	2.12	0.54
		7.5	1.13	2.91	0.39	1.30	2.09	2.47	0.63
	Mean		0.83	2.42	0.34	1.04	1.90	1.89	0.65
	UF, 120	0	0.62	1.91	0.32	1.35	1.41	1.68	0.73
		2.5	1.29	3.12	0.41	1.53	1.69	2.08	0.74
		5.0	1.43	3.22	0.44	1.60	2.09	2.98	0.54
		7.5	1.08	2.54	0.43	1.75	2.62	3.41	0.51
	Mean		1.08	2.70	0.40	1.56	1.95	2.58	0.63
UF, 180	0	1.24	2.51	0.49	0.99	1.28	2.94	0.34	
	2.5	1.43	2.88	0.50	1.22	1.83	3.12	0.39	
	5.0	1.70	3.46	0.49	1.42	2.45	3.30	0.43	
	7.5	1.21	3.15	0.38	1.50	2.75	3.32	0.45	
Mean		1.40	3.00	0.47	1.28	2.08	3.17	0.40	
Mean		1.04	2.56	0.41	1.15	1.93	2.36	0.49	
Sprinkler system	0.0	0	0.42	1.00	0.42	0.40	1.22	1.09	0.37
		2.5	0.44	1.68	0.26	1.17	1.47	1.59	0.74
		5.0	0.45	1.94	0.23	1.40	2.11	2.33	0.60
		7.5	1.47	1.99	0.74	1.45	3.11	2.70	0.54
	Mean		0.70	1.65	0.42	1.11	1.98	1.93	0.56
	Urea 120+15	0	0.63	1.96	0.32	1.00	1.28	1.68	0.60
		2.5	0.81	2.16	0.38	1.09	2.75	2.78	0.39
		5.0	0.92	2.17	0.42	1.38	3.57	3.43	0.40
		7.5	0.65	2.21	0.29	1.46	3.66	3.50	0.42
	Mean		0.75	2.13	0.35	1.23	2.82	2.85	0.45
	UF, 60	0	0.72	1.65	0.44	0.80	1.90	1.89	0.42
		2.5	0.83	1.66	0.50	0.93	2.67	2.75	0.34
		5.0	0.85	1.75	0.49	1.05	3.07	3.50	0.30
		7.5	0.95	2.40	0.40	1.51	3.28	3.73	0.40
	Mean		0.84	1.87	0.45	1.07	2.73	2.97	0.37
	UF, 120	0.0	0.41	1.64	0.25	0.90	1.64	2.19	0.41
		2.5	0.83	1.81	0.46	1.00	2.23	2.34	0.43
		5.0	0.89	1.96	0.45	1.07	2.43	2.85	0.38
		7.5	0.78	1.82	0.43	1.60	2.84	4.01	0.40
	Mean		0.73	1.81	0.40	1.14	2.29	2.85	0.40
UF, 180	0.0	0.77	2.16	0.36	0.94	1.74	2.22	0.42	
	2.5	0.89	2.24	0.40	1.07	1.94	2.68	0.40	
	5.0	1.07	2.39	0.45	1.50	2.02	3.02	0.50	
	7.5	0.95	2.17	0.44	1.75	2.88	4.41	0.40	
Mean		0.92	2.24	0.41	1.32	2.15	3.08	0.43	
Mean		0.79	1.94	0.41	1.17	2.39	2.73	0.44	
<i>LSD 0.05%</i>									
A			0.182	0.197		0.025		0.043	
B			0.066	0.204		0.017		0.031	
C			0.121	0.179		0.015		0.026	
AB			0.094	0.289		0.025		0.044	
AC			0.171	0.254		0.026		0.036	
BC			0.242	0.359		0.037		0.052	
ABC			0.342	1.070		0.052		0.073	

An opposite direction for peanut straw yield has been observed (Table, 3). The observed good performance of urea fertilizer in this study despite of coarse texture of soil may be referred to adding it in five equal doses and compost application.

About the effect of fertilizer rate, generally grain & straw yield of wheat and seeds & straw yield of peanut have been increased with increasing N-rate of UF under both irrigation systems. It is important to notice the clear effect of compost application, where with increasing its rates, grain & straw yields of both two crops have been increased. Also, the same effect has been occurred with yield of urea treatment. Such effect may attribute to the known organic matter advantages. Regarding harvest index (HI), data show similar effect for both irrigation systems on HI values either at wheat or peanut crop, there has also been an obvious superiority for HI values belonging to UF-high rates to those of other treatments.

Data given in Table 4 show the values of the relative increase of UF-treatments yield calculated of urea-treatment yield as a standard scale to govern on UF-fertilizer performance. Such performance has varied between negativity and positivity as affected by other studied treatments. For wheat, yield relative increase values ranged from -63.3% to 63.29% under DIS and from -20.85% to 33.59% under SIS. For peanut, such values ranged from -12.67% to 77.05% under DIS and from 0.37% to 129.85% under SIS. Here, it must be pointed that the mentioned above negative figures have been related to low rate of UF-fertilizer (60 kg N). In general, UF performance with second crop has frequently been better than that of first one. The authors have tended to think that the action of adaptation between UF-fertilizer and soil medium has been more effective at second crop, and consequently more decomposition and more nitrogen release have been occurred.

It would be mentioned that firstly, the performance of urea has been somewhat improved because of the dividing its rate into 5 doses and compost additions. Secondly, addition of compost alone has frequently given negative relative increase (Table, 4), this effect has been expected and in agreement with the result of Bobby et al, 2006. Thirdly, the effect of application of rhizobia inoculation should not be ignored. It has added nitrogen from air which no doubt being positively affected peanut yield quantity.

3.2. N, P and K-concentration

3.2.1. Wheat:

The data given in Table 5 show that DIS has had significant effect on the concentration of N%, P% and K%, either for grain or straw of wheat crop comparing to SIS. Under DIS, UF fertilizer application (on average) has given N%, P% and K%

values for grain yield more than that of urea while in straw yield, the values have been in equality. Under SIS, there has nearly been similarity for the effect of UF and urea on each of N%, P% and K% value in grain and straw. The three levels of used compost either alone or associated with N-fertilizers have had high significant effect on the content of N, P and K. Such effect must be due to its known several benefits (Gellings and Parmenter, 2004).

3.2.2. Peanut:

Insignificant differences have been observed between the values of N% and P% concentrations belonging to DIS and SIS except K% (Table, 6). The different forms of fertilizers and their rates have exhibited insignificant effects on N, P and K concentrations. The compost treatments have had clear significant effect on N, P and K content as occurred in wheat crop.

3.3. Uptake of N, P and K-nutrients

3.3.1. Wheat:

Apparently, effect of DIS has been superior to that of SIS with regard to N, P and K- uptake. However there have been significant differences between DIS and SIS effects on the values of P&K-uptake in grain yield and N&K-uptake in straw yield while no significant differences for N-uptake in grain yield and P-uptake in straw yield have been observed (Table, 7). Regarding fertilizer form, clear superiority for the effect of all N-fertilizers on N, P and K-uptake to that of compost has been marked. This has been attributed to the poverty of compost in such nutrients and its slight obtained yield. However the graded increase of used compost quantities (rates) has resulted in increasing the uptake of those nutrients (Table, 7).

As for N-fertilizer form, it is observed that under DIS: N, P and K-uptake values in grain yield of UF-treatments have been superior to those of urea treatment. An opposite direction has been shown in straw yield. Under SIS: N, P and K-uptake values in grain yield and N&K-uptake in straw yield of UF-treatments have nearly similar to those of urea.

Examination of the effect of fertilizer rate (Table, 7), the result has indicated that with increasing the rate of UF-fertilizer, the N, P and K-uptake values have increased either under DIS or SIS. Also, with increasing compost rate associated with UF-fertilizer treatments, the uptake of such nutrients has increased. However, this uptake at compost rate of 7.5 ton fed⁻¹ and UF-rates of 120 and 180 kg fed⁻¹ has slightly decreased which could be due to the expected effect of compost on liberation more nitrogen from UF-fertilizer. This effect may lead to obtaining fewer yields and consequently fewer uptakes.

In the matter of total N-uptake, data in Table, 7 show that the average values of total N-

uptake (grain +straw) under DIS have been greater than that under SIS. The effect of different treatments on total N-uptake under both irrigation systems could be ranked in the following order: UF, 180 > urea > UF, 120 > UF, 60 > compost.

3.3.2 Peanut:

Peanut crop has grown on the residual part of UF-fertilizer nitrogen on UF-treatments plots or taken activating dose (15 kg N fed⁻¹) from urea fertilizer for

that grown on urea treatment plots. Data presented in Table, 8 show that N-uptake average value in seeds yield under DIS has been greater than those under SIS, while P and K-uptake average values have nearly been in resemblance i.e. there has been no significant difference. N, P and K-uptake average values of straw yield under DIS have been greater than those under SIS with clear significant differences.

Table 4 Total Yields of Both Wheat & Peanut Crops and Relative Increase % of Compost &UF-Treatments Yield Calculated of Urea Treatment Yield.

Irrigation (A)	Treatments		Wheat (ton fed ⁻¹)			Yield relative increase calculated of urea(%)	Peanut (ton fed ⁻¹)			Yield relative increase calculated of urea yield (%)
	N-form Kg fed ⁻¹ (B)	Compost Ton fed ⁻¹ (C)	Grain	Straw	Total yield		Seeds	Straw	Total yield	
Drip system	0.0	0.0	0.46	1.07	1.53	-51.58	0.48	1.00	1.48	-49.32
		2.5	0.59	1.32	1.91	-39.56	0.55	1.51	2.06	-29.54
		5.0	0.82	1.46	2.28	-27.5	0.81	1.60	2.41	-17.47
		7.5	1.05	2.74	3.79	19.94	0.85	2.00	2.85	-2.40
	Mean		0.82	1.85	2.66	-15.82	0.74	1.70	2.44	-16.44
	Urea 120+15	0.0	0.82	2.34	3.16	00.00	0.79	2.13	2.92	00.00
		2.5	1.06	3.34	4.4	39.24	1.02	2.60	3.62	23.97
		5.0	1.42	3.54	4.96	56.96	1.47	2.68	4.15	42.12
		7.5	1.27	2.98	4.25	25.65	1.53	2.89	4.42	51.37
	Mean		1.14	3.05	4.19	32.59	1.20	2.65	3.85	31.85
	UF, 60	0.0	0.41	2.00	2.41	-23.73	0.77	1.36	2.13	17.05
		2.5	0.76	2.20	2.96	-63.3	0.92	1.63	2.55	-12.67
		5.0	1.02	2.57	3.59	13.61	1.15	2.12	3.27	11.98
		7.5	1.13	2.91	4.04	27.85	1.30	2.47	3.77	29.11
	Mean		0.83	2.42	3.25	11.40	1.04	1.89	2.93	11.38
	UF, 120	0.0	0.62	1.91	2.53	-19.94	1.35	1.68	3.03	3.77
		2.5	1.29	3.12	4.41	39.56	1.53	2.08	3.61	23.63
		5.0	1.43	3.22	4.65	47.15	1.60	2.98	4.58	56.85
		7.5	1.08	2.54	3.62	14.56	1.75	3.41	5.17	77.05
	Mean		1.08	2.70	3.78	19.62	1.56	2.58	4.11	40.75
	UF, 180	0.0	1.24	2.51	3.75	18.67	0.99	2.94	3.93	34.59
		2.5	1.43	2.88	4.31	36.39	1.22	3.12	4.34	48.63
		5.0	1.70	3.46	5.16	63.29	1.42	3.30	4.72	61.64
		7.5	1.21	3.15	4.36	37.97	1.50	3.32	4.82	65.07
Mean		1.40	3.00	4.4	39.24	1.28	3.17	4.45	52.39	
Mean			1.04	2.56	3.6	14.44	1.15	2.36	3.51	24.07
Sprinkler system	0.0	0.0	0.42	1.00	1.42	-45.17	0.40	1.09	1.49	18.32
		2.5	0.44	1.68	2.12	-18.15	1.17	1.59	3.29	22.76
		5.0	0.45	1.94	2.39	-7.72	1.40	2.33	3.73	39.93
		7.5	1.47	1.99	3.46	33.59	1.45	2.70	4.15	55.22
	Mean		0.79	1.87	2.66	2.70	1.34	2.21	3.72	38.81
	Urea 120+15	0.0	0.63	1.96	2.59	00.00	1.00	1.68	2.68	00.00
		2.5	0.81	2.16	2.97	14.67	1.09	2.78	3.87	44.40
		5.0	0.92	2.17	3.09	19.30	1.38	3.43	4.81	79.48
		7.5	0.65	2.21	2.86	10.43	1.46	3.50	4.96	85.07
	Mean		0.75	2.13	2.88	11.20	1.23	2.85	4.08	52.24
	UF, 60	0.0	0.72	1.65	2.37	-8.49	0.80	1.89	2.69	0.37
		2.5	0.83	1.66	2.49	-3.86	0.93	2.75	3.68	28.36
		5.0	0.85	1.75	2.55	-1.55	1.05	3.50	4.55	69.78
		7.5	0.95	2.40	3.35	29.34	1.51	3.73	5.24	95.52
	Mean		0.84	1.87	2.71	4.63	1.07	2.97	4.04	50.74
	UF, 120	0.0	0.41	1.64	2.05	-20.85	0.90	2.19	3.09	15.3
		2.5	0.83	1.81	2.64	1.93	1.00	2.34	3.34	24.62
		5.0	0.89	1.96	2.85	10.04	1.07	2.85	3.92	46.27
		7.5	0.78	1.82	2.6	0.39	1.60	4.01	5.61	109.33
	Mean		0.73	1.81	2.54	-1.93	1.14	2.85	3.99	48.88
	UF, 180	0.0	0.77	2.16	2.93	13.13	0.94	2.22	3.16	17.91
		2.5	0.89	2.24	3.13	20.85	1.07	2.68	3.75	39.93
		5.0	1.07	2.39	3.46	33.59	1.50	3.02	4.52	68.66
		7.5	0.95	2.17	3.12	20.46	1.75	4.41	6.16	129.85
Mean		0.92	2.24	3.16	22.01	1.32	3.08	4.37	63.06	
Mean			0.79	1.94	2.73	5.45	1.17	2.73	3.9	45.52

Table 5.N, P and K-Concentration (%) of Wheat Crop as Affected by Different Treatments

Irrigation (A)	Treatments		Concentration (%)					
	N-form Kg fed ⁻¹ (B)	Compost ton fed ⁻¹ (C)	Grain			Straw		
			N	P	K	N	P	K
Drip system	0.0	0.0	1.40	0.49	0.24	0.35	0.13	1.27
		2.5	1.46	0.50	0.26	0.36	0.18	1.33
		5.0	1.52	0.53	0.27	0.39	0.19	1.54
		7.5	1.66	0.55	0.29	0.39	0.20	1.78
	Mean		1.51	0.52	0.27	0.37	0.18	1.48
	Urea 120	0.0	1.46	0.30	0.23	0.36	0.17	1.11
		2.5	1.47	0.38	0.27	0.37	0.25	1.46
		5.0	1.75	0.46	0.29	0.39	0.32	1.58
		7.5	1.52	0.43	0.28	0.34	0.29	1.34
	Mean		1.55	0.39	0.25	0.37	0.26	1.37
	UF, 60	0.0	1.58	0.42	0.22	0.35	0.16	1.01
		2.5	1.68	0.43	0.25	0.36	0.39	1.23
		5.0	2.04	0.55	0.27	0.38	0.29	1.47
		7.5	3.36	0.70	0.32	0.40	0.30	1.48
	Mean		2.17	0.53	0.27	0.37	0.26	1.30
	UF, 120	0.0	1.57	0.42	0.24	0.35	0.14	1.24
		2.5	1.58	0.53	0.27	0.36	0.25	1.35
		5.0	1.68	0.57	0.29	0.40	0.35	1.51
		7.5	1.50	0.50	0.29	0.36	0.30	1.48
	Mean		1.58	0.51	0.27	0.37	0.26	1.40
	UF, 180	0.0	1.31	0.37	0.23	0.34	0.14	1.07
		2.5	1.53	0.43	0.24	0.35	0.38	1.32
		5.0	1.74	0.54	0.31	0.38	0.52	1.50
		7.5	1.60	0.42	0.24	0.36	0.15	1.25
Mean		1.55	0.44	0.26	0.36	0.30	1.29	
Mean			1.67	0.48	0.27	0.37	0.25	1.37
Sprinkler system	0.0	0.0	0.58	0.19	0.20	0.30	0.11	0.50
		2.5	1.50	0.48	0.28	0.31	0.12	0.50
		5.0	1.57	0.48	0.29	0.36	0.13	0.50
		7.5	1.58	0.50	0.29	0.36	0.14	0.70
	Mean		1.31	0.41	0.27	0.33	0.13	0.55
	Urea 120	0.0	1.52	0.30	0.23	0.35	0.10	0.65
		2.5	1.68	0.48	0.24	0.38	0.20	0.57
		5.0	1.91	0.54	0.28	0.38	0.20	0.59
		7.5	1.70	0.53	0.26	0.36	0.16	0.57
	Mean		1.70	0.46	0.25	0.37	0.17	0.60
	UF, 60	0.0	1.16	0.34	0.23	0.35	0.14	0.48
		2.5	1.45	0.35	0.25	0.36	0.16	0.53
		5.0	1.57	0.35	0.26	0.40	0.17	0.64
		7.5	1.67	0.36	0.27	0.40	0.17	0.65
	Mean		1.46	0.35	0.25	0.38	0.16	0.58
	UF, 120	0.0	1.42	0.44	0.25	0.38	0.13	0.64
		2.5	1.57	0.50	0.25	0.38	0.20	0.73
		5.0	1.98	0.51	0.29	0.40	0.23	0.78
		7.5	1.68	0.50	0.27	0.38	0.22	0.74
	Mean		1.66	0.49	0.27	0.39	0.20	0.72
	UF, 180	0.0	1.31	0.39	0.25	0.37	0.15	0.65
		2.5	1.56	0.56	0.28	0.38	0.24	0.67
		5.0	2.02	0.60	0.29	0.38	0.25	0.72
		7.5	1.85	0.43	0.29	0.37	0.17	0.68
Mean		1.69	0.50	0.28	0.38	0.20	0.68	
Mean			1.56	0.44	0.26	0.37	0.17	0.62
<i>LSD0.05%</i>								
A			0.043	0.055	0.025	0.785	0.049	0.025
B			0.0534	0.252	0.031	0.373	0.0178	0.0178
C			0.0729	0.032	0.037	0.018	0.0447	0.0316
AB			0.0755	0.036	0.044	0.062	0.2520	0.0252
AC			0.1032	0.045	0.052	0.026	0.0632	0.0447
BC			0.1459	0.063	0.073	0.036	0.0893	0.0632
ABC			0.2063	0.089	0.103	0.052	0.1263	0.0893

Table 6. N, P and K-Concentration (%) of Peanut Crop as Affected by Different Treatments

Irrigation (A)	Treatments		Concentration (%)					
	N-form Kgfed ¹ (B)	Compost tonfed ¹ (C)	Seeds			Straw		
			N	P	K	N	P	K
Drip system	0.0	0.0	3.41	0.45	0.29	0.86	0.37	0.17
		2.5	3.64	0.66	0.30	1.53	0.38	0.33
		5.0	3.82	0.67	0.35	1.62	0.40	0.36
		7.5	4.18	0.83	0.43	1.81	0.41	0.38
	Mean		3.76	0.65	0.34	1.46	0.39	0.31
	Urea, 120+15	0.0	3.70	0.64	0.35	1.44	0.31	0.25
		2.5	3.78	0.71	0.36	1.67	0.38	0.30
		5.0	4.25	0.78	0.39	1.79	0.39	0.31
		7.5	4.26	0.78	0.39	2.11	0.41	0.33
	Mean		4.00	0.73	0.37	1.75	0.37	0.30
	UF, 60	0.0	3.78	0.59	0.28	1.00	0.31	0.25
		2.5	3.82	0.67	0.33	1.19	0.38	0.32
		5.0	4.09	0.68	0.35	1.68	0.41	0.35
		7.5	4.12	0.77	0.36	1.72	0.45	0.45
	Mean		3.95	0.68	0.33	1.40	0.39	0.34
	UF, 120	0.0	3.52	0.61	0.32	1.53	0.32	0.28
		2.5	3.98	0.70	0.34	1.64	0.37	0.37
		5.0	4.19	0.77	0.36	1.80	0.46	0.43
		7.5	4.20	0.77	0.36	1.84	0.46	0.44
	Mean		3.97	0.71	0.35	1.70	0.40	0.38
	UF, 180	0.0	3.37	0.56	0.29	1.47	0.33	0.18
		2.5	3.55	0.69	0.30	1.52	0.36	0.28
		5.0	4.09	0.79	0.41	1.95	0.38	0.35
		7.5	4.10	0.79	0.42	1.97	0.38	0.36
Mean		3.78	0.71	0.36	1.73	0.36	0.29	
Mean			3.89	0.70	0.35	1.61	0.38	0.32
Sprinkler system	0.0	0.0	2.01	0.69	0.32	0.80	0.28	0.41
		2.5	2.25	0.71	0.34	0.83	0.29	0.44
		5.0	2.5	0.74	0.34	0.90	0.30	0.44
		7.5	2.45	0.80	0.36	1.10	0.31	0.45
	Mean		2.30	0.74	0.34	0.91	0.30	0.44
	Urea, 120+15	0.0	3.32	0.64	0.33	1.00	0.29	0.41
		2.5	3.78	0.65	0.35	1.04	0.30	0.43
		5.0	4.26	0.65	0.36	1.05	0.30	0.48
		7.5	4.27	0.65	0.37	1.10	0.31	0.49
	Mean		3.91	0.65	0.35	1.05	0.30	0.45
	UF, 60	0.0	3.75	0.64	0.32	0.96	0.28	0.41
		2.5	3.81	0.65	0.33	0.97	0.29	0.42
		5.0	3.90	0.65	0.35	0.98	0.30	0.42
		7.5	4.10	0.67	0.41	1.08	0.30	0.43
	Mean		3.89	0.65	0.35	1.00	0.29	0.42
	UF, 120	0.0	3.79	0.64	0.33	0.93	0.29	0.42
		2.5	4.07	0.65	0.35	0.94	0.30	0.42
		5.0	4.15	0.67	0.39	0.95	0.31	0.42
		7.5	4.22	0.68	0.40	0.95	0.31	0.43
	Mean		4.06	0.66	0.37	0.94	0.30	0.42
	UF, 180	0.0	3.70	0.66	0.33	1.00	0.28	0.42
		2.5	3.90	0.68	0.34	1.03	0.29	0.43
		5.0	4.10	0.70	0.35	1.06	0.30	0.45
		7.5	4.44	0.71	0.35	1.07	0.31	0.45
Mean		4.04	0.69	0.34	1.04	0.30	0.44	
Mean			3.64	0.68	0.35	0.99	0.30	0.43
<i>LSD0.05%</i>								
A			0.136	0.025	0.025	0.049	0.025	0.025
B			0.083	0.018	0.018	0.039	0.040	0.035
C			0.075	0.018	0.018	0.052	0.041	0.018
AB			0.118	0.025	0.025	0.056	0.056	0.025
AC			0.106	0.026	0.026	0.103	0.073	0.026
BC			0.150	0.037	0.036	0.095	0.103	0.037
ABC			0.213	0.052	0.052	0.145	0.146	0.052

Table 7. Uptake of N, P and K (kg fed⁻¹) of Wheat Crop as Affected by Different Treatments

Irrigation (A)	Treatments		Uptake (kg fed ⁻¹)						Total N-Uptake kg fed ⁻¹
	N-form Kg fed ⁻¹ (B)	Compost Ton fed ⁻¹ (C)	Grain			Straw			
			N	P	K	N	P	K	
Drip system	0.0	0.0	6.44	2.25	1.10	3.36	2.08	16.5	10.19
		2.5	8.61	2.95	1.53	5.10	2.38	17.55	13.37
		5.0	12.46	4.35	2.21	5.75	2.92	25.99	18.16
		7.5	17.60	5.83	3.07	9.65	3.56	34.79	28.28
	Mean		11.28	3.79	1.94	5.97	2.74	23.71	17.20
	Urea, 120+15	0.0	11.97	2.46	1.89	8.41	4.00	34.16	20.40
		2.5	15.58	4.03	2.86	12.9	8.42	37.07	27.94
		5.0	24.85	6.53	4.12	13.14	10.27	55.93	38.66
		7.5	19.30	5.46	3.56	10.12	9.54	39.93	29.44
	Mean		17.93	4.48	3.06	11.15	8.06	41.77	28.84
	UF, 60	0.0	6.48	1.72	0.90	8.00	3.20	20.24	13.48
		2.5	12.77	3.27	1.90	8.36	6.60	27.0	20.69
		5.0	20.81	5.61	2.75	9.25	7.45	38.04	30.57
		7.5	37.97	7.91	3.62	10.19	8.53	42.78	49.61
	Mean		19.51	4.36	2.20	8.95	6.45	32.02	26.98
	UF, 120	0.0	8.16	2.18	1.25	7.64	2.67	25.79	15.8
		2.5	20.38	6.84	3.48	11.23	7.80	38.64	31.61
		5.0	24.02	8.15	4.15	11.59	11.30	47.74	36.90
		7.5	16.20	5.40	3.13	8.84	7.62	38.35	25.34
	Mean		17.19	5.45	2.94	9.83	7.34	37.63	27.00
	UF, 180	0.0	16.24	4.59	2.85	9.54	3.51	33.13	24.78
		2.5	21.88	6.15	3.43	10.08	10.9	36.00	31.96
		5.0	29.58	9.18	5.27	11.73	18.1	51.9	42.73
		7.5	19.36	5.08	2.90	11.48	4.84	33.6	30.70
Mean		21.77	6.14	3.56	10.71	9.34	38.66	32.28	
Mean		17.54	4.93	2.75	9.32	6.78	34.76	26.71	
Sprinkler system	0.0	0.0	2.436	0.798	0.84	3.00	1.20	7.70	5.44
		2.5	6.60	2.112	1.23	6.07	3.24	8.40	11.81
		5.0	7.065	2.16	1.31	6.09	3.88	9.74	14.05
		7.5	23.23	7.35	4.26	7.12	5.09	9.88	30.39
	Mean		9.83	2.87	1.84	5.57	3.35	8.93	14.58
	Urea, 120+15	0.0	9.576	1.89	1.45	7.45	5.49	11.23	16.44
		2.5	13.608	3.888	1.94	7.50	8.18	12.37	21.82
		5.0	17.572	4.968	2.58	7.83	12.4	12.81	25.82
		7.5	11.05	3.445	1.69	8.46	13.1	14.31	19.01
	Mean		12.95	3.48	1.90	7.81	9.78	12.68	20.62
	UF, 60	0.0	8.352	2.448	1.66	5.83	2.89	8.00	14.13
		2.5	12.035	2.905	2.08	5.97	3.38	10.68	18.01
		5.0	13.345	2.975	2.21	6.97	8.31	11.45	20.35
		7.5	15.865	3.42	2.57	9.60	5.95	12.74	25.47
	Mean		12.40	2.93	2.11	7.09	4.38	10.72	19.29
	UF, 120	0.0	5.822	1.804	1.03	6.56	2.99	10.50	12.05
		2.5	13.031	4.15	2.08	6.80	5.35	13.21	19.91
		5.0	17.622	4.539	2.58	7.38	5.81	14.5	25.46
		7.5	13.104	3.9	2.11	6.84	5.20	10.0	20.02
	Mean		12.40	3.55	1.93	6.90	4.84	13.05	19.05
	UF, 180	0.0	10.087	3.003	1.93	7.95	4.47	14.78	18.08
		2.5	13.884	4.984	2.49	8.54	5.21	15.10	22.40
		5.0	21.614	6.42	3.10	8.84	6.99	17.25	30.70
		7.5	17.575	4.085	2.76	8.35	4.41	14.10	25.60
Mean		15.79	4.55	2.55	8.42	6.27	15.31	24.20	
Mean		12.67	3.47	2.06	7.16	5.63	12.14	19.42	
<i>LSD0.05%</i>									
A			5.900	0.623	0.482	0.025	6.840	10.11	
B			1.338	0.339	0.179	0.414	0.457	1.632	
C			1.598	0.340	0.195	0.592	0.473	1.737	
AB			1.962	0.481	0.253	0.587	0.647	2.308	
AC			2.260	0.481	0.277	0.837	0.668	2.456	
BC			3.197	0.680	0.391	1.184	0.946	3.474	
ABC			4.521	0.962	0.553	1.675	1.337	4.913	

As for fertilizer form, clear significant effect for all N-fertilizers on N, P and K-uptake comparing to that of compost treatments either under DIS or SIS has been marked. About N-fertilizer form, there have been significant differences in N, P and K-uptake values among different N-fertilizer treatments; under DIS: N, P-uptake values of seeds and K-uptake of straw belonging to UF- treatments have been superior to those of urea treatments while K-uptake of seeds yield and N, P-uptake of straw yield have come inferior. Under SIS, there has been superiority for N, P and K-uptake of seeds belonging to UF- treatments to those of urea treatments, while inferiority for N, P and K-uptake of straw has been observed (Table 8).

Examination of data presented in Table 8 has illustrated high superiority for DIS effect on the total N-uptake average values to that of SIS as shown at N-uptake of wheat crop (Table 7). However, it is obviously noticed that N-uptake of peanut crop has been much more than that of wheat crop although the peanut has grown on the residual part of the nitrogen of UF-fertilizer. This may attribute partially to the nitrogen quantity coming from air and fixed by rhizobia inoculation.

The effect of different treatments on total N-uptake under DIS could be ranked in order of: UF, 120 > UF, 180 > urea > UF, 60 > compost while under SIS, it has been as follows: urea > UF, 180 > UF, 120 > UF, 60 > compost.

3.4. N-recovery and N-use efficiency

3.4.1. Wheat:

N-recovery values of wheat calculated as in model 1 (materials and methods) and presented in Table 9 have ranged from 9.75 Kg N fed⁻¹ (on average) with compost treatments to 32.54 Kg N fed⁻¹ (on average) with UF, 180 treatments under DIS. Under SIS, they have varied from 13.31 Kg N fed⁻¹ (on average) with compost treatments to 18.76 Kg N fed⁻¹ (on average) with UF, 180 treatments. Maximum N-recovery has been with the UF-rate of 180 Kg N fed⁻¹ under DIS. Generally, it may be ordered the effect of different treatments under DIS as follows: UF, 180 > urea > UF, 60 > UF, 120 > compost and under SIS as follows: UF, 180 > urea > UF, 120 > UF, 60 > compost.

3.4.2. Peanut:

In the light of preceding studies on peanut crop fertilization using N¹⁵ tracer technique (Danso and Eskew, 1981, Zahran, 1999 and Adlan, and Mukhtar, 2004), it could be concluded that the N-derived from air (fixed nitrogen by rhizobia inoculation) being represented average figure of 60% of the total nitrogen existing in peanut crop tissue (total N-recovery). Thereon, by subtracting this value from total N-recovery, the value of N-derived from fertilizer can be obtained (Table 9).

In this context, it can be discussed the peanut crop N-recovery as total N-recovery, N-recovery derived from air and N-recovery derived from applied N-fertilizers. Data given in Table 9 show that total N-recovery and N-recovery derived from air average values under DIS have been markedly superior to those under SIS. Their values under DIS have ranged from 27.77 to 81.98 Kg N fed⁻¹ and from 16.66 to 49.19 Kg N fed⁻¹ respectively while under SIS, these values have ranged from 36.82 to 52.38 Kg N fed⁻¹ and from 22.09 to 31.43 Kg N fed⁻¹ respectively. The effect of different treatments in this respect can be ordered as follows: UF, 120 > UF, 180 > urea > UF, 60 > compost, under DIS while under SIS, the order has come as follows: urea > UF, 180 > UF, 120 > UF, 60 > compost.

It would be pointed out to the importance of rhizobia inoculation as a proper management practice to provide the plant with some of required nitrogen and protect the environment where it has added an amount of nitrogen ranged from 9.95 to 66.72 Kg N fed⁻¹.

In case of N-recovery derived from applied N-fertilizers, it is observed that its average values under DIS have been also superior to that under SIS. Such values have ranged from 11.11 to 32.79 Kg N fed⁻¹ for former and from 18.17 to 20.33 Kg N fed⁻¹ for latter. Hence, it can be reported that used different management practices have truly affected N-recovery either for wheat or peanut.

As for total corrected N-recovery of the wheat-peanut cropping sequence (derived only from fertilizer), it is observed that its value has been 42.98 under DIS and 33.75 Kg N fed⁻¹ under SIS. For sub-sub-treatments, such values have ranged from 10.33 to 81.69 Kg N fed⁻¹ under DIS and from 15.48 to 60.23 Kg N fed⁻¹ under SIS. Regardless the N-fertilizer form, the associated-compost has had positive effect on such recovery

To discuss N-use efficiency, it must calculate: (a) the all inputs of used nitrogen (nitrogen quantity in compost + nitrogen quantity in N-fertilizer of treatment, Kg N fed⁻¹) and (b) total corrected N-recovery in kg N fed⁻¹ (wheat N-recovery + peanut N-recovery from only N-synthetic fertilizers). N-use efficiency has been obtained by dividing b/a relative to 100, as in model 2 (materials and methods). Thus, data presented in Table 9 show that N-use efficiency values of DIS have been slightly surpassed to those of SIS. Such values (on average) of UF-treatments have been also surpassed to those of urea treatments under both DIS and SIS. This result has been expected and in agreement with Abbady *et al.*, 2011. Hence UF-fertilizer application as an invented practice for fertilization management can be considered very successful concept. Also, it is observed that N-use efficiency values belonging to compost treatments

have been the highest values comparing to other nitrogen or to nitrogen fixed from air. treatments which may due to its few content of

Table 8. Uptake of N, P and K (kg fed⁻¹) of Peanut Crop as Affected by Different Treatments

Treatments			Uptake (kg fed ⁻¹)						Total N-Uptake (kg fed ⁻¹)	
Irrigation (A)	N-form Kg fed ⁻¹ (B)	Compost Ton fed ⁻¹ (C)	Seeds			Straw				
			N	P	K	N	P	K		
Drip system	0.0	0.0	16.37	2.16	1.39	8.60	3.70	1.70	25.0	
		2.5	20.02	3.63	1.65	23.10	5.74	4.98	43.1	
		5.0	30.94	5.43	2.84	25.92	6.40	5.76	56.9	
		7.5	35.95	7.14	3.70	36.20	8.20	7.60	72.1	
	Mean		25.82	4.59	2.39	23.46	6.01	5.01	49.28	
	Urea, 120+15	0.0	29.23	5.06	2.77	30.67	6.60	5.33	59.9	
		2.5	38.56	7.24	3.67	43.42	9.88	7.80	82.0	
		5.0	62.48	11.47	5.73	52.98	11.54	9.18	115.5	
		7.5	65.18	11.93	5.97	60.98	11.85	9.54	126.2	
	Mean		48.86	8.92	4.53	47.01	9.97	7.96	95.87	
	UF, 60	0.0	29.11	4.54	2.16	13.50	4.19	3.38	42.6	
		2.5	35.14	6.16	3.04	19.40	6.19	5.22	54.5	
		5.0	47.04	7.82	4.03	35.62	8.69	7.42	82.7	
		7.5	53.56	10.01	4.68	42.48	11.12	11.12	96.0	
	Mean		41.21	7.13	3.47	27.75	7.55	6.78	68.96	
	UF, 120	0.0	47.52	8.24	4.32	28.46	5.95	5.21	76.0	
		2.5	60.89	10.71	5.20	34.11	7.70	7.70	95.0	
		5.0	67.04	12.32	5.76	53.64	13.71	12.81	120.7	
		7.5	73.50	13.48	6.30	62.74	15.69	15.00	136.2	
	Mean		62.24	11.19	5.40	44.74	10.76	10.18	106.98	
	UF, 180	0.0	33.36	5.54	2.87	43.22	9.70	5.29	76.6	
		2.5	43.31	8.42	3.66	47.42	11.23	8.74	90.7	
		5.0	58.08	11.22	5.82	64.35	12.54	11.55	122.4	
		7.5	61.50	11.85	6.30	65.40	12.62	11.95	126.9	
	Mean		49.06	9.26	4.66	55.10	11.52	9.38	104.16	
	Mean		45.44	8.22	4.09	39.61	9.16	7.86	85.05	
	Sprinkler system	0.0	0.0	8.04	2.76	1.28	8.72	3.05	4.47	16.76
			2.5	26.33	8.31	3.98	13.2	4.61	7.00	39.53
5.0			35.00	10.36	4.76	20.96	6.99	10.25	55.96	
7.5			35.52	11.60	5.22	29.7	8.37	12.15	65.23	
Mean			26.22	8.26	3.81	18.15	5.76	8.47	58.44	
Urea, 120+15		0.0	33.20	6.40	3.30	16.80	4.87	6.89	50.0	
		2.5	41.20	7.09	3.82	28.91	8.34	11.95	70.1	
		5.0	58.79	8.97	4.97	36.02	10.29	16.46	94.8	
		7.5	62.34	9.49	5.40	38.50	10.85	17.15	100.8	
Mean			48.88	7.99	4.37	30.06	8.59	13.11	78.94	
UF, 60		0.0	30.00	5.12	2.56	18.14	5.29	7.75	48.1	
		2.5	35.43	6.05	3.07	26.68	7.98	11.55	62.1	
		5.0	40.95	6.83	3.68	34.30	10.50	14.70	75.3	
		7.5	61.91	10.12	6.19	40.28	11.19	16.04	102.2	
Mean			42.07	7.03	3.87	29.85	8.74	12.51	71.92	
UF, 120		0.0	34.11	5.76	2.97	20.37	6.35	9.20	54.5	
		2.5	40.70	6.50	3.50	22.00	7.02	9.83	62.7	
		5.0	44.41	7.17	4.17	27.08	8.84	11.97	71.5	
		7.5	67.52	10.88	6.40	38.10	12.43	17.24	105.6	
Mean			46.68	7.58	4.26	26.88	8.66	12.06	73.57	
UF, 180		0.0	34.78	6.20	3.10	8.60	3.70	1.70	43.38	
		2.5	41.73	7.28	3.64	23.10	5.74	4.98	64.83	
		5.0	61.50	10.50	5.25	25.92	6.40	5.76	87.42	
		7.5	77.70	12.43	6.13	36.20	8.20	7.60	113.9	
Mean			53.93	9.10	4.53	23.46	6.01	5.01	77.38	
Mean			43.55	7.99	4.17	25.68	6.60	5.33	72.05	
<i>LSD0.05%</i>										
A			2.389	0.419	0.214	1.15	1.163	0.145		
B			1.999	0.3667	0.236	1.27	0.265	0.182		
C			1.874	0.419	0.203	1.55	0.178	0.232		
AB			2.827	0.519	0.334	1.79	0.374	0.258		
AC			2.650	0.593	0.287	2.19	0.251	0.329		
BC			3.750	0.838	0.406	3.10	0.355	0.466		
ABC			5.300	1.185	0.574	4.39	0.503	0.659		

Table 9. Total N-Inputs, N-Recovery of Wheat & Peanut Crops, Total Corrected N-Recovery and N-Use Efficiency

Irrigation (A)	Treatment		¹ Total N- Inputs Kg fed ⁻¹	² N-recovery for wheat Kg fed ⁻¹	N-recovery for Peanut			⁵ Total corrected N- recovery Kg fed ⁻¹	Nitrogen use efficiency %
	N-form kg fed ⁻¹ (B)	Compost Ton fed ⁻¹ (C)			Total N Kg fed ⁻¹	³ N-from air Kg fed ⁻¹	⁴ N-from fertilizer Kg fed ⁻¹		
Drip system	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.5	12.5	3.18	18.1	10.86	7.24	11.04	88.00
		5.0	25.0	7.97	18.1	10.86	7.24	15.21	60.84
		7.5	37.5	18.09	47.1	28.26	18.84	36.93	98.48
	Mean		25.0	9.75	27.77	16.66	11.11	21.06	82.44
	Urea, 120+15	0.0	135.0	10.21	34.9	20.94	13.96	24.17	17.90
		2.5	147.5	17.75	57.0	34.20	22.8	40.55	27.49
		5.0	160.0	28.47	90.5	54.30	36.2	64.67	40.42
		7.5	172.5	19.25	101.2	60.72	40.48	59.73	34.63
	Mean		153.75	18.92	70.9	42.54	28.36	47.28	27.61
	UF, 60	0.0	60.0	3.29	17.6	10.56	7.04	10.33	17.22
		2.5	72.5	10.5	29.5	17.7	11.80	22.3	30.76
		5.0	85.0	20.38	57.7	34.62	23.08	43.46	51.13
		7.5	97.5	39.42	71.0	42.6	28.40	67.82	69.56
	Mean		78.75	18.40	43.95	26.37	17.58	35.98	42.17
	UF, 120	0.0	120.0	5.61	51.0	30.60	20.4	26.01	34.3
		2.5	132.5	21.42	70.0	42.00	28.00	49.42	37.29
		5.0	145.0	26.71	95.7	57.42	38.28	64.99	44.82
		7.5	157.5	15.15	111.2	66.72	44.48	44.48	28.24
	Mean		138.75	16.99	81.98	49.19	32.79	46.23	36.16
	UF, 180	0.0	180.0	24.78	51.6	30.96	20.64	45.42	25.23
		2.5	192.5	31.96	65.7	39.42	26.28	58.76	30.52
		5.0	205.0	42.73	97.4	58.44	38.96	81.69	39.85
		7.5	217.5	30.70	101.9	61.14	40.76	71.46	32.86
Mean		198.75	32.54	79.15	47.49	31.79	64.33	38.42	
Mean				19.32	60.75	36.45	24.33	42.98	45.36
Sprinkler system	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.5	12.5	6.37	22.77	13.66	9.11	15.48	123.84
		5.0	25.0	8.61	39.22	23.53	15.69	22.3	89.2
		7.5	37.5	24.95	48.46	29.07	19.39	49.75	118.24
	Mean		25.0	13.31	36.82	22.09	14.73	29.18	110.42
	Urea 120+15	0.0	135.0	11.00	23.5	14.1	9.4	20.4	15.11
		2.5	147.5	16.38	43.6	26.16	17.44	33.82	22.93
		5.0	160.0	20.38	68.1	40.86	27.24	47.62	29.76
		7.5	172.5	13.57	74.3	44.58	29.72	43.29	25.1
	Mean		153.75	15.33	52.38	31.43	20.95	36.28	23.23
	UF, 60	0.0	60.0	8.69	21.6	12.96	8.64	17.33	28.88
		2.5	72.5	9.47	35.6	21.36	14.24	23.71	32.70
		5.0	85.0	14.91	48.8	29.28	19.52	34.43	40.51
		7.5	97.5	20.03	75.7	45.42	30.28	50.31	51.6
	Mean		78.75	13.28	45.43	27.26	18.17	31.45	38.42
	UF, 120	0.0	120.0	6.61	28.0	16.8	11.2	17.81	14.84
		2.5	132.5	14.47	36.2	21.72	14.48	28.95	21.85
		5.0	145.0	20.02	45.0	27.0	18.0	38.02	26.22
		7.5	157.5	14.58	79.1	47.46	31.64	46.22	29.35
	Mean		138.75	13.92	47.08	28.25	18.83	32.75	23.07
	UF, 180	0.0	180.0	12.64	16.58	9.95	6.63	19.27	10.71
		2.5	192.5	16.96	38.33	22.99	15.34	32.3	16.78
		5.0	205.0	25.26	60.92	36.55	24.37	44.53	20.47
		7.5	217.5	20.16	87.4	52.45	34.97	60.23	29.38
Mean		198.75	18.76	50.81	30.47	20.33	39.08	19.34	
Mean				14.92	46.51	27.9	18.60	33.75	42.89

1-total N-input = N-fertilizerfed⁻¹+N-compost fed⁻¹ ; 2-N-recovery = N-uptake fed⁻¹ for treatment-N-uptake fed⁻¹ for control
 3-N-from air, kg/fed⁻¹ = N-recovery of peanut x 60%, 4-N-from fertilizer, kg/fed⁻¹ = total N-recovery of peanuts -N-from air
 5-Total corrected N-recovery, kg fed⁻¹ = N-recovery of wheat, kg fed⁻¹ + N-recovery from fertilizer of peanuts, kg fed⁻¹

3.5. Energy consumption and CO₂ gas emissions evaluation:

One of the most important routes to combat global warming is to enhance efficiency of energy

consumption to reduce CO₂ emissions originated from combustion of fossil fuel necessitated to obtain such energy. In agriculture sector, most of this energy has been used either directly (in field) to power mechanization like irrigation systems or indirectly as in the manufacture of goods like fertilizers. Because of importance such inputs to obtain desired yield, this section will be devoted to discuss this issue under the conditions of this study.

Table 10 contains the calculations of consumed energy to manufacture each of compost, N-fertilizers and that required to operate irrigation systems machine as well as that comes from sun; local compost production in farm of the station has spent 538.56 MJ for one ton (soil conditioner development project, 2012) and energy required to manufacture one Kg of nitrogen fertilizer ranged from 51 to 68 MJ (Baht *et al.*, 1994), consumed energy for operating irrigation systems has been calculated using water requirement, irrigation efficiency & irrigation pump discharge (Shelke, 2010) and that of energy from sun which supplied directly by the sun for creating the organic matter through photosynthesis process nourishing N-fixers for fixing nitrogen from air. To calculate this energy, it is assumed that the fixation of one Kg of nitrogen from air will require the same as figures of Baht *et al.*, 1994.

Thus, total consumed energy data given in Table 10 represent total energetic inputs of this study. Consumed energy value to operate DIS has been less than that of SIS due to the magnitude of irrigation efficiency of former comparing to that of latter. Consumed energy value necessitated for wheat crop has been less than that of peanut crop due to that the water requirement of former is already less than that of latter. Consumed energy of different fertilizers has been the same either under DIS or SIS.

Energy from sun as an invisible energetic input must be well discussed because it has certainly associated in building up plant tissue and consequently, crop yield. The listed values of this energy have shown: firstly, clear superiority for DIS effect comparing to that of SIS. This effect may be attributed to the average obtained N-recovery of former has been greater than that of latter. Secondly, the effect of different sub-treatments has widely varied and can be ranked for DIS as follows: UF, 120 > UF, 180 > urea > UF, 60 > compost and for SIS as follows: urea > UF, 180 > UF, 120 > UF, 60 > compost. This variation has been basically related to obtained yield of each treatment. Thirdly, regardless of N-fertilizer form, addition of compost in gradually increased rates has increased such energy values approximately in the same pattern. It is well-known

that the existence of organic matter could encourage plant growth and activate the fixation process (Gellings and Parmenter, 2004). To illustrate the importance of this energy as a clean energy trapped from sun, the percentage of this energy relative to total energy inputs has been calculated. These values have amounted 11.66% for DIS and 8.29% for SIS. Also, they have ranged from 7.59 to 15.47 % and from 7.19 to 8.97% for sub-treatments under DIS and SIS respectively. Hence, it could be deduced the positive effect of pursued management practices on this form of energy. On the other hand, the biological nitrogen fixation could help to ameliorate energy supply problems, offsetting some of energy used to plant production and make more efficient use for energy which would essentially reflect on global warming as an environmental vision and urgent need for energy as a survival vision.

To realize the effect of suggested management practices on energy consumption, energy consumption ability (ECA) has been calculated according to Abbady *et al.*, 2011. It represents the amount of energy consumed to produce one ton plant dry matter (materials and methods). The data presented in Table 10 show that ECA averaged value of DIS has been less than that of SIS i.e. DIS as an irrigation management has been more efficient in consuming energy to produce plant dry matter unit than SIS. Also under DIS, ECA value of UF fertilizer treatments (on average) has been 4378.27 MJ, the same figure for other treatments (compost and urea) has been 6671.2 MJ, then using UF- fertilizer has saved an energy amount of 2292.93 MJ comparing to others in relative reduction of 52.37%. Under SIS, however, an opposite direction has been seen, where the averaged value of such energy of UF-fertilizer treatment and others have amounted 5652.62 and 5411.1 MJ respectively with relative reduction of - 4.27% which would decisively clarify the complexity of soil management practices interference and also the conjugation of DIS with UF-fertilizer as SRNF has represented a successful management.

As for the different individual fertilization treatments, it could be ordered their effect on ECA values in the following rank: under DIS; UF, 120 < UF, 180 < urea < UF, 60 < compost and under SIS; compost < UF, 60 < UF, 180 < urea < UF, 120. It is observed that the effect of application of UF-fertilizer on energy saving have been more efficient under DIS than that under SIS due to the better performance of UF-fertilizer under DIS in dry matter production (two successive yields). Also regardless of N-form, it is observed that the addition of compost either under DIS or SIS has positively affected energy saving.

Table 10. Consumed Energy for Manufacturing Compost & N-Fertilizers, Operating Irrigation Systems, Total Energy, Energy from Sun, %Energy from Sun Calculated of Total Energy and Energy Consumption Ability

Irrigation (A)	Treatment		Consumed Energy (MJ fed ⁻¹)				Energy from sun MJ fed ⁻¹	%Energy from sun relative to total energy	Total increased dry matter Ton fed ⁻¹ Year ⁻¹	ECA MJton ⁻¹ Year ⁻¹	
	N-form kgfed ⁻¹ (B)	Compost ton fed ⁻¹ (C)	Compost ton fed ⁻¹	N-fert. kg fed ⁻¹	Irrigation system						total
					wheat	peanut					
Drip system	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		2.5	1346.4	0.0	3149.1	6298.9	10794.4	646.2	5.99	0.96	11244.2
		5.0	2692.8	0.0	3149.1	6298.9	12140.8	646.2	4.32	0.96	12646.7
		7.5	4039.2	0.0	3149.1	6298.9	13487.2	1681.5	12.47	3.63	3715.5
	Mean		2019.6	0.0			12140.8	991.3	7.59	1.85	9202.1
	Urea, 120+15	0.0	0.0	8032.5	3149.1	6298.9	17480.5	1245.9	7.13	3.07	5693.97
		2.5	1346.4	8032.5	3149.1	6298.9	18826.9	2034.9	10.81	5.01	3757.86
		5.0	2692.8	8032.5	3149.1	6298.9	20173.3	3230.9	16.02	6.1	3307.10
		7.5	4039.2	8032.5	3149.1	6298.9	21519.7	3612.8	16.79	5.66	3802.07
	Mean		2019.6	8032.5			19500.1	2531.1	12.69	4.96	4140.3
	UF, 60	0.0	0.0	3570	3149.1	6298.9	13018.0	628.3	4.83	1.53	8508.5
		2.5	1346.4	3570	3149.1	6298.9	14364.4	1021.6	7.11	1.95	7366.4
		5.0	2692.8	3570	3149.1	6298.9	15710.8	2059.9	13.11	3.85	4080.7
		7.5	4039.2	3570	3149.1	6298.9	17055.2	2534.7	14.86	4.8	3553.2
	Mean		2019.6	3570			15037.1	1561.1	9.98	3.04	5877.2
	UF, 120	0.0	0.0	7140	3149.1	6298.9	16588.0	1820.7	10.98	2.55	6505.1
		2.5	1346.4	7140	3149.1	6298.9	17934.4	2499.0	13.93	5.01	3579.7
		5.0	2692.8	7140	3149.1	6298.9	19280.8	3416.5	17.72	6.22	3099.8
		7.5	4039.2	7140	3149.1	6298.9	20627.2	3969.8	19.25	5.78	3568.7
	Mean		2019.6	7140			18607.6	2926.5	15.47	4.89	3413.4
	UF, 180	0.0	0.0	10710	3149.1	6298.9	20156.0	1842.1	9.14	4.67	4316.1
		2.5	1346.4	10710	3149.1	6298.9	21504.4	2345.5	10.91	5.64	3812.8
		5.0	2692.8	10710	3149.1	6298.9	22850.8	3477.2	15.22	6.87	3326.2
		7.5	4039.2	10710	3149.1	6298.9	24197.2	3637.8	15.03	6.17	3921.8
	Mean		2019.6	10710			22177.1	2825.7	12.58	5.84	3844.2
	Mean		2019.6	5890.5			17492.5	2167.14	11.66	4.12	5295.44
	Sprinkler system	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			2.5	1346.4	0.0	3988.3	7978.6	13313.3	812.77	6.11	2.50
5.0			2692.8	0.0	3988.3	7978.6	14659.7	1400.04	9.55	2.94	4986.3
7.5			4039.2	0.0	3988.3	7978.6	16006.1	1729.66	10.81	4.70	3405.6
Mean			2019.6	0.0			14659.7	1314.15	8.82	3.38	4572.4
Urea, 120+15		0.0	0.0	8032.5	3988.3	7978.6	19999.4	838.95	4.2	2.36	8474.3
		2.5	1346.4	8032.5	3988.3	7978.6	18345.8	1556.5	8.48	3.93	4668.1
		5.0	2692.8	8032.5	3988.3	7978.6	22692.2	2431.2	10.71	3.26	6960.8
		7.5	4039.2	8032.5	3988.3	7978.6	24038.6	2652.5	11.30	4.91	4895.8
Mean			2019.6	8032.5			21269.0	1869.8	8.67	3.615	6249.8
UF, 60		0.0	0.0	3570	3988.3	7978.6	15536.9	771.1	4.96	2.15	7226.5
		2.5	1346.4	3570	3988.3	7978.6	16883.3	1270.9	7.53	3.26	5178.9
		5.0	2692.8	3570	3988.3	7978.6	18229.7	1742.2	9.56	4.19	4350.8
		7.5	4039.2	3570	3988.3	7978.6	19576.1	2702.5	13.81	5.68	3446.5
Mean			2019.6	3570			17556.5	1621.7	8.97	3.82	5050.7
UF, 120		0.0	0.0	7140	3988.3	7978.6	19106.9	999.6	5.23	2.23	8568.1
		2.5	1346.4	7140	3988.3	7978.6	20453.3	1292.3	6.32	3.07	6662.3
		5.0	2692.8	7140	3988.3	7978.6	21799.7	1606.5	7.37	3.86	5647.6
		7.5	4039.2	7140	3988.3	7978.6	23146.1	2823.9	12.20	5.30	4367.2
Mean			2019.6	7140			21126.5	1680.7	7.78	4.94	6311.3
UF, 180		0.0	0.0	10710	3988.3	7978.6	22686.9	592.0	2.61	3.18	7134.3
		2.5	1346.4	10710	3988.3	7978.6	24023.3	1367.9	5.69	3.97	6051.2
		5.0	2692.8	10710	3988.3	7978.6	25369.7	3120.8	12.3	5.07	5003.9
		7.5	4039.2	10710	3988.3	7978.6	26716.1	2174.7	8.14	6.37	4194.1
Mean			2019.6	10710			24699.0	1813.9	7.19	4.65	5311.61
Mean			2019.6	5890.5			19862.1	1660.05	8.29	4.08	5499.16

Energy of N-fertilizer fed⁻¹ = N-rate fed⁻¹ x energy required to manufacture 1 kg of N-fertilizer (59.5MJ)

Energy of compost fed⁻¹ = compost in ton fed⁻¹ x 538.56 MJ

Energy from sun fed⁻¹ = N-fixed from air fed⁻¹ x energy required to manufacture 1 kg of N-fertilizer (59.5MJ)

Energy consumption ability (ECA) = total consumed energy, MJ fed⁻¹ / yield increased, ton.fed⁻¹

To discuss consumed energy cost and CO₂ emissions quantity, the energy in MJ form (Table 10) has been calculated in an equivalent diesel fuel form as shown in Table 11, where Goering, 1989 demonstrated that a liter of diesel fuel has an energy content of about 37.4 MJ and U.S. Environmental Protection Agency, 2005 stated that carbon coefficient for one liter of diesel fuel amount is 2.67 Kg CO₂. Hence, the data show that the averaged quantities of diesel fuel as a consumed energy have ranged from 467.7 under DIS to 531.05 liter fed⁻¹ year⁻¹ under SIS respectively, with cost of 514.47 and 584.16 EGP fed⁻¹ year⁻¹ (price of diesel fuel liter in Egypt = 1.1 EGP). Such quantities of diesel fuel represent 2.94 and 3.34 American barrel fed⁻¹ year⁻¹ respectively (American barrel = 158.984 Liters).

Also, such energy values and its cost have been affected by the sub-treatments which can be ordered as follows: UF, 180 > UF, 120 > urea > UF, 60 > compost either under DIS or SIS due to the increasingly used N-rates. However, it would be mentioned that the rates of UF-fertilizer suggested to fertilize wheat and peanut cropping sequence have been added as a one addition whereas N-fertilization for peanut in urea treatment has depended on the biological N-fertilizer.

To produce such amounts of energy, the emitted-CO₂ values as a result of combustion this fuel (Table 11) have amounted 1248.79 Kg CO₂ fed⁻¹ year⁻¹ for DIS and 1417.87 Kg CO₂ fed⁻¹ year⁻¹ for SIS, in other expression 340.58 Kg carbon fed⁻¹ year⁻¹ for former and 386.69 Kg carbon fed⁻¹ year⁻¹ for latter. They have also ranged for sub-treatments from 866.68 to 1583.13 Kg CO₂ fed⁻¹ year⁻¹ under DIS and from 1046.61 to 1763.00 Kg CO₂ fed⁻¹ year⁻¹ under SIS. These values in carbon form have ranged from 236.37 to 431.76 Kg carbon fed⁻¹ year⁻¹ for former and from 285.44 to 488.82 Kg carbon fed⁻¹ year⁻¹ for latter. Examination of above data provides that using DIS comparing to SIS has saved 169.08 Kg CO₂ fed⁻¹ year⁻¹, i. e. 46.11 Kg carbon fed⁻¹ year⁻¹, with relative reduction of 13.55%.

As regards the effect of sub-treatments, the results have illustrated that the emitted-CO₂ gas quantity related to compost has been less than those of other treatments either under DIS or SIS. The emitted-CO₂ quantity belonging to other treatment has increased with increasing their rates.

As for the energy from sun as a diesel fuel form, the values of this energy have amounted 57.8 and 45.43 liter fed⁻¹ season⁻¹ under DIS and SIS respectively. Also for sub-treatments, they have

ranged from 16.8 to 106.1 liter fed⁻¹ season⁻¹ under DIS and from 15.8 to 83.4 liter fed⁻¹ season⁻¹ under SIS respectively. Their cost has been 63.6 and 48.24 EGP fed⁻¹ season⁻¹ under DIS and SIS respectively. Also, it has ranged from 29.15 to 86.08 EGP fed⁻¹ season⁻¹ for sub-treatments under DIS and from 33.47 to 63.91 EGP fed⁻¹ season⁻¹ under SIS. However this cost will not be paid because such energy as mentioned before has directly trapped from sun. Addition to the unpaid-cost, the most important point in this respect is CO₂ emissions which have been already avoided to release and emit to the atmosphere. Data given in Table 11 also have illustrated that the values of avoided-CO₂ has amounted 154.33 Kg CO₂ fed⁻¹ season⁻¹ under DIS and 117.21 Kg CO₂ fed⁻¹ season⁻¹ under SIS. Also they have ranged from 70.76 to 208.97 Kg CO₂ fed⁻¹ season⁻¹ for sub-treatments under DIS and from 109.38 to 133.41 Kg CO₂ fed⁻¹ season⁻¹ for sub-treatments under SIS. Thus, the use of biologically fixed nitrogen as a partial alternative to chemical N-fertilizer could have great potential for limiting CO₂ emissions and consequently for mitigating global warming.

ECA values as a diesel fuel form presented in Table 11 have amounted 145.73 liter ton⁻¹ year⁻¹ under DIS and 148.56 liter ton⁻¹ year⁻¹ under SIS with cost 159.64 EGP ton⁻¹ for former and 163.39 EGP ton⁻¹ for latter respectively. Also ECA values have ranged from 102.77 to 246.03 liter ton⁻¹ year⁻¹ for sub-treatments under DIS and from 122.26 to 168.75 liter ton⁻¹ year⁻¹ for sub-treatments under SIS. Their costs have ranged from 113.06 to 267.33 EGP ton⁻¹ year⁻¹ (on average), for sub-treatments under DIS and from 134.48 to 185.62 EGP ton⁻¹ (on average) under SIS respectively.

From the same Table, it is noticed that the emitted CO₂ values to produce one ton of plant dry matter have amounted 389.10 Kg CO₂ ton⁻¹ year⁻¹ under DIS and 396.64 Kg CO₂ ton⁻¹ year⁻¹ under SIS. Also they have ranged from 274.43 to 656.93 Kg CO₂ ton⁻¹ year⁻¹ for sub-treatments under DIS and from 326.43 to 446.18 Kg CO₂ ton⁻¹ year⁻¹ for sub-treatments under SIS. These results have illustrated that the application of UF-fertilizer for N-fertilization and DIS for irrigation have been the most efficient management practices comparing to other treatments. The importance of this estimation lies in an economy of cropping productivity in relation to those of CO₂ emissions as a major cause to global warming and which need further studies.

Table 11. Total Consumed Energy & Energy from Sun (liter fed⁻¹) & ECA (liter ton⁻¹ yield) as a Diesel Fuel Form, Emitted CO₂ Kg.ton⁻¹ yield, Emittted & Avoided CO₂ in Kg and Energy Cost, in EGP fed⁻¹ or ton⁻¹

Irrigation (A)	Treatment		Total consumed Energy			Energy from sun			ECA(liter. ton ⁻¹ yield)		
	N-form Kg.fed ⁻¹ (B)	Compost Ton Fed ⁻¹ (C)	Diesel fuel Liter. fed ⁻¹	Emitted CO ₂ Kg. fed ⁻¹	Cost EGP. Liter fed ⁻¹	Diesel fuel Liter fed ⁻¹ Season ⁻¹	Avoided CO ₂ Kg.fed ⁻¹ Season ⁻¹	Avoided Cost EGP fed ⁻¹ Season ⁻¹	Diesel fuel Liter fed ⁻¹ year ⁻¹	Emitted CO ₂ Kg. fed ⁻¹ year ⁻¹	Cost EGP ton ⁻¹ year ⁻¹
Drip system	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.5	288.6	770.56	317.46	17.3	46.19	19.03	300.66	802.60	330.66
		5.0	324.6	866.68	357.06	17.3	46.19	19.03	338.15	902.91	371.96
		7.5	360.6	962.80	396.66	44.9	119.88	49.39	99.35	265.26	99.35
	Mean		324.6	866.68	357.06	26.5	70.76	29.15	246.03	656.93	267.33
	Urea, 120+15	0.0	467.4	1247.96	514.14	33.3	88.91	36.63	152.25	406.51	167.47
		2.5	503.4	1344.08	553.74	54.4	145.25	59.84	100.48	268.28	110.52
		5.0	539.4	1440.19	593.34	83.4	222.68	91.74	88.42	236.08	97.26
		7.5	575.4	1536.32	632.94	96.6	257.92	106.26	101.66	271.43	111.82
	Mean		521.4	1392.14	573.54	66.9	178.62	73.61	110.71	295.58	121.77
	UF, 60	0.0	348.1	929.43	382.91	16.8	44.86	18.48	227.5	607.43	250.25
		2.5	384.1	1025.55	422.51	27.3	72.89	30.03	196.96	525.88	216.65
		5.0	420.1	1121.67	462.11	55.1	147.12	61.05	109.11	291.29	120.02
		7.5	456.0	1217.52	501.6	67.8	181.03	74.58	95.00	253.65	104.5
	Mean		402.1	1073.54	442.3	41.8	111.52	46.04	157.14	419.56	172.86
	UF, 120	0.0	443.6	1184.41	487.9	48.7	130.03	53.57	173.93	464.39	191.32
		2.5	479.6	1280.53	527.6	66.8	178.36	73.48	95.71	255.55	105.28
		5.0	515.5	1376.39	567.1	91.4	244.04	100.54	82.88	221.28	91.16
		7.5	551.5	1472.51	606.7	106.1	283.29	116.71	95.41	254.74	104.95
	Mean		497.5	1328.46	547.3	78.3	208.97	86.08	111.98	298.99	123.18
	UF, 180	0.0	538.9	1438.86	592.8	49.3	131.63	54.23	115.40	308.12	126.94
		2.5	574.9	1534.98	632.4	62.7	167.41	68.97	101.94	272.18	112.13
		5.0	610.9	1631.10	672.0	93.0	248.31	102.3	88.94	237.47	97.83
		7.5	647.0	1727.49	711.7	97.3	259.79	107.03	104.86	279.98	115.34
Mean		592.9	1583.13	652.3	75.6	201.76	83.13	102.77	274.43	113.06	
Mean		467.7	1248.79	514.5	57.8	154.33	63.60	145.73	389.10	160.09	
Sprinkler system	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.5	356.0	950.52	391.6	21.73	58.02	23.90	142.39	380.18	156.62
		5.0	392.0	1046.64	431.2	37.43	99.94	41.17	133.33	355.99	146.66
		7.5	427.97	1142.68	470.77	46.25	123.49	50.88	91.06	243.13	100.16
	Mean		391.99	1046.61	431.19	35.14	93.82	38.65	122.26	326.43	134.48
	Urea, 120+15	0.0	534.7	1427.65	588.2	22.4	59.81	24.64	226.59	604.99	249.24
		2.5	490.5	1309.64	539.6	41.6	111.07	45.76	124.82	333.26	137.30
		5.0	606.7	1619.88	667.4	65.0	173.55	71.5	186.12	496.96	204.73
		7.5	642.7	1716.01	706.9	70.9	189.30	77.99	130.90	349.50	143.99
	Mean		568.65	1518.29	625.5	50.0	133.41	54.97	167.11	446.18	183.82
	UF, 60	0.0	415.43	1109.20	456.97	41.2	110.00	45.32	193.22	515.89	212.3
		2.5	451.4	1205.24	496.5	33.9	90.51	37.29	138.47	369.71	152.31
		5.0	487.4	1301.36	536.1	46.6	124.42	51.26	116.33	310.60	127.96
		7.5	523.4	1397.48	575.7	72.3	193.04	79.53	92.15	246.04	101.36
	Mean		469.41	1253.32	516.32	48.5	129.49	33.47	135.04	360.56	148.48
	UF, 120	0.0	510.9	1364.10	561.9	26.7	71.28	32.31	229.09	611.67	251.99
		2.5	546.9	1460.22	601.5	34.6	92.38	38.06	178.14	475.63	195.95
		5.0	582.9	1556.34	641.2	43.0	114.81	47.30	151.01	403.19	166.11
		7.5	618.8	1652.19	680.7	75.5	201.59	83.05	116.77	311.78	128.44
	Mean		564.8	1508.19	621.3	45.0	119.97	50.18	168.75	450.56	185.62
	UF, 180	0.0	606.6	1619.62	667.3	15.8	42.19	17.38	190.76	509.32	209.83
		2.5	642.3	1714.94	706.5	36.6	97.72	40.26	161.80	432.01	177.98
		5.0	678.3	1811.06	746.1	83.4	222.5	91.74	133.79	357.22	147.16
		7.5	714.3	1907.18	785.7	58.1	155.13	63.91	112.14	299.41	123.35
Mean		660.4	1763.00	726.2	48.5	129.38	63.91	149.62	399.49	164.58	
Mean		531.05	1417.87	584.10	45.43	121.21	48.24	148.56	396.64	163.39	

Energy content of a diesel fuel liter⁻¹ = 37.4 M J.Carbon coefficient of one liter diesel fuel = 2.67Kg CO₂Energy in diesel fuel form (lite fed⁻¹) = energy fed⁻¹ in MJ/37.4Emitted or avoided CO₂ Kg fed⁻¹ = Energy in diesel fuel (lite fed⁻¹) x 2.67

3.6. Economic evaluation

To estimate economic response of the two successive cropping yields to suggested management practices, the net return and investment factor (materials and methods) have been employed. The agricultural inputs and outputs have presented in tables 12 and 13. They have been as follows:

(i) Inputs have included costs of irrigation systems application, N-fertilizers and compost:

1-The cost of both drip and sprinkler irrigation systems have been assumed to be the cost of energy required to operate the two systems which being 277.88 EGP for drip system and 351.97 EGP for sprinkler system.

2-the cost of N-fertilizers have included the price of one ton of urea (1800 EGP) and the price of one ton of ureaform (3000 EGP).

3- The cost of compost has represented the price of one ton which being 220 EGP.

The costs of other agriculture operations have not been included because they have been similarly carried out for all treatments and their cost have been the same.

(ii) Outputs have included the price of both wheat and peanut yield which being as follows:

Price of one ton of wheat grain = 2668 EGP (based on the price of one ardab= 400 EGP)

Price of one ton of wheat straw = 100 EGP

Price of one ton of peanut seeds = 5000 EGP

Price of one ton of peanut straw = 50 EGP

Data in table 12 show that the gross return value of DIS has been greater than that of SIS. Gross return value of UF treatments (on average) has been greater than other treatments either under DIS or SIS. Data in table 13 reveal that the cost of application of DIS has been less than that of SIS. The net return (NR) and investment factor (IF) of DIS has been much more than that of SIS i.e. application of DIS has been more profitability than that of SIS. This may be attributed to the positive effect of DIS on crop productivity and its higher water consumption efficiency

NR of the treatments under DIS has taken the following rank: UF, 120 > UF, 180 > urea > UF, 60 > compost. Under SIS, the rank has been: urea > compost > UF, 180 > UF, 60 > UF, 120. The observed results regarding former rank could be referred to the best agronomic performance of UF under DIS in spite of its higher cost. As for latter rank, urea treatment has headed the rank, this effect has attributed to its lower cost matching its higher yield comparing with other treatments under SIS. Examination of NR and IF results of all treatments given in table 13 has shown that the urea & UF, 120 treatments under DIS and urea & UF, 60 under SIS could be chosen as the most profitable treatments.

To determine the optimum economic UF-treatment, Fig 1 show that UF- rate of 120 Kg N fed⁻¹ under DIS has been the optimum rate because of it has met the highest IF (4, 71) and even the best one comparing to all rest treatments (Table 13). Under SIS, the UF, 60 treatment has had highest profitability (highest IF) in spite of the lowering NR (FAO, 2000). This could emphasize that the interferences of different elements of soil management have affected each other.

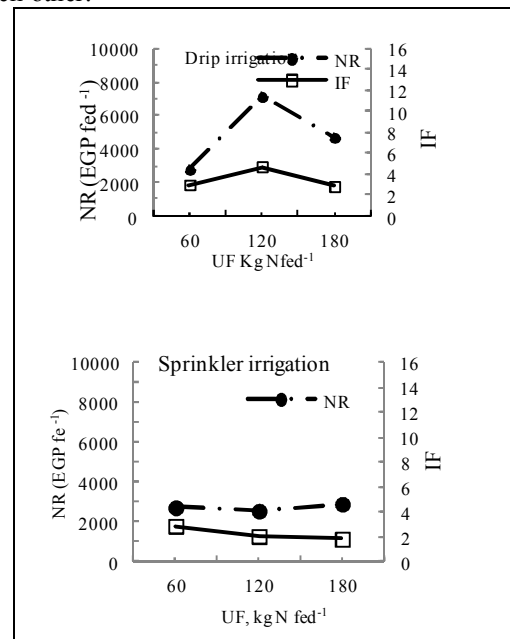


Fig.1 Effect of UF-fertilizer application under drip and sprinkler irrigation systems on NR and IF

To discuss the economic role of compost application

(i) Under DIS, Fig. 2 illustrates that using the compost alone has been unprofitable. However, with increasing the added rates, it has implemented some profitability. Also, with increasing the added rate for every treatment, the NR and IF values have been mostly increased up to the rate of 5 ton fed⁻¹. Such values have been declined at rate of 7.5 ton fed⁻¹ for all treatments, i.e. its addition has not been feasible due to its additional cost to the different treatments. Hence, the economic optimum rate of compost has been 5 ton fed⁻¹. (ii) Under SIS, Fig.3 shows that increasing NR and IF values has generally matched the increasing compost levels. They have only recorded higher values with compost alone treatment. In other treatments, no clear trend to select economic optimum compost rate has been observed. However, 5 or 7.5 ton fed⁻¹ rates may be rational. In general, the profitability (IF) under this system has mostly been low, where its averaged value has been less than 3 (FAO, 2000). Also, this profitability has been lower than that of drip irrigation system.

Table 12. Yield Increase (Ton fed⁻¹) and Gross Return (EGP fed⁻¹) of Wheat and Peanut Crops as Affected by Different Treatments

treatments			Wheat				peanut				gross return EGPfed ⁻¹	
Irrigation	N-form Kg fed ⁻¹	Compost Ton fed ⁻¹	yield increase Ton fed ⁻¹		Return EGP fed ⁻¹		yield increase Ton fed ⁻¹		Return EGP fed ⁻¹			
			grain	straw	grain	straw	seeds	straw	seeds	straw		
Drip system	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		2.5	0.13	0.25	346.67	25.0	0.07	0.51	350	25.5	747.17	
		5.0	0.36	0.39	960.48	39.0	0.37	0.60	1850	30.0	2879.5	
		7.5	0.59	1.67	1574.1	167.0	0.37	1.00	1850	50.0	3641.1	
	Mean		0.36	0.77	960.42	77	0.30	0.70	1350	36.17	2422.6	
	Urea 120+15	0.0	0.36	1.27	960.48	127	0.31	1.13	1550	56.5	2693.98	
		2.5	0.6	2.27	1600.8	227.0	0.54	1.60	2700	80.0	4607.8	
		5.0	0.96	2.47	2561.3	247.0	0.99	1.68	4950	84.0	7842.3	
		7.5	0.81	1.91	2161.1	191	1.05	1.89	5250	94.5	7696.6	
	Mean		0.79	1.98	1820.9	198	0.72	1.58	3612.5	78.75	5710.17	
	UF, 60	0.0	0.0	0.93	0.0	93.0	0.58	0.36	2900	18.0	3011	
		2.5	0.3	1.13	800.4	113.0	0.44	0.63	2200	31.5	3144.9	
		5.0	0.56	1.5	1494.1	150.0	0.67	1.12	3350	56.0	5050.1	
		7.5	0.67	1.84	1787.6	184.0	0.82	1.47	4100	73.5	6145.1	
	Mean		0.38	1.35	1020.5	112.5	0.63	1.34	2950	44.75	4337.8	
	UF, 120	0.0	0.62	0.84	1654.2	84.0	0.87	0.68	4350	34.0	6122.2	
		2.5	1.29	2.05	3441.7	205.0	1.05	1.08	5250	54.0	8950.7	
		5.0	1.43	2.15	3815.2	215.0	1.12	1.98	5600	99.0	9729.2	
		7.5	1.08	0.84	2881.5	84.0	1.75	2.41	8750	120.5	11836	
	Mean		1.11	1.42	2948.2	147	1.27	1.54	5987.5	76.88	9159.53	
	UF, 180	0.0	0.78	0.81	2081.0	81.0	0.51	1.94	2550	97.0	4809.0	
		2.5	0.97	1.81	2587.9	181.0	0.74	2.12	3700	106.0	6574.9	
		5.0	1.24	2.39	3308.3	239.0	0.94	2.30	4700	115.0	8353.3	
		7.5	0.75	2.08	2001.0	208.0	1.02	2.32	5100	116.0	7425.0	
	Mean		0.94	1.9	2494.6	177.3	0.80	2.17	4012.5	108.5	6790.6	
	Mean		0.72	1.64	1944.9	142.3	0.74	1.47	3582.4	69.01	5684.14	
	Sprinkler system	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			2.5	0.02	0.68	53.36	68.0	0.77	0.50	3850	25.0	3996.36
5.0			0.03	0.94	80.04	94.0	1.0	1.24	5000	62.0	5236.04	
7.5			1.05	0.99	2801.4	99.0	1.05	1.61	5250	80.5	8230.9	
Mean			0.37	1.1	978.27	87.0	0.94	1.12	4700	55.83	4365.83	
Urea 120+15		0.0	0.21	0.96	560.28	96.0	0.60	0.59	3000	29.5	3685.78	
		2.5	0.39	1.16	1040.5	116.0	0.69	1.69	3450	84.5	4691.0	
		5.0	0.50	1.17	1334.0	117.0	0.98	2.34	4900	117.0	6468.0	
		7.5	0.23	1.21	613.64	121.0	1.06	2.41	5300	120.5	6768.8	
Mean			0.46	1.13	887.11	112.5	0.83	1.76	4162.5	87.88	5403.39	
UF, 60		0.0	0.30	0.65	800.4	65.0	0.4	0.8	2000	40.0	2905.0	
		2.5	0.41	0.66	1093.9	66.0	0.53	1.66	2650	83.0	3892.9	
		5.0	0.43	0.75	1147.2	75.0	0.65	2.41	3250	120.5	4592.7	
		7.5	0.53	1.40	1414.0	140.0	1.11	2.64	5550	132.0	7236.0	
Mean			0.42	0.87	1113.9	86.5	0.67	1.88	3362.5	93.88	4656.65	
UF, 120		0.0	0.0	0.64	0.0	64.0	0.50	1.81	2500	90.5	2654.5	
		2.5	0.41	0.81	1093.9	81.0	0.52	1.25	2600	62.5	3837.4	
		5.0	0.47	0.96	1253.9	96.0	0.67	1.76	3350	88.0	4787.9	
		7.5	0.36	0.82	960.48	82.0	1.2	2.92	6000	146.0	7188.48	
Mean			0.25	0.81	827.07	80.8	0.72	1.94	3612.5	96.75	4617.07	
UF, 180		0.0	0.35	1.16	933.8	116.0	0.54	1.13	1749.6	56.5	2857.1	
		2.5	0.47	1.24	1253.9	124.0	0.67	1.59	3350.0	79.5	4807.4	
		5.0	0.65	1.39	1734.2	139.0	1.1	1.93	5500.0	96.5	7469.7	
		7.5	0.53	1.17	1414.0	117.0	1.35	3.32	6750.0	166.0	7177.0	
Mean			0.50	1.24	1333.9	124.0	0.92	1.99	4337.4	99.63	5577.6	
Mean			0.4	1.29	1028.1	98.06	0.82	1.74	4034.9	86.79	4924.11	

Table 13. Economic Evaluation of Wheat and Peanut Crops as Affected by Different Treatments

treatments			Fertilizers cost EGP fed ⁻¹		Irrigation cost EGP fed ⁻¹	Total cost EGP fed ⁻¹	Gross return EGP fed ⁻¹	Net return EGP fed ⁻¹	Invest- ment factor
Irrigation	N-form Kg fed ⁻¹	Compost Ton fed ⁻¹	N-kg Fed ⁻¹	Compost ton fed ⁻¹					
					Drip system	0.0	0.0	0.0	0.0
2.5	0.0	550.0	277.882	827.88			747.17	-80.71	0.90
5.0	0.0	1100.0	277.882	1377.8			2879.5	1501.7	2.09
7.5	0.0	1650.0	277.882	1927.8			3641.1	1713.3	1.89
Mean						1377.8	2422.6	1044.76	1.63
Urea 120+15	0.0	522.6	0.0	277.882		800.48	2693.98	1893.5	3.67
	2.5	522.6	550.0	277.882		1350.5	4607.8	3257.3	3.41
	5.0	522.6	1100.0	277.882		1900.5	7842.3	5941.8	4.13
	7.5	522.6	1650.0	277.882		2450.5	7696.6	4041.3	3.14
Mean						1625.5	5710.17	3783.5	3.58
UF, 60	0.0	450	0.0	277.882		727.88	3011.0	2283.12	4.14
	2.5	450	550.0	277.882		1277.8	3144.9	1867.1	2.46
	5.0	450	1100.0	277.882		1827.8	5050.1	3222.3	2.76
	7.5	450	1650.0	277.882		2377.8	6145.1	3767.3	2.58
Mean						1552.8	4337.8	2784.9	2.98
UF, 120	0.0	900	0.0	277.882		1177.8	6122.2	4944.4	5.2
	2.5	900	550.0	277.882		1727.8	8950.7	7222.9	5.18
	5.0	900	1100.0	277.882		2277.8	9729.2	7451.4	4.27
	7.5	900	1650.0	277.882		2827.8	11836	9008.2	4.19
Mean						2002.8	9159.53	7156.73	4.71
UF, 180	0.0	1350	0.0	277.882		1627.8	4809.0	3181.2	2.95
	2.5	1350	550.0	277.882		2177.8	6574.9	4397.1	3.02
	5.0	1350	1100.0	277.882		2727.8	8353.3	5625.5	3.06
	7.5	1350	1650.0	277.882		3277.8	7425.0	5625.5	2.27
Mean					2452.8	6790.6	4707.3	2.83	
Mean						1802.3	5684.14	3895.43	3.15
Sprinkler system	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.5	0.0	550.0	351.97	901.97	3996.36	3094.39	4.43
		5.0	0.0	1100.0	351.97	1451.9	5236.04	3784.14	3.6
		7.5	0.0	1650.0	351.97	2001.9	8230.9	6229.0	4.11
	Mean					1451.9	4365.83	2913.93	3.01
	Urea 120+15	0.0	522.6	0.0	351.97	874.57	3685.78	2811.21	4.21
		2.5	522.6	550.0	351.97	1423.9	4691.0	3267.10	3.29
		5.0	522.6	1100.0	351.97	1974.5	6468.0	4493.5	3.28
		7.5	522.6	1650.0	351.97	2524.5	6768.8	4244.3	2.68
	Mean					1699.4	5403.39	3703.995	3.37
	UF, 60	0.0	450	0.0	351.97	801.97	2905.0	2103.03	3.62
		2.5	450	550.0	351.97	1351.9	3892.9	2541.00	2.88
		5.0	450	1100.0	351.97	1901.9	4592.7	2690.80	2.42
		7.5	450	1650.0	351.97	2451.9	7236.0	3514.1	2.43
	Mean					1626.9	4656.65	2712.23	2.86
	UF, 120	0.0	900	0.0	351.97	1251.9	2654.5	1402.6	1.47
		2.5	900	550.0	351.97	1801.9	3837.4	2035.5	2.13
		5.0	900	1100.0	351.97	2351.9	4787.9	2436.00	2.04
		7.5	900	1650.0	351.97	2901.9	7188.48	4286.58	2.48
	Mean					2076.9	4617.07	2540.17	2.03
	UF, 180	0.0	1350	0.0	351.97	1701.9	2857.1	1155.2	1.68
		2.5	1350	550.0	351.97	2901.9	4807.4	1905.5	1.66
		5.0	1350	1100.0	351.97	2801.9	7469.7	4667.8	2.67
		7.5	1350	1650.0	351.97	3351.9	7177.0	3825.1	1.14
Mean					2689.4	5577.6	2888.40	1.79	
Mean						2383.8	4924.11	2540.31	2.07

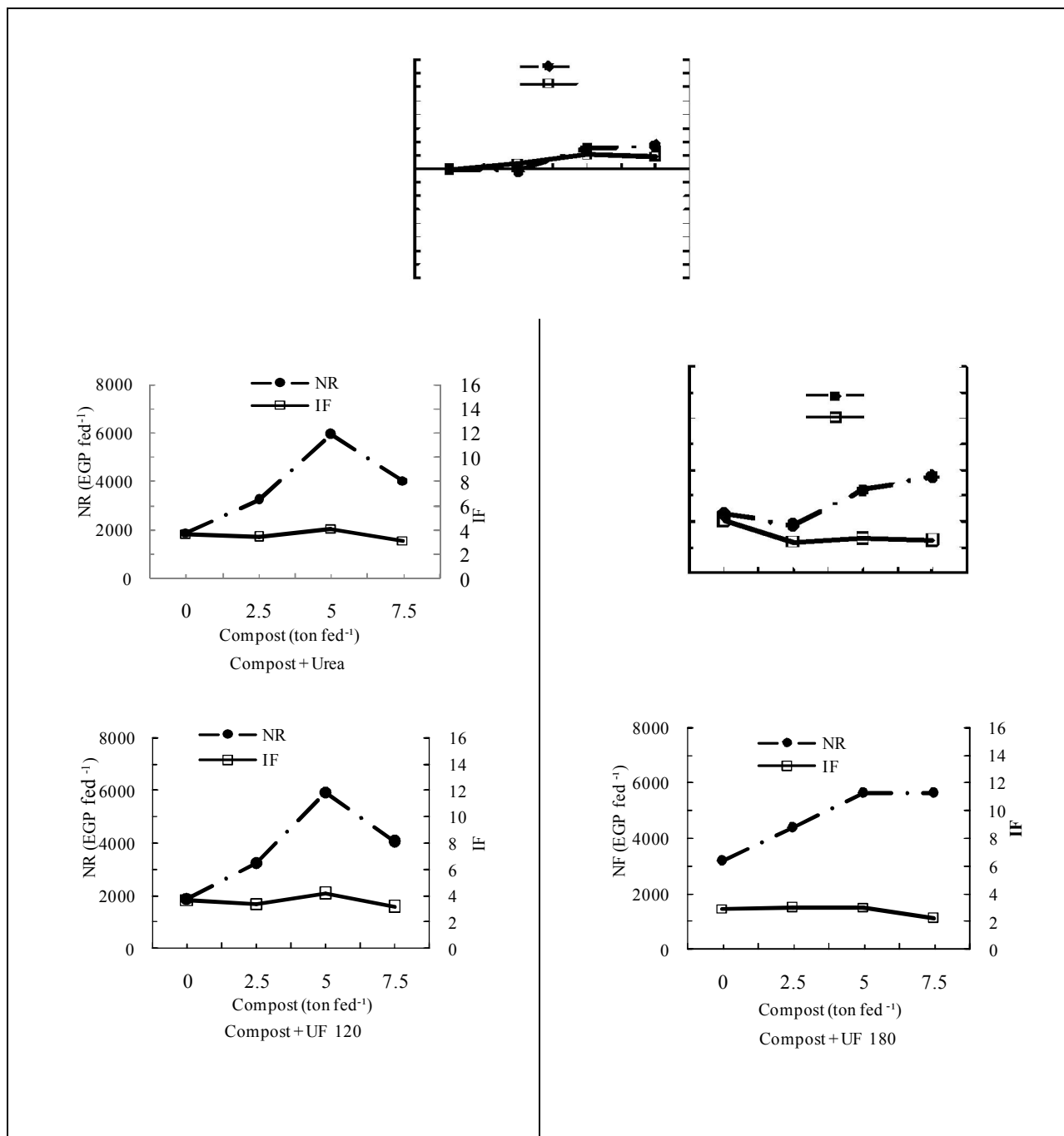


Fig.2 Effect of conjugation of compost and N-fertilizers application under drip irrigation system on NR and IF

Although the actual cost of avoided CO₂ depending on N-fixing process (N-fixed has not had any cost) in this experiment has been estimated at nothing (0.0 EGP fed⁻¹), it could be considered another new income source (Table 14) adding to the traditional primary net return where the policies makers in international agricultural and environmental organizations around the world have legislated some rules to sold the carbon reduction owing to pursuing the sustainable agricultural practices. For example, U.S. Agricultural Sector has offered monetary incentives to farmers adopting management practices which lead to reduce the emitted carbon dioxide (Jan *et al.*, 2004).

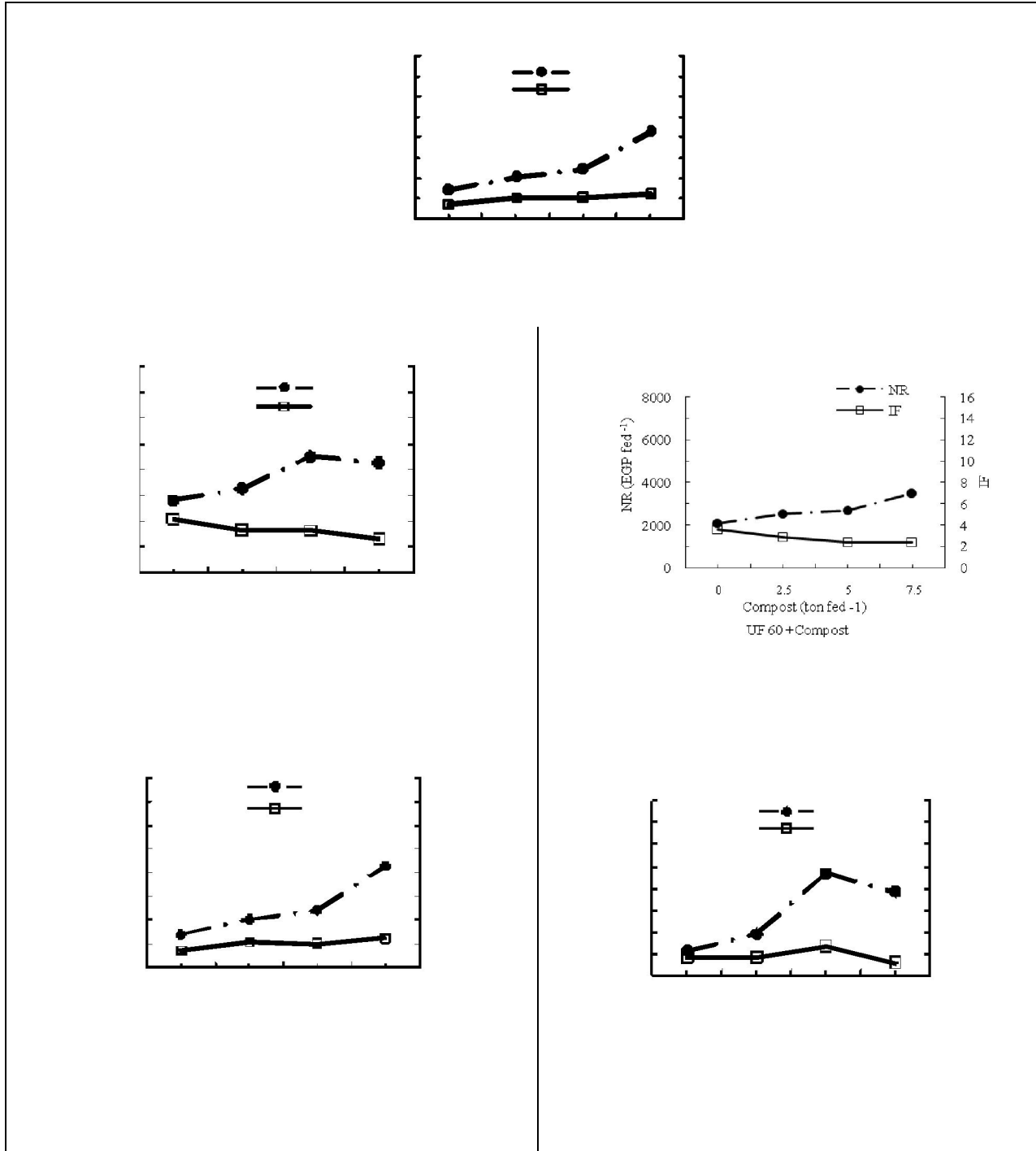


Fig.3 Effect of conjugation of compost and N-fertilizers application under sprinkler irrigation system on NR and IF

On the basis of European Union policy to combat climate change and reducing greenhouse gas emissions, Emissions Trading System of European Commission through its cap and trade schemes (www.CO2prices.eu) has put a price on carbon emissions reduction of € 20 for 1 ton CO₂. Using such price to evaluate the avoided CO₂ economy in this study, it is found that the revenue of the avoided-CO₂ by using N-fixers (Table 14) has ranged from 24.42 to 19.19 EGP fed⁻¹ season⁻¹ under DIS and SIS respectively, in relative increase profit has ranged from 1.19 to 0.64% for DIS and SIS respectively. For sub-treatments, it has ranged from 7.31 to 44.83 EGP fed⁻¹ season⁻¹ under DIS while under SIS, it has ranged from 6.68 to 31.90 EGP fed⁻¹ season⁻¹ respectively. The % net return increase values have ranged from 0.06 to 9.08% under DIS and from 0.31 to 0.87% under SIS. Overall, it is importance to observe that the combination among DIS, biological N-fertilizer and UF-fertilizer as management practices has given the higher revenue which would primarily refer to their better effectiveness on yield productivity.

Table 14 Net Return, Avoided CO₂ Emissions, Revenue of Avoided CO₂ Emissions, Total net Return and % Net Return Increase

irrigation	treatments		Net return EGP fed ⁻¹	Avoided CO ₂ Kg.fed ⁻¹ season ⁻¹	revenue of Avoided CO ₂ EGP fed ⁻¹ season ⁻¹	Total net return EGP fed ⁻¹	% net return increase	
	N-form Kg fed ⁻¹	Compost Ton fed ⁻¹						
Drip system	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		2.5	-80.71	46.19	7.31	-73.4	9.08	
		5.0	1501.7	46.19	7.31	1509.01	0.49	
		7.5	1713.3	119.88	18.97	1732.27	1.11	
	Mean		1044.76	70.76	11.20	1055.96	3.56	
	Urea, 120+15	0.0	1893.5	88.91	14.07	1907.57	0.74	
		2.5	3257.3	145.25	22.99	3280.28	0.71	
		5.0	5941.8	222.68	35.24	5977.03	0.06	
		7.5	4041.3	257.92	40.82	4082.10	1.01	
	Mean		3783.5	178.62	28.28	3811.75	0.63	
	UF, 60	0.0	2283.12	44.86	7.10	2290.22	0.31	
		2.5	1867.1	72.89	11.54	1878.64	0.62	
		5.0	3222.3	147.12	23.28	3245.57	0.72	
		7.5	3767.3	181.03	28.65	3795.94	0.76	
	Mean		2784.9	111.52	17.64	2802.59	0.62	
	UF, 120	0.0	4944.4	130.03	20.58	4964.97	0.42	
		2.5	7222.9	178.36	28.23	7251.12	0.39	
		5.0	7451.4	244.04	38.62	7490.01	0.52	
		7.5	9008.2	283.29	44.83	9053.02	0.50	
	Mean		7156.73	208.97	33.07	7189.78	0.46	
	UF, 180	0.0	3181.2	131.63	20.83	3202.02	0.66	
		2.5	4397.1	167.41	26.49	4423.59	0.60	
		5.0	5625.5	248.31	39.30	5664.78	0.70	
		7.5	5625.5	259.79	41.11	5666.61	0.73	
	Mean		4707.3	201.76	31.93	4739.25	0.67	
	Mean		3895.43	154.33	24.42	3920.71	1.19	
	Sprinkler system	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			2.5	3094.39	58.02	9.18	3103.57	0.29
			5.0	3784.14	99.94	15.82	3799.96	0.41
			7.5	6229.0	123.49	19.54	6248.54	0.31
		Mean		4369.17	93.82	14.85	4384.02	0.34
		Urea, 120+15	0.0	2811.21	59.81	9.47	2820.67	0.34
			2.5	3267.10	111.07	17.58	3284.67	0.55
			5.0	4493.5	173.55	27.47	4520.96	0.61
			7.5	4244.3	189.30	29.96	4273.89	0.81
		Mean		3703.99	133.41	21.12	3725.05	0.58
UF, 60		0.0	2103.03	110.00	17.41	2120.43	0.83	
		2.5	2541.00	90.51	14.32	2555.32	0.56	
		5.0	2690.80	124.42	19.69	2710.49	0.73	
		7.5	3514.1	193.04	30.55	3544.64	0.87	
Mean			2712.23	129.49	20.49	2732.72	0.75	
UF, 120		0.0	1402.6	71.28	11.28	1413.88	0.81	
		2.5	2035.5	92.38	14.62	2050.12	0.72	
		5.0	2436.00	114.81	18.17	2454.16	0.75	
		7.5	4286.58	201.59	31.90	4318.38	0.75	
Mean			2540.17	119.97	18.99	2559.14	0.76	
UF, 180		0.0	1155.2	42.19	6.68	1161.88	0.58	
		2.5	1905.5	97.72	15.47	1920.96	0.81	
		5.0	4667.8	222.5	35.21	4703.00	0.75	
		7.5	3825.1	155.13	24.55	3849.64	0.64	
Mean			2888.40	129.38	20.48	2908.87	0.70	
Mean			2540.31	121.21	19.19	2563.13	0.64	

Revenue of avoided CO₂ fed⁻¹ = price of ton CO₂ x avoided CO₂ emissions in ton fed⁻¹

Total net return fed⁻¹ = net return fed⁻¹ + revenue of avoided CO₂ fed⁻¹

Price of ton CO₂ is around € 20 =158.26 EGP and 1 Euro (€) = 7.9131 EGP

4. Conclusion

The results of this study pay attention to reconsider agriculture management practices for sandy soils and chose the proper one or ones which suffice optimal productivity with rational energetic & economic costs and also secure the ecosystem from CO₂ emissions. Also, the results have affirmed that using DIS as irrigation regime, UF-fertilizer as slow release N-fertilizer and rhizobia

inoculation as N-fixer has had promised impact to combat global warming.

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The Etiology of Sudden wilt disease Syndrome on Melon in Egypt

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Abstract: In the present research, five fungi were isolated from melon plants suffered from sudden wilt disease syndrome. These fungi were identified as *Fusarium solani*, *Macrophomina phaseolina*, *Monosporascus cannonballus*, *Pythium aphanidermatum* and *Rhizoctonia solani*, *Fusarium solani*. Some factors affecting the disease occurrence *i.e.*, water saturation, distance between irrigation nozzles, and plant beds, types of soils, varieties reaction and host range were studied. All cantaloupe cultivars were affected with sudden wilt. All cucurbit hosts were infected with the causal organisms of sudden wilt.

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Key words: Sudden wilt, Cantaloupe, *Fusarium solani*, *Monosporascus cannonballus*, Water saturation, Irrigations nozzles, Plant beds, Types of soils

1. Introduction:

Melon (*Cucumis melo*) is considered one of the major summer and nili vegetable crops in commercial fields and under protected cultivation during winter in Egypt. It is considered a major source of essential nutrients such as vitamins, minerals, carbohydrates, antioxidants and anti-carcinogenic substances, which are important to human nutrition and health (Joseph, 1994). The cultivated area of melons during 2010 reached 146211 feddans yielded about 8-10 tons/feddan of fruits.

Melon is liable to attack by several soil borne fungal pathogens during different growth stages resulted in considerable losses in fruits yield. The most important diseases, however, are damping-off, Fusarium wilt (Zitter *et al.*, 1996), sudden wilt (Cohen *et al.*, 1996, Pivonia *et al.*, 1997, Cohen *et al.*, 2000) and *Monosporascus* root rot / vine decline (Uematsu *et al.*, 1985, Martyn and Miller, 1996).

In Egypt, sudden wilt disease syndrome on melons has been frequently occurred causing severe losses during the growing seasons. Therefore, the present investigation aims to study the disease occurrence, causal pathogen, and pathogenic capabilities of the isolated fungi, varieties resistance and host range, efficiency of the environmental conditions.

2. Materials and Methods

1- Isolation of the associated fungi :

Isolation was made from twenty plants per field. Five fields represented each location showing disease symptoms. The diseased plants were uprooted then the roots were washed under running tap water to remove the soil particles. The tap and lateral roots were excised into small pieces (0.5-0.8 cm). The root

pieces were disinfested in 0.5% sodium hypochlorite then 70% ethanol for two minutes each. Then, they were rinsed in sterilized distilled water and dried between two sterilized filter papers. The surface sterilized samples were plated onto Potato Dextrose Agar (PDA) medium and incubated at 25°C until the recovery of the fungal colonies. The recovered fungi were microscopically examined.

2- Purification and Identification of the isolated fungi:

Purification of the isolated fungi was carried out using hyphal tip and /or single spore techniques (Dhingra and Sinclair, 1985).

The developed fungal colonies were kindly identified by the staff members of the "Mycology and Plant Diseases Survey Department" in Plant Pathology Research Institute. They used the morphological and microscopically characteristics of the recovered fungi according to (Barnett 1960, Pollack and Uecker, 1974 and Nelson *et al.*, 1983). The identified fungi were sub-cultured on PDA slants and kept at 5°C for further studies.

3- Production of inoculums :

The fungi used in this study were grown on cornmeal-sand medium. A mixture of 2-5 g corn meal and 95-98 g fine sand previously washed was transferred in a 250 ml glass bottle. Then each bottle received 50 ml of distilled water and plugged with a cotton stopper. The bottled medium was autoclaved at 121°C for 1 hr. The tested fungi were grown on PDA and incubated for 7 days at 25°C. A 4-mm disc of agar with mycelium from 7 days old culture of each fungus used in this study was transferred to the surface of the bottled medium. Five bottles were served for each fungus. All bottles were incubated at

25°C for 15 days and were daily shaken to spread the fungal inoculums through the medium.

4-Disease assessment :

Plants suffered from pre - and post - emergence damping - off disease were assessed two and four weeks after sowing respectively. Sudden wilt disease incidence was recorded at the fruit setting stage of cantaloupe plants. Plants were uprooted washed carefully, and the disease incidence was determined. Disease severity was determined using an improved grading system for measuring plant diseases described by (Horsfall and Barratt, 1945).

5-Varietal reaction :

Seeds of four cantaloupe cultivars namely, Galia, Rafigal, Ideal and Primal were sown in seedling trays for one month. The tested fungi were grown on autoclaved medium containing corn meal (80 g), sand (350 g) and water (80 ml) They were transferred alone or in combinations to sterilized pots (25 diam.) filled with in formalin-sterilized loamy soil (using 5 % formalin). The amount of each inoculum was (3 %) of soil weight per each pot. Three seedlings of one month old were transplanted in each pot. Percentage of infection with sudden wilt disease was estimated at fruit setting (70 days of sowing).

6- Host Range :

Reaction of the cucurbitaceous hosts namely, cucumber (cv. Beit Alpha), squash (cv. Eskandarani), watermelon (cv. Giza 1), snake cucumber (cv. Nabolsy), and loofah (cv.land race) to the different sudden wilt pathogens was studied.

Seeds of each host were sown in a seedling tray for one month. The studied pathogens' inocula were prepared and transferred alone or in combinations to sterilized pots (25 cm) filled with in formalin-sterilized loamy soil (using 5 % formalin) and seedlings transplanting were done as previously mentioned. Mean percentage of infection by sudden wilt disease was recorded at fruit setting, 70 days after sowing.

The Role of Irrigation Regime In Sudden Wilt Syndrome Development.

A- Effect of different distances between irrigation nozzle and plant position on the soil bed :

The effect of different distances between irrigation nozzle and plant position on the development of sudden wilt disease of cantaloupe was studied in field during summer season of 2009 at El-Kassaseen, Ismailia governorate. This experiment was carried out in sandy loamy soil naturally infested with sudden wilt pathogen(s) using cantaloupe cv. Galia. Intra row spacing was 50 cm, (the distance between 2 plants), and beds were 150 cm apart. Drip irrigation system was used. The distance between plant and

irrigation nozzle was 10, 15 or 25 cm. Data were recorded at fruit setting, 70 days after cultivation.

B- Effect of different intervals of irrigation on the sudden wilt infection of cantaloupe, under field condition. [Planted in pots (25 diam.)] :

The effect of different intervals of irrigation on the sudden wilt infection of cantaloupe was studied in field experiment cultivated in pots during winter and summer seasons 2009 at El-Kassaseen, Ismailia. Experiment was carried out in sterilized sandy loamy soil pots infested with each of sudden wilt pathogens using cantaloupe cv. Ideal. The pots were drip irrigated at different intervals (6, 9 and 12 days). The seedlings were mulched by using a plastic mulch to protect the plant from frost damage at night during winter time. Data were recorded at fruit setting where the plants 70 days after cultivation.

C- Effect of water saturation levels and soil types on the sudden wilt infection of cantaloupe, under greenhouse conditions :

The effect of water saturation levels of the soil on the sudden wilt infection of cantaloupe was studied in an experiment in pots, under greenhouse conditions. Water saturation levels were determined according to the method given by (Piper 1950). Three levels of saturation *i.e.* 100%, 50% and 25% were investigated. Also three soil types namely: sandy, clay and sandy loamy soil were used through this experiment.

A weighted amount of soil (350 g) was placed in a glass funnel (500 ml). Then a measured volume of water was poured on the soil until saturation. The run-off (excess of water) was received in a receiving beaker. After that, the measured amount of water was estimated for complete saturation of three kgs of each type of soil. The actual volume of water needed for saturate (100% saturation) sandy, clay and loamy soil was 70, 126 and 98 ml respectively (Piper 1950). Then, it can be estimated the volumes of water needed for 50 and 25 % water holding capacity accordingly. Plastic pots, 25 cm each, were filled with 3 kgs of each of the tested type of soil. Soil was infested with sudden wilt pathogens *i.e.* *F. solani*, *P. aphanidermatum*, *M. phaseolina*, *R. solani* and *M. cannonballus*. The amount of inoculum was 3% of soil weight in each pot (Dhingra and Sinclair, 1985). Seven seeds of cantaloupe cv. Ideal were sown in each pot. The experiment was drip irrigated. Each treatment was replicated five times.

The following aspects were studied:

- Effect of soil type on sudden wilt disease incidence.
- Effect of saturation level on the development of the disease.

3. Results

Isolation, identification:

Five genera of pathogenic fungi, *i.e.* *Fusarium*, *Monosporascus*, *Rhizoctonia*, *Pythium* and *Macrophomina* were isolated from diseased roots of cantaloupe. They were identified to their species level as *F. solani*, *Macrophomina phaseolina*, *Monosporascus cannonballus*, *Rhizoctonia solani* and *Pythium aphanidermatum*.

Reaction of common cantaloupe cultivars to sudden wilt pathogens:

In this experiment, four cantaloupe cultivars representing the most important commercially cultivars grown in Egypt were evaluated. These

cultivars *i.e.* Galia, Rafigal, Ideal and Primal were tested against the most common pathogens *i.e.* *F. solani*, *M. phaseolina*, *P. aphanidermatum*; *R. solani* and *M. cannonballus* (**Table 1**) alone or in all possible combinations under greenhouse condition.

Results showed that the tested cultivars have a similar reaction towards the tested pathogens either alone or in combination. The four cultivars were susceptible to sudden wilt diseases. However, the more the pathogens combined the more the number of infected plants of each cultivar.

Table (1): Varietal reaction of four cantaloupe cultivars to sudden wilt pathogens, under greenhouse condition.

Pathogen	Cultivars / Mean of sudden wilt infection (%)				
	Galia	Rafigal	Ideal	Primal	Mean
1- <i>F. solani</i>	3.69	3.69	5.31	3.69	4.09
2- <i>M. phaseolina</i>	3.69	3.69	5.31	3.69	4.09
3- <i>P. aphanidermatum</i>	0.71	0.71	5.31	0.71	1.86
4- <i>R. solani</i>	0.71	0.71	5.31	0.71	1.86
5- <i>M. cannonballus</i>	3.69	3.69	3.69	3.69	3.69
Mean	2.49	2.49	4.98	2.49	3.11
1+2	5.31	5.31	3.69	3.69	4.50
1+3	3.69	3.69	3.69	3.69	3.69
1+4	3.69	0.71	5.31	3.69	3.35
1+5	5.31	5.31	5.31	0.71	4.16
2+3	0.71	0.71	3.69	3.69	2.20
2+4	3.69	3.69	3.69	3.69	3.69
2+5	5.31	5.31	3.69	3.69	4.50
3+4	0.71	0.71	12.69	0.71	3.70
3+5	0.71	0.71	12.69	0.71	3.70
4+5	0.71	0.71	12.69	0.71	3.70
Mean	2.98	2.68	6.71	2.49	3.72
1 + 2 + 3	5.31	5.31	9.00	5.31	6.23
1 + 2 + 4	5.31	5.31	5.31	5.31	5.31
1 + 2 + 5	9.00	9.00	5.31	3.69	6.75
1 + 3 + 4	12.69	12.69	12.69	12.69	12.69
1 + 3 + 5	26.56	26.56	26.56	26.56	26.56
1 + 4 + 5	24.64	24.64	26.56	26.56	25.60
2 + 3 + 4	16.38	16.38	11.25	11.25	13.81
2 + 3 + 5	25.69	29.22	29.22	29.22	28.33
2 + 4 + 5	24.64	26.56	23.31	25.69	25.05
3 + 4 + 5	29.09	29.09	29.09	30.08	29.33
Mean	17.93	18.47	17.83	17.63	17.96
1 + 2 + 3 + 4	29.09	29.09	29.09	29.70	29.24
1 + 2 + 3 + 5	33.21	36.77	36.77	37.98	36.18
1 + 2 + 4 + 5	36.77	39.13	39.13	43.810	39.71
2 + 3 + 4 + 5	29.09	29.09	29.09	29.70	29.24
Mean	32.04	33.52	33.52	35.29	33.59
1 + 2 + 3 + 4 + 5	40.27	42.69	47.31	47.31	44.39
Control	0.71	0.71	0.71	0.71	0.71
Mean	16.07	16.76	18.51	17.65	17.24
L.S.D. at 5 %	1.22	0.56	1.14	1.58	

*Mean of five replicates. Percentages data were arcsine-transformed before carrying out the analysis of variance.

Analysis of variance of this experiment, (Table 2) shows that each of the individual pathogen or different combinations was highly significant and differed in their virulence on cantaloupe cultivars. Similarly, differences among cantaloupe cultivars were significant when tested against the individual pathogen or different combinations. Moreover, pathogens/cultivars interaction was always a significant source of variation in sudden wilt incidence suggesting that, the individual pathogen or different combinations responded differently with the different cultivars tested.

Host range:

Data obtained in Table (3) indicate that all the tested cucurbit hosts were susceptible to each one of the sudden wilt fungal pathogens either alone or in all possible combinations but they differed in their reaction in this respect. In most cases, increasing the number of the causal agents added in different combinations showed high level of aggressiveness on the tested hosts.

Cucumber plants cv. Beit alpha were severely infected by the causal agent combinations of (*F. solani* + *M. phaseolina* + *P. aphanidermatum* + *M. cannonballus*) followed by (*F. solani* + *P. aphanidermatum* + *R. solani*) and (*F. solani* + *M. cannonballus*). In addition, *M. phaseolina* alone was highly pathogenic, while *P. aphanidermatum* was the least one in this respect.

Squash plants cv. Eskandarani showed higher infection by all fungal combinations including three fungi except *F. solani* + *M. phaseolina* combined with each of *P. aphanidermatum* and *R. solani*. In addition, the combinations of either any four fungi or five were highly pathogenic on squash, while, combinations of *F. solani* + *M. phaseolina* with *P. aphanidermatum* or *R. solani* were the least pathogenic.

Watermelon plants cv. Giza 1 showed highly infection by *F. solani* + *P. aphanidermatum* combined with either *R. solani* or *M. cannonballus* as well as *M. phaseolina* + *P. aphanidermatum* + *R. solani*.

Snake cucumber plants cv. Napolsi was highly infected by (*P. aphanidermatum* + *R. solani*) combined with *F. solani* or *M. phaseolina*. While either *M. phaseolina* or *M. cannonballus* alone and *P. aphanidermatum* combined with either *F. solani* or *M. cannonballus* were the least effective since they gave the least percentage of infection (10%).

Loofah plants cv. Balady (land race) were severely infected by (*M. phaseolina* + *R. solani*), combined with *F. solani* or *M. cannonballus* as well as combination of *M. phaseolina* + *P. aphanidermatum* + *R. solani* + *M. cannonballus* resulted in 50% infection. However, the combination of *P. aphanidermatum* + *R. solani* + *M. cannonballus* gave the least percentage of infection (10%).

Irrigation Regime:

Effect of different distances between irrigation nozzle and plant position on the soil bed:

The effect of different distances between irrigation nozzle and plant position on the bed on sudden wilt disease infection on cantaloupe was studied in the field during summer of 2009. Data presented in Table (4) show that increasing the distance of irrigation nozzle by 10, 15 or 25 cm away from the cantaloupe plant position on the bed significantly decreased the mean percentage of infection with sudden wilt disease. The more the distance of the irrigation nozzle, up to 25 cm the less disease development, and vice versa.

Effect of different intervals of irrigation on the sudden wilt infection of cantaloupe, under field conditions:

The effect of intervals of irrigation regime on the development of sudden wilt infection on cantaloupe was studied in field plots infected by *F. solani*, *M. phaseolina*, *P. aphanidermatum*, *R. solani*, and *M. cannonballus* during the winter and summer seasons of 2009.

Results presented in Table (5) showed that percentage of sudden wilt infection caused by *P. aphanidermatum* and *M. cannonballus* increased by increasing the intervals between irrigation times in winter season. In summer season, however, sudden wilt infection caused by *M. cannonballus* increased by increasing the intervals between irrigation times.

The effect of water saturation levels and three soil types on sudden wilt infection of cantaloupe under greenhouse condition:

Data in Table (6) showed that the highest sudden wilt infection on cantaloupe plants was in loamy followed by clay then sandy soils. The three types of soil exhibited the highest percentage of sudden wilt infection when reached 50 and 100 % of water saturation level.

Table (2): Analysis of variance of reaction of four cantaloupe cultivars to the five pathogens and their different combinations.

Source of variance	Degree of freedom	Sum of square	Mean of square	F - value
Pathogens treatments	30	9520.15	308.34	166.49**
Cultivars	3	38614.87	12871.62	6957.63**
Pathogens X Cultivars	90	31965.66	355.17	225.33**
Error	218	402.53	1.85	

** Significant at $P < 0.01$.**Table (3):** Average percentage of infection by the causal agents of sudden wilt on various cucurbitaceous hosts, under greenhouse condition.

Pathogen	Cucurbitaceous hosts / Mean of sudden wilt infection (%)					
	Cucumber	Squash	Water-melon	Snake cucumber	Loofah	Mean
1- <i>F. solani</i>	20	30	30	30	20	26
2- <i>M. phaseolina</i>	30	30	10	10	20	20
3- <i>P. aphanidermatum</i>	10	20	20	20	20	18
4- <i>R. solani</i>	15	30	30	20	20	23
5- <i>M. cannonballus</i>	15	30	10	10	30	19
Mean	18	28	20	18	22	21.2
1+2	30	30	15	20	30	25
1+3	20	30	10	10	20	18
1+4	20	20	20	20	30	22
1+5	35	35	20	20	20	26
2+3	20	30	10	20	20	20
2+4	20	35	35	15	35	28
2+5	20	40	10	15	20	21
3+4	15	45	10	15	20	21
3+5	20	40	20	10	20	22
4+5	20	20	20	20	20	20
Mean	22	32.5	17	16.5	23.5	22.3
1+ 2+ 3	20	15	10	25	18	17.6
1+ 2+ 4	20	10	20	20	50	24
1+ 2+ 5	25	50	20	35	20	30
1+ 3+ 4	40	50	50	50	25	43
1+ 3+ 5	20	45	50	20	20	31
1+ 4+ 5	30	50	20	20	20	28
2+ 3+ 4	20	50	50	50	20	38
2+ 3+ 5	20	50	20	20	20	26
2+ 4+ 5	20	50	25	25	50	34
3+ 4+ 5	20	50	20	20	10	24
Mean	23.5	42	28.5	28.5	25.3	29.56
1+ 2+ 3+ 4	20	50	20	20	20	26
1+ 2+ 3+ 5	50	50	50	20	20	38
1+ 2+ 4+ 5	20	50	50	20	20	32
2+ 3+ 4+ 5	20	50	20	20	50	32
Mean	27.5	50	35	20	27.5	32
1+ 2+ 3+ 4+ 5	20	50	20	30	20	28
Control	0	0	0	0	0	
Mean	22.2	40.5	24.1	22.6	23.66	26.6

Table (4): Effect of different distances between irrigation nozzle and plant position on the bed on sudden wilt disease infection in the field during summer of 2009.

Distance between irrigation nozzle and plant position (cm)	% infection (70 days after sowing)
10	12
15	10
25	8
L. S. D. at 5%	1.1

Table (5): Effect of intervals of irrigation on sudden wilt infection on cantaloupe plants on cv. Galia (70 days of sowing) in pots, under field conditions, during winter and summer seasons of 2009.

Fungi	Percentage of sudden wilt infection						Mean
	Winter			Summer			
	6 days	9 days	12 days	6 days	9 days	12days	
<i>F. solani</i>	25	50	20	35	65	20	35.8
<i>M. phaseolina</i>	10	65	30	20	70	20	35.8
<i>P. aphanidermatum</i>	59	75	85	30	35	40	54.0
<i>R. solani</i>	15	50	20	25	60	30	33.3
<i>M. cannonballus</i>	35	70	80	40	75	85	64.2
Control without inoculation	0	0	0	0	0	0	
Mean	24.0	52.5	39.2	25.0	50.8	32.5	
L.S.D. at 5% for:							
Fungi (F)	4.2			6.0			
Intervals (I)	7.1			9.2			
F X I	10.4			12.5			

Table (6): Effect of soil types and different levels of water saturation on sudden wilt infection on cantaloupe (cv. Galia), under greenhouse conditions

Fungi	Soil Types												Mean
	Clay				Loamy				Sandy				
	% of saturation				% of saturation				% of saturation				
	25	50	100	Mean	25	50	100	Mean	25	50	100	Mean	
<i>F. solani</i>	35	45	20	33.33	35	50	20	35.00	30	35	20	28.33	32.22
<i>M. phaseolina</i>	20	35	25	26.76	35	45	20	33.33	10	25	20	18.33	26.14
<i>P. aphanidermatum</i>	30	60	65	51.67	35	70	80	61.67	25	40	40	35.00	41.44
<i>R. solani</i>	30	50	25	35.00	35	60	30	41.67	25	45	20	30.00	35.55
<i>M. cannonballus</i>	25	40	60	41.67	30	70	75	58.33	20	30	40	30.00	29.44
Mean of saturation	28	46	39		34	59	45		22	35	28		
Mean of soil types	37.67				46				28.33				

4. Discussion

In the past two decades, a destructive disorder of cantaloupe (*Cucumis melo* L.), characterized by sudden (commonly within 2 weeks to harvest) and generally uniform collapse of entire fields has plagued the cantaloupe industry in warmer climatic production regions (Reuveni *et al.*, 1983, Eyal and Cohen, 1986, Martyn and Miller, 1996, Pivonia *et al.*, 1996b, and Pivonia *et al.*, 1997). Common names of the disorder include crown blight, collapse, vine decline, quick decline and sudden wilt (Reuveni *et*

al., 1983, Eyal and Cohen, 1986, Stanghellini *et al.*, 1995, Cohen *et al.*, 1996).

In the present study, a considerable number of fungi have been reported as causal agents of melon collapse worldwide, but descriptions of vine and root symptoms have often been overlapping and the cause of vine collapse in many cases is unclear. In (1970, Troutman and Matejka) concluded that *R. solani*, *Verticillium albo-atrum*, and an unidentified fungus which was later described as *M. cannonballus* (Pollack and Uecker, 1974), were the primary fungi

associated with cantaloupe collapse and decline in Arizona. In Israel, growing melons as a monoculture crop, without crop rotation and without MB fumigation between the growing seasons, resulted in severe cases of sudden wilt. The causal agent of this phenomenon has not been identified in all cases. Several soil borne pathogens, such as *F. solani* (Mart.) Sacc. f. sp. *cucurbita* W.C. Snyder & H.W. Hans, *F. equiseti* (Corda) Sacc., *M. phaseolina* (Tassi) Goid, and *Monosporascus eutypoides* (Petra) von Arx have been isolated from such wilted plants in various regions in Israel (Reuveni *et al.*, 1983, Eyal and Cohen, 1986 and Pivonia *et al.*, 1996a). In Israel, field trials and inoculation experiments conducted by (Reuveni *et al.*, 1983) showed that *M. eutypoides* was a primary agent of melon collapse in the Jordan Valley, which is a hot and arid region. In Texas, a root rot-vine decline of muskmelon was first reported in 1988 (Champaco *et al.*, 1988) and was subsequently attributed to *M. cannonballus* (Mertely *et al.*, 1991). *M. cannonballus* (Pollack & Uecker 1974) was reported as the main pathogen in the southern part of the United States (Mertely *et al.*, 1993, Martyn and Miller, 1996); while in the Northeastern States, vine decline was associated with Fusarium wilt and cucumber mosaic virus (CMV) (Zitter, 1995). A sudden wilt of melons in California has been attributed to *Pythium ultimum*, *P. aphanidermatum*, and *P. myriotylum* (Gottlieb and Butler, 1939, and Amann, 1989). Four fungi (*F. solani*, *M. cannonballus*, *M. phaseolina*, and *Stangospora* sp.) were frequently isolated from muskmelon roots suffered from root rot/vine decline disease. *Pythium spp.*, *Cephalosporium* sp., and *F. oxysporum* were also encountered but at relatively low frequencies (Mertely *et al.*, 1991). (Bruton *et al.*, 1998) have classified diseases causing vine decline in mature melon plants into three groups. The first group contains the vascular wilts which are represented by *Fusarium oxysporum* and *Verticillium dahliae*. The second group contains the crown-rot fungi represented by *Myrothecium roridum* and *Macrophomina phaseolina*. The third group contains the root-rot fungi that incite melon declines represented by *Monosporascus cannonballus* and *Acremonium cucurbitacearum*.

Four cantaloupe varieties, Galia, Rafigal, Ideal and Primal the most commonly grown in Egypt were tested against the most common pathogens *i.e.* *F. solani*, *M. phaseolina*, *P. aphanidermatum*; *R. solani* and *M. cannonballus* alone and in all possible combinations under greenhouse condition. Results showed that the tested varieties have a similar susceptibility reaction towards the tested pathogens either alone or in combination. The more the pathogens combined the more the number of infected

plants of each variety. The use of varieties resistant to plant diseases is one of the best control measures, but according to the available literature there are currently no commercially available sudden wilt resistant varieties. However, (Mertely *et al.*, 1993) reported that honeydew varieties are more resistant than either cantaloupe or watermelon varieties. In a preliminary evaluation, (Wolff 1995) found 108 of 130 muskmelon cultigens were moderately to highly susceptible to root rot and vine decline in the field. 'Deltex', an Ananas type melon was found to be more tolerant to root rot, vine decline than commonly used commercial varieties of cantaloupe such as 'Caravelle'. The reduction in the incidence of wilt may be partially due to root system size and structure; 'Deltex' has a more vigorous root system, giving it better adaptation to dry-land production.

Five cucurbit hosts, cucumber, loofah, snake cucumber, squash, and watermelon, were subjected to the infection by the tested pathogens alone or in combination. The tested cucurbit hosts were susceptible to each one of the sudden wilt fungal pathogens either alone or in all possible combinations but they differed in their reaction in this respect. In most cases, the more the pathogens combined the more the number of infected plants of each cultivar. Although sudden wilt phenomenon was originally reported on cantaloupe, watermelon is highly susceptible, cucumber and summer squash are somewhat susceptible, and pumpkin, several winter squashes, bottle gourd (*Lagenaria siceraria*) and sponge gourd (*Luffa aegyptiaca*) have been shown through greenhouse tests to be susceptible as well (Mertely *et al.*, 1993).

In field experiment using drip irrigation system where the irrigation nozzles were positioned 10, 15, and 25 cm away from cantaloupe plant position on the cultivation bed, the percentage of sudden wilted plants were determined. Results showed that increasing the distance of irrigation nozzle by 10 cm, 15 or 25 cm away from the cantaloupe plant position on the bed significantly decreased the mean percentage of infection with sudden wilt disease. The more distance of the irrigation nozzle, up to 25 cm, the less the disease development, and vice versa. The effect of the intervals between irrigation times on the development of sudden wilt symptoms on cantaloupe grown in infested field plots showed that percentage of sudden wilt infection caused by *P. aphanidermatum* and *M. cannonballus* increased by increasing the intervals between irrigation times in winter season. However, sudden wilt infection caused *M. cannonballus* increased by increasing the intervals between irrigation times. (Cohen *et al.*, 2000) reported that in the daily irrigated plots, first wilt

symptoms were observed 47 days after planting, and melon plants totally collapsed 13 days later. However, in the less frequently irrigated melon plants, first wilt symptoms were observed 60 days after planting. In the daily irrigated plots, the root system penetrated to a depth of 20 cm, whereas plant roots under the less frequent irrigation scheme penetrated the soil to depth of 40 cm. Manipulating root system size through modifications in an irrigation scheme effectively reducing disease incidence. However, irrigation cannot be used effectively as the only management practice (Cohen *et al.*, 2000).

In the present study the highest sudden wilt infection on cantaloupe plants was in loamy followed by clay then sandy soils. The three types of soil exhibited the highest percentage of sudden wilt infection when reached 50 % of water saturation level. *P. aphanidermatum*, and *M. cannonballus* caused the highest sudden wilt incidence in clay and loamy soils at 50 and 100 % water saturation levels. Martyn (2007) reported that heavy soils are more conductive to vine declines of melon than light, sandy soils, but this is not always the case.

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Change of physico-chemical proprieties of some local oils during frying

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Abstract: Virgin olive oil (stored for 18 months) and Sunflower oil (stored for 3 months) were used for repeated deep – fat frying potato fillet (French fries) for two weeks consecutive at 160 – 180 °C and the frying time was set for eight (8) minutes and then allowed to cool for five hours at ambient temperature. This study was performed to assess the quality local oils using physico – chemical methods for analysis, it was also conducted to compare and correlate oil quality parameters as: the Peroxide value(PV), Fry fatty acid value (FFA), Iodine value (IV), Saponification values (SV), Density(D) and Refractive index(RI). The heating thermo gram showed that all quality parameters were significantly changed as frying time advanced.

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Introduction:

Frying is one of the most popular proceedings for food preparation worldwide. Hence, the use and abuse of frying oils have become of great concern, especially since compounds originated at high temperature are suspicious to impair the nutritional value of fats(Amany et al, 2008)]. Indeed, well several years, controls are performed to ensure the quality of frying oil to preserve the consumers of adverse health effects as a result of the formation of degradation products (Skrokki, 1995).

Some Nutritionists go far as to advocate virilually excluding fried products in an efforts to promote healthy eating (Sebedio and Grandgirand, 1987). Numerous types of edible oils are used in frying; however, repeated use of frying oils produces undesirable constituents that may pose health hazards (Croon and al, 1986). During frying, a number of reactions occur in the frying oil causing oxidation and hydrolytic degradation of the oil. Heating in the presence of air causes partial convertibly of fats and oils to volatile chain scission products, non volatile oxidized derivatives and dimeric, polymeric substances (Knoth, 2009),. The free radical formed by fatty acids react with oxygen to generate peroxides that enter into a multitude of reaction producing numerous products, such as aldehydes, ketones, acids and polymerized fats(Ahmed, 1996) Heat, water, air and the presence of contamination materials together with duration of frying cause these degradative reactions. The main cause of oil degradation are oxidation, thermal treatment, and oil food interaction at high temperature (Gertz, 2000)

Oxidative and chemicals changes in frying fats during use are characterized by a decrease in the total unsaturations of the fat with increase in free fatty acids,

foaming, color andviscosity (Aladeduneye and Przbyski, 2009) The main aim of this study was to evaluated some effect important chemical and physical changes of the selected vegetable oils during deep fat frying of Potato fillet (French fries) using physico-chemical methods in order to evaluate the quality of frying oils.

Material and methods:

Our choice is based on olive oil in the costal region of El Milia (Algeria), known for its hot and humid climate in summer and cold in winter. The harvest is done traditionally and sunflower oil locally-produced was taken from supermarket, the main properties of this oil are: Refined Sunflower 100%, rich in vitamin E, without cholesterol, temperature maximum 170°C and reused 10 times. They are destined th mixture of glacial acetic acid and chloroform(2 :3) reacted with saturated potassium iodide, and titrated with standard Na₂S₂O₃. For measuring free fatty acids, samples of oils/fat were neutralized with ethanol, using phenolphthalein indicator and titrated with NaOH. The Iodine value(g/100g) determines the degree of unsaturations was found by mixing the samples with CCl₄, Wijis solution, potassium iodide and distilled water, and titrated with 0.01 Na₂S₂O₃ using starch as indicator. The saponification value is the number of milligrams of potassium hydroxide or sodium hydroxide required to saponify 1g of fat under these conditions.

Results:

All results determined are shown in tables 1 and 2. The results show an increase in all the measured parameters with increased frying time excepting iodine value and saponifition index. The extent of oxidation of

the sample as measured by POV increased from 1.6 to 3.6 meq/ Kg for (OO), then decreased after third and fifth frying operation. This could be explained by the fact of these oils were resistant to oxidation up to a point of the heating (White et al, 2005). The graph in Figure 4 shows the shape of the variation of the index of peroxide depending on number of fries for each oil type, we find that the heating of the oil Causes the increase of the index of peroxide at the beginning of cooking to a maximum value (6.75 for the fifth frying cooking oil in SFO and 18.5 to third frying cooking in olive oil. Then there is a decrease. However, FFA of

these two oils were almost same behavior heating but FSO had the low measurement as Figure 1 and table 1 shown The increase of the acidity can be explained by the thermo-oxidation of oil, this increase, is due to the liberation of fatty acids by hydrolysis which is a change which undergoes the oil during the repeated frying (Stevenson et al, 2004). The iodine values and sapon-ifications for each controlled sample show a decreasing trend for both the oils, as shown in Fig 2 and 3 respectively and table. 1. Similar results has been reported in soybean, corn and crude rape seed oils (Chu, 2004).

Table 1: Parameters Values

N ^{br} c of frying	Before frying	1	2	3
POV(SFO,OO)	(1.6, 9)	(2.1, 10.7)	(3.45, 13)	(4.2, 18.5)
FFA(SFO,OO)	(0.06, 0.21)	(0.09,0.21)	(0.14, 0.22)	(0..18, 0.24)
IV(SFO, OO)	(130,83.12)	(84.38,78.04)	(59, 59)	(39.97,39.97)
SV(SFO,OO)	(193.54,108.03)	(178.11,150.31)	(172.50,150.31)	(168.30, 112.02)

Table. 1 (continued)

N ^{br} c of frying	4	5	6	7
POV(SFO,OO)	(5.56, 15.56)	(6.75, 12.02)	6.25 (SFO)	5.8 (SFO)
FFA(SFO,OO)	(0.21,0.26)	(0.24, 0.33)	0.25 (SFO)	0.29(SFO)
IV(SFO, OO)	(27.28,27.28)	(20.93, 17.76)	14.59 (SFO)	12(SFO)
SV(SFO,OO)	(140.25,98.70)	(126.22, 42.07)	126.92(SFO)	112.20 (SFO)

The density and refractive index were determined for each oil sample, before and after thermal treatment. the physical parameters were determined by picnometer method for density and the

refractive index was determined with an Abbe refractometer ATGO 3T type, the results are presented in table2.

Table 2: Density and refractive index

N ^{br} c of frying	Before frying	1	2	3
IR(SFO, OO)	(1.464,1.463)	(1.465,1.466)	(1.465,1.468)	(1.466, 1.469)
D(SFO,OO)	(0.916,0.908)	(0.916,0.909)	(0.917,0.910)	(0.917,0.912)

Table. 2: (Continued)

N ^{br} c of fries	4	5	6	7
Ir (SFO,OO)	(1.466, 1.472)	(1.466,1.475)	(1.468,SFO)	1.469 (SFO)
D(SFO, OO)	(0.918,0.915)	(0.919,0.916)	0.919(SFO)	0.920(SFO)

The refractive index of the vegetable oils is increasing during thermal treatment. Biggest influence on the refractive index was observed at the Olive oil seems less stable against thermal treatment. This result was confirmed recently (Nita et al, 2010). As we can

see from table 2 the density of oils has small variations around the initial value, this indicating that the thermal treatment does not affect sensible the density as a result of relatively short period of thermal treatment.

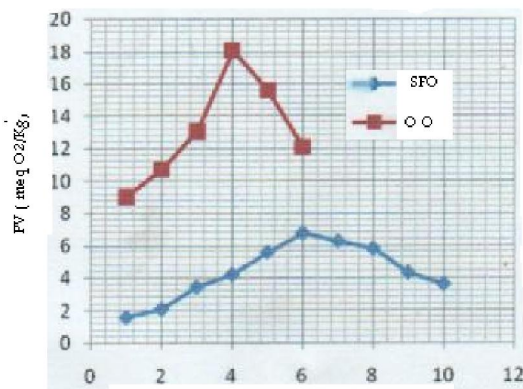


Fig. 4 Peroxide value as a function of frying oils

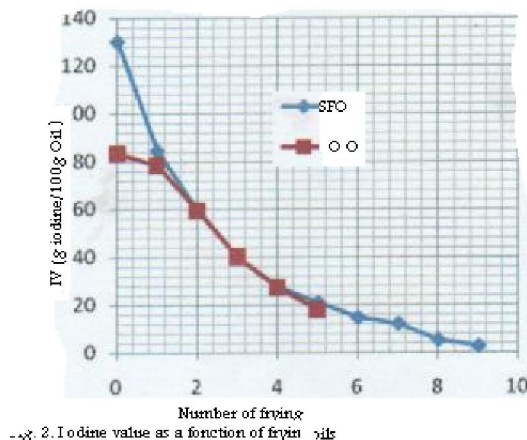


Fig. 2 Iodine value as a function of frying oils

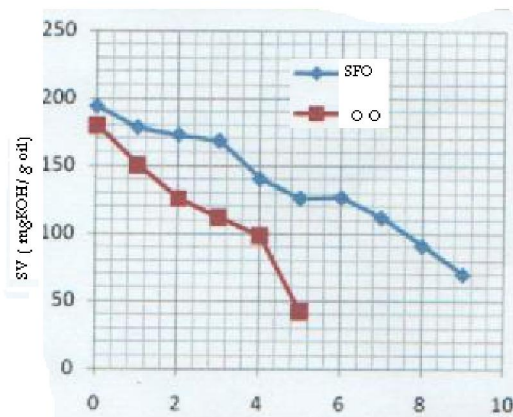


Fig. 3 Saponification value as a function of frying oils

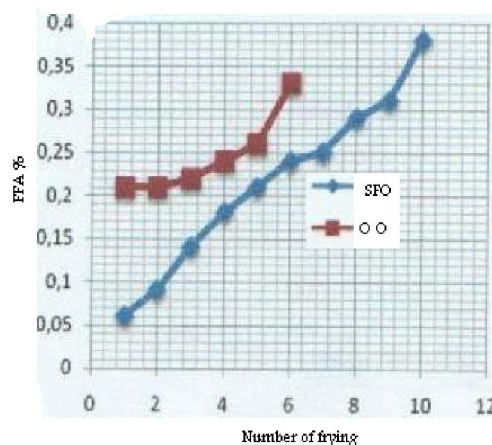


Fig. 1 Free fatty acid as a function of frying oils

Illustration curves

Discussions :

During repeated frying foods, there can be observed a normally degradation in the vegetal oils, because of these degradation reactions, a number of physical and chemicals changes occurs in frying oils including increase in density(D), refractive index(RI), free fatty acid content (FFA), peroxide value(PV) and decrease in saponification value (SV) and iodine value(IV). If the frying process is continued, these materials will undergo further degradation and finally the oil will not be appropriate for frying. The physico-chemical parameters of olive oil showed a lower quality of olive oil compared to sunflower oil. The analysis showed that the acidity in olive oil for example reaches a value higher than the Algerian norm (0.3%) in the fifth frying, while in the case of Sunflower oil up to eighth in condition better than normal kitchens. Although some recent studies have shown the contrary(Choe and Min, 2007). This is due to olive oil contains more oleic acid and less linoleic acid and lenolenic acid than other 9vegetable oils, that is, monounsaturated than polyunsaturated fatty acids. It

was found also that cooler regions will yielded oils with higher oleic acid than warmer climate. That is, a cool region olive oil may be more monounsaturated in content than a warmer region oil.

Our statement that the differences in measurements in determining the quality of the oils was mainly due to the method of obtaining oil from the harvest until the arrival at the mill, which are some factors that affect the quality of oils may vary from region to region and even in the same area. We advised the consumer to pay attention to the labels package mentioning the number of fry that depends on the working conditions of each oil.. Although some further analysis are necessary to complete this work by other fried foods, cooking with other oils, a sensory analysis that will establish criteria for foods, cooking with other oils, a sensory analysis that will establish criteria for characterizing the flavor of oil and complementary analysis such as: Colour, Viscosity, HPLC, FTIR and MIR.

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Abbreviations: OO: Olive Oil, SFO: Sunflower Oil
PV: Peroxide Value, IV: Iodine Value SV: Saponification Value, FFA: Free Fatty Acid D: Density, RI Refractive Index. MIR: Medium infrared, FTIR: Fourier transform infrared spectroscopy HPLC: Hight performens liquid chromatography

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10/5/2013

Interaction of religion and state in the era of the samanids

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Abstract: samanids ruled over a century. Though Iranian, being Sunni and Hanafin, they considered the caliphate system their emir-al-Momenin (believer's, emir), head of religion, and clergy. They annually gave some gifts and in case of necessity, they would pay taxes. In return, the caliphate system always supported samanid rulers and confirmed them and allowed some independence for them. Muslim samanids had a stable and unified state, because religion made people from different areas with difference cultures, languages and races become close to each other with the centrality of samanids rulers. Samanid showed that ancient Iran culture could be consistent with Islam. And this was the greatest service of samanids to Islam and Persian culture. samanids rulers encouraged religious activity, and they had a religious morale and an open thinking such that in samanids' territory, pre-Islam religions. Such as Judaism, Buddhism, Zoroastrianism, etc. and Islamic sects such as jihad Hanafin... lived freely. They used ghazi forces as jihad (battle) against infidels in order to suppress and attack infidel Turks.

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Keywords: religion, sect, state, government, samanids

Introduction

When samanids came to power, it was nearly two centuries that Islam had arrived in Transunion-during this period, many people of this region had converted to Islam and in some cities, some centers had been established for religious education. most holy centers which were in the hands of Buddhists, Nestorian Christians, and Zoroastrians before, now converted into mosques. this shows that a decrease in the followers of those religions and an increase in the population of Muslims. a look at the events of samanid era shows that the state left behind a tough period of chaos and conflict, however in fact beyond these events, samanid days is considered a brilliant period for the history of khorasan. An era which made the region –along with other Islamic lands-ready to get into the great Islamic civilization that reached its zenith in the fourth and fifth centuries AH (Higri century). samanid with a 110-year-old government could free Islam from its limited areas and circle and turn it into a universal culture and community. They also showed that Islam could be unbound to Arabic language and in this respect; they achieved a high base in the history of the world. The following achievement investigates the interaction of religion and state in samanid era as well as religious position of Transunion, dispersion of sects and religions, situation of Bukhara, the samanid capital, etc.

Religious governance of samanids:

Samanid rule lasted for 110 years (from 279 AH, the date of Nasr's death to the date of domination of ilak khan over Bukhara- during the century and a half, though Iranian, samanids being sunni considered Abbasid caliph their emir-al-momenin (emir of believers) and spiritual director and they identically

took the same method as tahirids for their life and rolling instruction. that's why the class and religious scholars in Transunion and khorasan always would support samanids, unlike those converted to shiism and had a secret life being afraid of the power of samanids and Sunni scholars and in case they had an opportunity, they conspired with the opposition of samanid rulers and confidentially invited them to overthrow this hierarchy of rulers. The symmetry of state and religion in samanids thought founded an emirate in which national integration and political unity were not perceivable except through religious unity. Persian civilization and culture extremely owe samanids. In order to exercise sovereignty over vast territories rolled directly by the command of samanids or their puppet rulers, religion was an effective factor in bringing together the people possibly governed by ethnic or linguistic differences. On the other hand, adherence to religion and trying to spread it caused the state to be confirmed by caliphate system in Baghdad and obtain domestic prestige, as it is can be seen obviously in the official correspondence with the capital and vice versa. Also it was common in samanid coins, etc. as such, the rule of samanid emir was recognized only when he received the charter of ruling from the caliph. however, there is no evidence to prove that samanid rulers like tahirids, used to pay regular tribute and taxes to the caliph. But they sometimes would send gifts or amounts of cash to Baghdad. Samanid ruler had a delegate to the caliph of Baghdad. this delegate would report significant events to samanid caliphs and rulers. One reason that samanids extended their borders towards north and east was to obtain slaves rather than to propagation of Islam. However the religious missionaries accompanying samanid army towards those

regions converted many infidels to Islam. Even prior to the rule of Ismail, samanids participated in tahirids invasions and conquests in Transunion. samanid rulers were faithful Muslims and except for a little while when emir Nasr bin ahmad, the second, claimed to have the same belief as Ismailis, samanid rulers remained firm hanafi Sunni believers, shafeis also lived in the territory of samanids, but there were not lost of them there Shiites living in samanid territory, hid their sect (beliefs) after the death of Nasr –bin-Ahmad. samanid rulers encouraged religious activities and supported the translation of religious Arabic books into Persian, such as history of tabari (torikhe tabari).till the end of samanid era, religious scholars supported their state, however finally they also let down samanids. Dervishes and missionaries who used to move into the plains of central Asia in order to preach Islam were move effective in converting the religion of turks than military MEASURES. Invasions of infidel turks into samanid territory at least till the end of the rule of Ismail caused volunteers or ghazis from all over the east of Islam world to come to Transunion in order to war with pagans. With the acceptance of Islam by turks, there was no more need for the services of Islamic fighters (Mujahids) in the central Asia, but they were active in Anatolia the Caucasus area. uniting various elements in Transunion by samanids and turning them into a single nation was like a miracle in many respects, as if the unity of Iran and its culture took place in the center Asia not in Iran itself. Furthermore, the foundation of this unity was Islam and samanids demonstrated that ancient Iran's culture could be consistent with Islam. And this has been the biggest service of samanids to the world of Islam, and of course to Iran. Following the people's tendency to Islam, and person who became the city's governor, would add some buildings to the Jameh(Grand) mosque, such that Ismail samani bought many houses and extended the mosque space by one-third. In days of emir Mansour bin Nooh, they bought many years and gardens and by spending big amounts of money, they built a prayer place for the ceremony of Eid and a beautiful platform and niche for it. To the command of emir, they established tall minarets on top of which people could hear the muezzin (one who calls to prayer) and get ready to say their prayers. In samanid days, the followers of pre-Islam religions and Islamic religions and sects could live freely. The state would not harsh with them and Islamic theologians and scholars had debates with them and criticized their ideas and opinions in their writings. Buddhists whose religion was common in Transunion before the arrival of Islam lived in some parts of samanid territory and they had temples in balkh and in the vicinity of India. Cities of ghazni and samarkand accommodated Jews, and Vazgird in the south of Samarkand and vingird

located in the vicinity of Tashkent were Christian centers. Zoroastrianism, the formal religion of pre-Islam Iran, still had some followers in the territory of samanids. They were called Garbs or mugs.muslimiah movement appeared in Transunion after the death of Abu Muslim khorasani (the year 137 AH) and their followers were called green believers (khurramdins). They were spread in the areas of balkh, marv, and Herat. Another group were while clothes weaver (Sepid Jamegan). They had mazdaki ideas and lived in the areas of balkh, Samarkand, and Aylaq(near modern Tashkent). Sadat alavi of khorasan and Transunion were among religious sects that activated in the territory of samandis and were highly honored by samanid rulers. Ismailiyya was a Shi'ite sect that preached and invited their beliefs in cities of khorasan. They were called by names such as batiniah and qurmats. Hanafi kramyh sect were spread in cities of nishapur, Herat, and Gharchestan. Ismailites by attracting followers in the highest civilian and military ranks of samanids, obtained a popular base in khorasan and transition. kharijites were spread in villages in sistan, the outskirts of Herat, and India border. They lost their influence in khorasan in the early rule of samanids.

Among Persian sects in sassanian era which were widespread in parts of samani territory, were Manichean sect and the surviving sects of mazdak religion. They were under the spiritual and political support of the king of china. They were known as soybeans. Beh Afaridians splitted from Zoroastrianism that lived freely in some parts of khorasan including Border River bank in samanid time.

Conclusion:

Samanids ruled over one century though Iranian because of their Sunni and hanafi beliefs. They considered the caliphates system their emir-al-momenin (leader of believers) and religious and spiritual director. They would give some gifts, and if necessary, pay taxes to the caliph. In return, the caliphate system would always support samanid rulers and confirm them.it also allowed some independence for them. Samanid rulers, whether prior to or after getting to power, by adopting different methods and ways towards scholars and knowledgeable people as well as code of governance taken from the sassanids, made way for the development of Iranian-Islamic science and civilization. Having been religious rulers, they spread Islam while being proud of their Iranian identity. They did not hesitate in the way of expansion of the foundation of civilization. Samani kings' relation with caliphs was not a same and unified relationship; rather it was a steep relationship such that the changes in the caliphate system would affect the relations with samanids. For example, when buyids beame dominant

in Baghdad, avoided making coins and delivering speeches. On the other hand, the caliphate system used insidious policy of violence and reconciliation towards samanids. Samanids tried to keep their independence against the caliph, so they attempted to gain religious legitimacy by means of spiritual subordination. They accepted hanafi sect which was aligned with the caliphate system. Regarding the relationship between samanids and the caliphate system, it should be noted that although they would not like to be a subordinate (follower) of the caliphate system, they did not want its power to be destroyed, since they needed its legitimacy. Samanid rulers tried to have both acceptance and legitimacy: national acceptance, and religious legitimacy which was accepted by people with the arrival of Islam. samanids obtained three positive results by announcing and accepting to be the subordinate of the caliphate system. First, by accepting the religion of Abbasid caliphs as the official religion of samani state, they created a religious unity among people and ruling over vast lands became easier. Second, they won the support of clergies and religious scholars of transitional and khorasan which were subordinates of the caliphs and people would follow them. Third, with the execute to obey the caliphs; they were permitted to destroy regional competitors.

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**Evaluation of the Effective Barriers in GSCM implementation Using DEMATEL Method
(Case study: Iran Khodro CO)**

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Abstract: The purpose this study is Evaluation of the Effective Barriers in GSCM implementation Using DEMATEL Methods and the impact of these factors on each. To identify critical influential factors, the authors studied and reviewed relevant literature from numerous fields of study associated with the essential issues of GSCM. This research uses the DEMATEL method as the tool that determines the Prioritization and Influence severity of each factor. The results show Organization Management has great impact on success of GSCM implementation among main aspects. Among criteria of Organization Management, Lack of top management support has Great Influence on other criteria. Also, among criteria of Organizational Culture, the lack of incentive legislation for the Green Supply Chain has Great Influence on other criteria. Also, among criteria of Organizational Structure, Lack of information and data required has Great Influence on other criteria. Also, among criteria of Rules and guidelines, Lack of supply chain integration has Great Influence on other criteria.

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Keywords: Supply Chain, Green Supply Chain Management, Multi-criteria decision making, DEMATEL

1. Introduction

The rapid of environmental issues throughout the world have increasing much concern from customers, buyers, communities and also government. For instance, both the local or international customers and buyers are now requiring their suppliers to make environmental friendly products. Ho et al. (2002), Giannakis and Croom (2004) and Chen and Paulraj (2004) take a strategic management perspective to address theory development in the SCM area. Likewise, New (1997) provides a thematic overview of the SCM literature. Some of the reviews are narrowly based along functional lines; for example, Skjoett-Larsen's (1999) review is focused on the logistics discipline while Larson and Halldorsson's (2002) review is based on the purchasing literature. GSCM is defined to be the addition of green issues into supply chain management (Hervani et al., 2005). In addition, Zhu and Sarkis (2004) state that GSCM supply chain involves from suppliers to manufacturers, customers and reverse logistics throughout the so called closed-loop supply chain. Hervani et al. (2005) indicate there are various activities involving GSCM such as reuse, remanufacturing, and recycling which are embedded in green design, green procurement practices, total quality environmental management, environmentally friendly packaging, transportation, and various product end-of-life practices. Green supply chain management (GSCM) is one of the corporate environmental management that had been recognized

and applied by among manufacturing companies. It aims to reduce or minimize negative environmental impact such as pollution, waste of resources, and product dumping. GSCM was starting debated since the quality revolution of the 1980s and supply chain revolution of the 1990s. Zhu and Sarkis (2004) defined GSCM has a ranged from green purchasing to integrated supply chains starting from suppliers, to manufacturer, to customer and reverse logistics.

All of business activities related to green supply chain management (GSCM) have played as an important role to environmental management factors applied for the purpose of business manufacturer. Scholars and practitioners explore the close relationship between supplier's product quality and environmental performance influenced the customers in global market. They also consider how to manage operational firm more efficiently in the market competition (Sarmah, Acharya & Goyal, 2006).

2. Supply Chain Management

The term supply chain management (SCM) as a concept, a philosophy and a management process, emerged in the 1980s from then current practices (Svensson, 2003), gained academic focus gradually, and flourishing since the 1990s (Svensson, 2003). Recently, SCM is such an important topic that at the moment researchers in many different academic fields are conducting research in this and related fields. Today's global marketplace offers significant opportunities to conduct supply chain management

(SCM). Ogulin (2003) suggests that supply chain firms need to develop organizational, procedural, technical, and strategic capabilities to respond to four emerging requirements in the twenty-first century: customer and end consumer focus, technology adoption, relationships management, and styles of leadership. In addition, knowing that the firm's capabilities are limited in time and effort, management will need to choose the level of partnership appropriate for each particular supply chain member (Lambert and Cooper, 2000).

Within the SCM domain there are many aspects that need to be tackled for the purpose of practical application, topics such as performance evaluation of a supply chain and its members, inter-organizational coordination and management, how the supply chain members share the outcome of the operations (Croxtton et al., 2001); human interaction in a supply chain (Giannakis and Croom, 2004); knowledge (strategic and operational aspects) sharing among supply chain members. Supply chain management (SCM), represents the integration of key business processes among industry partners to add value for the end customers. It tightly links together several consecutive elements of the industry value chain: from upstream suppliers; to sub-assembly manufacturers; to final manufacturers; to distributors; to retailers; to end-customers. Supply chain refers to the end-to-end business processes, which are embodied in technologies such as Customer Relationship Management (CRM) and enterprise resource management (ERP). A supply chain links organizations directly with one or more flows of products, services, finances and information.

3. Green Supply Chain Management

In recent years, green supply chain management (GSCM) initiatives have gained considerable prominence. However, how much value it brings to organizations is still being investigated. Kogg (2003) used the definition of GSCM given by Zsidisin and Siferd (2001): "the set of supply chain management policies held, actions taken and relationships formed in response to concerns related to the natural environment with regard to the design, acquisition, production, distribution, use, re-use and disposal of the firm's goods and services". Srivastava (2007) defined GSCM as "integrating environmental

thinking into supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final products to the consumers, and end-of-life management of the product after its useful life". Generally, GSCM is understood to involve screening suppliers based on their environmental performance and doing business only with those that meet certain environmental regulations or standards (Rao, 2002). Supplier selection either in GSCM or sustainable supply chain management (SSCM) has been identified as significant in making purchasing decisions (Hu and Hsu, 2010). Simultaneously in the operational process of supply chain management, thus contributing to the initiative of green-supply chain management (G-SCM). Correspondingly, all the solutions, including logistics management, for managing the overall lifecycle of products should be integrated in a more comprehensive supply chain procedure.

Despite the importance of G-SCM in industrial ecology, the integration of logistics flows in a green-supply chain still remains as a critical issue in G-SCM for the following reasons. First, from an organizational strategic point of view, it is difficult to coordinate the activities of all the chain members, including the product-oriented logistics distribution channels and corresponding reverse-logistics channels. To a certain extent, this difficulty is rooted in the conflicts of operational goals among these chain members. For instance, maximizing the profits of one member in a reverse-logistics chain does not necessarily maximize the profits of a manufacturer in a given green supply chain due to the induced reverse logistics costs. Second, there is a lack of appropriate models for use as tools to manage the corresponding logistics flows associated with each chain member under the condition of system optimization in the process of G-SCM.

4. Effective Barriers in GSCM implementation

Based on the previous literature review, we focus on four main aspects including Organization Management, Organizational Culture, Organizational Structure and Rules and Guidelines. From these main aspects, 18 Effective Barriers in GSCM implementation are maintained. The classification of those main Criteria and their Sub-Criteria are shown in Table 1.

Criteria	Sub-Criteria	Reference
Organization Management	Instability of the senior management	Sarkis (2009), Balasubramanian (2012), Ravi and Shankar, (2005), Yu & Hui, (2008)
	Lack of top management support	Helen and Neil (2012), Ravi and Shankar, (2005), Yu & Hui, (2008)
	Lack of knowledge and experience of	Balasubramanian (2012), Ravi and Shankar,

	staff	(2005), Hall (2006)
	Employee dissatisfaction	Sarkis (2009), Balasubramanian (2012), Ravi and Shankar, (2005),
Organizational Culture	Weak Organizational Culture	Sarkis (2009), Balasubramanian (2012), Ravi and Shankar, (2005),
	Lack of attention in Green Innovation	Sarkis (2009), Balasubramanian (2012), Ravi and Shankar, (2005),
	Lack of resources	Sarkis (2009), Helen and Neil (2012), Ravi and Shankar, (2005),
	the lack of incentive legislation for the Green Supply Chain	Balasubramanian (2012), Ravi and Shankar, (2005), Hall (2006)
Organizational Structure	Uncertainty in the Supply Chain	Sarkis (2009), Balasubramanian (2012), Helen and Neil (2012)
	Lack of technical infrastructure	Sarkis (2009), Balasubramanian (2012), Ravi and Shankar, (2005)
	Lack of information needed	Sarkis (2009), Balasubramanian (2012), Ravi and Shankar, (2005)
	Lack of communication between members of the supply chain	Sarkis (2009), Balasubramanian (2012), Ravi and Shankar, (2005)
	attention to the short-term profit	Sarkis (2009), Balasubramanian (2012), Ravi and Shankar, (2005)
Rules and Guidelines	Lack of financial resources	Balasubramanian (2012), Ravi and Shankar, (2005)
	Lack of government support	Balasubramanian (2012), Ravi and Shankar, (2005), Sarkis (2009)
	Slow Return to capital after the implementation of green supply chain	Helen and Neil (2012), Ravi and Shankar, (2005),
	Lack of supply chain integration	Balasubramanian (2012), Ravi and Shankar, (2005), Hall (2006)
	Lack of appropriate strategies for green supply chain vision and mission	Balasubramanian (2012), Helen and Neil (2012), Sarkis (2009), Hall (2006)

5. DEMATEL Technique

The DEMATEL method was first conducted by The Battelle Memorial Institute through its Geneva Research Centre in 1973. DEMATEL is an extended method for building and analyzing a structural model for analyzing the influence relation among complex criteria. However, making decisions is very difficult in fuzzy environment to segment complex factors.

The procedures of the DEMATEL method (Fontela & Gabus, 1976) are discussed below.

Step 1: *Generating the direct-relation matrix.*

We use five scales for measuring the relationship among different criteria: 0 (no influence), 1 (very low influence), 2 (low influence), 3 (high influence), and 4 (very high influence). Next, decision makers prepare sets of the pair-wise comparisons in terms of effects and direction between criteria. Then the initial data can be obtained as the direct-relation matrix which is an $n \times n$ matrix T where each element of a_{ij} is denoted as the degree in which the criterion i affects the criterion j .

Step 2: *Normalizing the direct-relation matrix.* Normalization is performed using the following,

$$K = \frac{1}{\max_{1 \leq i \leq n} \sum_{j=1}^n a_{ij}} \quad i, j = 1, 2, \dots, n \quad (1)$$

$$S = K.T \quad (2)$$

Step 3: *Attaining the total-relation matrix.* The total relation matrix M can be acquired by using Eq. (3), where I is denoted as the identity matrix

$$M = X(I - X)^{-1} \tag{3}$$

Step 4: *Producing a causal diagram.* The sum of rows and the sum of columns are separately denoted as vector D and vector R through Eqs. (4-6). Then, the horizontal axis vector $(D + R)$ named ‘‘Prominence’’ is made by adding D to R , which reveals the relative importance of each criterion. Similarly, the vertical axis $(D - R)$ named ‘‘Relation’’ is made by subtracting R from D , which may divide criteria into a cause and effect groups. Generally, when $(D - R)$ is positive, the criterion belongs to the cause group and when the $(D - R)$ is negative, the criterion represents the effect group. Therefore, the causal diagram can be obtained by mapping the dataset of the $(D + R, D - R)$, providing some insight for making decisions.

$$M = [m_{ij}]_{n \times n}, \quad i, j = 1, 2, \dots, n \tag{4}$$

$$D = \left[\sum_{j=1}^n m_{ij} \right]_{n \times 1} = [t_i]_{n \times 1} \tag{5}$$

$$R = \left[\sum_{i=1}^n m_{ij} \right]_{1 \times n} = [t_j]_{1 \times n} \tag{6}$$

where D and R denote the sum of rows and the sum of columns, respectively. Finally, a causal and effect graph can be acquired by mapping the dataset of $(D + R, D - R)$, where the horizontal axis $(D + R)$ is made by adding D to R , and the vertical axis $(D - R)$ is made by subtracting R from D .

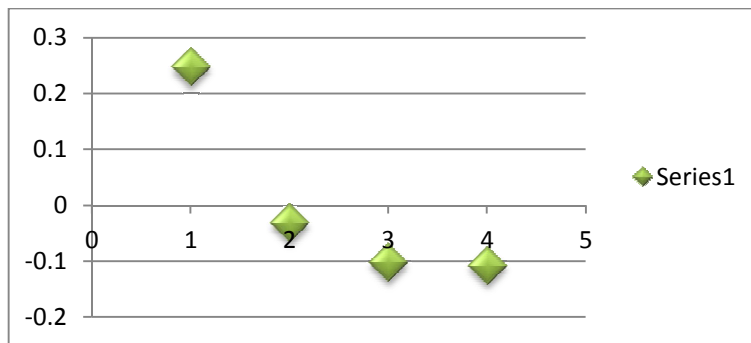
6. Data analysis

Data collected from the experts was analyzed with the DEMATEL method. The degree of central role $(D_x + R_x)$ in DEMATEL represents the strength of influences both dispatched and received. On the other hand, if $(D_x - R_x)$ is positive, then the evaluation criterion x dispatches the influence to other evaluation criteria more than it receives. If $(D_x - R_x)$ is negative, the evaluation criterion x receives the influence from other evaluation criteria more than it dispatched. Total relationships matrices are demonstrated in Tables 2 to Table 6.

The results show Organization Management has great impact on success of GSCM implementation among main aspects.

Table 2. The matrix $X(I-X)^{-1}$ for Main aspect.

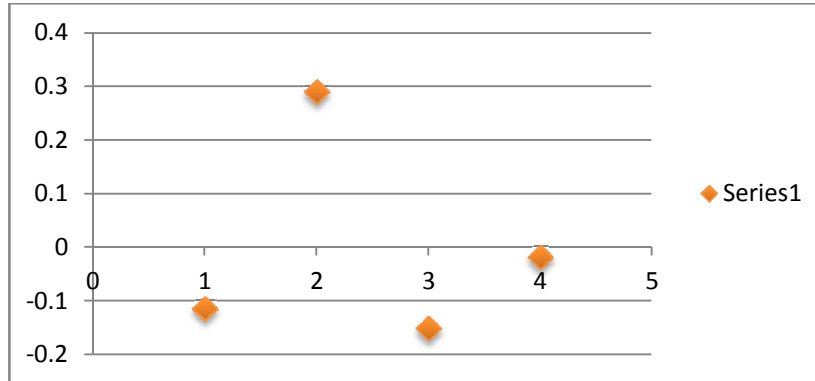
	Organization Management	Organizational Culture	Organizational Structure	Rules and Guidelines	D	D+R	D-R
Organization Management	0.453	0.481	0.521	0.416	1.871	3.496	0.246
Organizational Culture	0.475	0.574	0.216	0.281	1.546	3.125	-0.033
Organizational Structure	0.256	0.199	0.268	0.562	1.285	2.674	-0.104
Rules and Guidelines	0.441	0.325	0.384	0.157	1.307	2.723	-0.109
R	1.625	1.579	1.389	1.416			



Among criteria of Organization Management, Lack of top management support has Great Influence on other criteria.

Table 3.The matrix $X(I-X)^{-1}$ for factor of Organization Management.

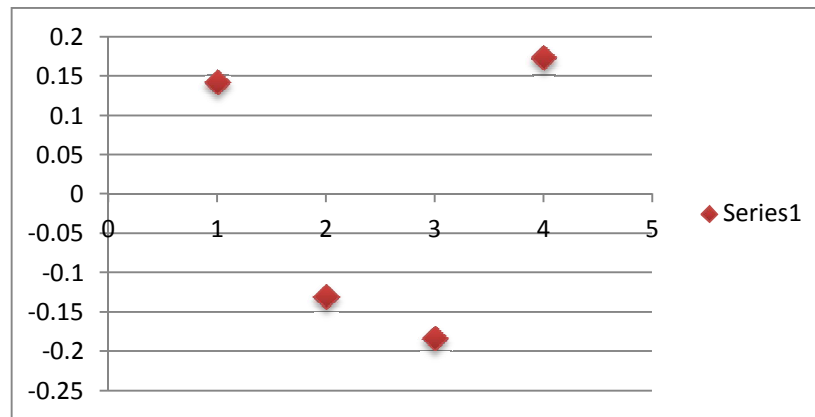
	Instability of the senior management	Lack of top management support	Lack of knowledge and Experience	Employee dissatisfaction	D	D+R	D-R
Instability of the senior management	0.568	0.412	0.458	0.369	1.807	3.73	-0.116
Lack of top management support	0.625	0.365	0.305	0.445	1.74	3.191	0.289
Lack of knowledge and Experience	0.369	0.257	0.357	0.469	1.452	3.057	-0.153
Employee dissatisfaction	0.361	0.417	0.485	0.256	1.519	3.058	-0.02
R	1.923	1.451	1.605	1.539			



Among criteria of Organizational Culture , the lack of incentive legislation for the Green Supply Chain has Great Influence on other criteria.

Table 4.The matrix $X(I-X)^{-1}$ for factor of Organizational Culture.

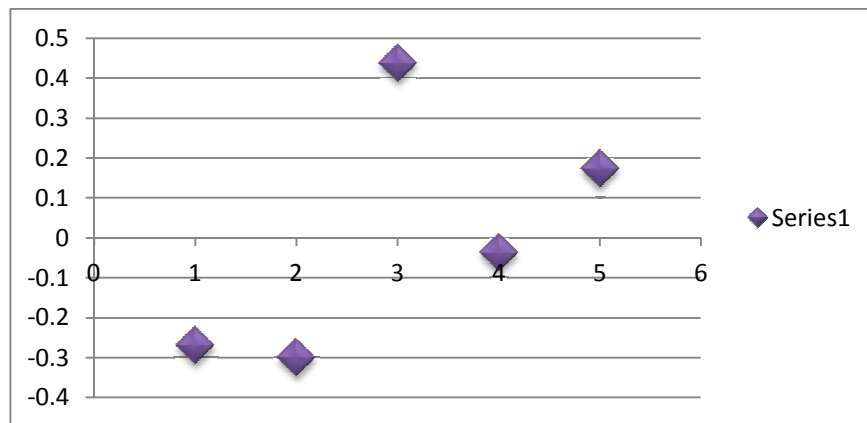
	Poor organizational culture	Lack of green initiatives	Lack of resources	The lack of incentive rules	D	D+R	D-R
Poor organizational culture	0.344	0.524	0.412	0.257	1.537	2.932	0.142
Lack of green initiatives	0.524	0.257	0.452	0.367	1.6	3.331	-0.131
Lack of resources	0.287	0.361	0.415	0.247	1.31	2.804	-0.184
The lack of incentive rules	0.258	0.352	0.452	0.524	1.586	2.999	0.173
R	1.395	1.731	1.494	1.413			



Among criteria of Organizational Structure, Lack of information and data required has Great Influence on other criteria.

Table 5. The matrix $X(I-X)^{-1}$ for factor of Organizational Structure.

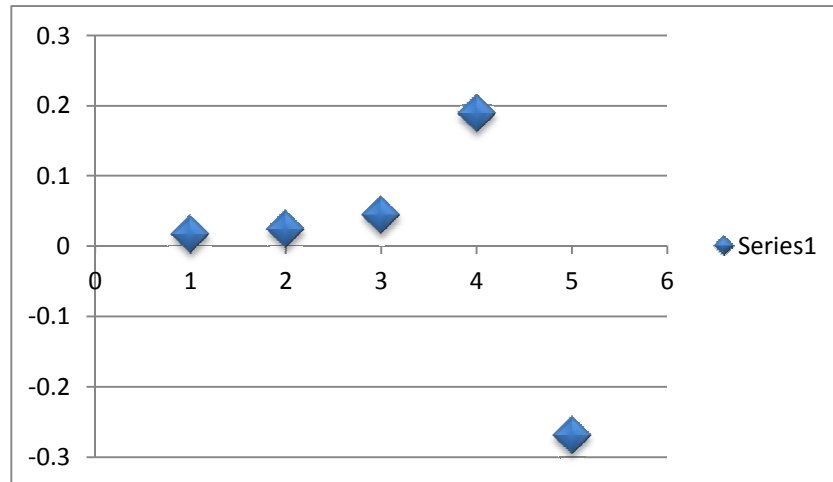
	Uncertainty in the Supply Chain	Lack of technical infrastructure	Lack of information	Lack of communication between members of the supply chain	Attention to short-term profit	D	D+R	D-R
Uncertainty in the Supply Chain	0.314	0.521	0.268	0.336	0.415	1.854	3.978	-0.27
Lack of technical infrastructure	0.287	0.342	0.269	0.645	0.357	1.9	4.101	-0.301
Lack of information	0.447	0.526	0.361	0.452	0.360	2.146	3.855	0.437
Lack of communication between members of the supply chain	0.392	0.441	0.426	0.306	0.520	2.085	4.208	-0.038
Attention to short-term profit	0.517	0.293	0.385	0.462	0.472	2.129	4.086	0.172
R	2.124	2.201	1.709	2.123	1.957			



Among criteria of Rules and guidelines , Lack of supply chain integration has Great Influence on other criteria.

Table 6. The matrix $X(I-X)^{-1}$ for factor of Rules and guidelines.

	Financial implications	lack of government support	Slow Return of Capital	Lack of supply chain integration	Lack sustainable of GSCM Strategies in organizations vision and mission	D	D+R	D-R
Financial implications	0.256	0.514	0.482	0.360	0.287	1.899	3.782	0.016
lack of government support	0.524	0.413	0.288	0.355	0.514	2.094	4.165	0.023
Slow Return of Capital	0.462	0.384	0.185	0.309	0.410	1.75	3.457	0.043
Lack of supply chain integration	0.373	0.446	0.390	0.350	0.419	1.978	3.768	0.188
Lack of sustainable GSCM Strategies in organizations vision and mission	0.268	0.314	0.362	0.416	0.412	1.772	3.814	-0.27
R	1.883	2.071	1.707	1.79	2.042			



7. Conclusion

This research uses the DEMATEL method as the tool that determines the Prioritization and Influence severity of each factor. The results show Organization Management has great impact on success of GSCM implementation among main aspects. Among criteria of Organization Management, Lack of top management support has Great Influence on other criteria. Also, among criteria of Organizational Culture, the lack of incentive legislation for the Green Supply Chain has Great Influence on other criteria. Also, among criteria of Organizational Structure, Lack of information and data required has Great Influence on other criteria. Also, among criteria of Rules and guidelines, Lack of supply chain integration has Great Influence on other criteria.

Handfield et al. (2002) developed a decision model to measure environmental practice of suppliers using a multiattribute utility theory approach. Kainumaa and Tawarab (2006) proposed the multiple attribute utility theory method for assessing a supply chain including re-use and recycling throughout the life cycle of products and services. Handfield et al. (2005) observed the increasing importance of supply-chain strategy as management increasingly adopts environmental practices. Effectively achieving corporate green goals means linking an environmental corporate strategy with every business functional strategy, thus eliminating obstacles to environmental integration. Decision-makers should appropriately modify the contents and aims of environmental practices to match changes in business development. Many companies have just begun exploring environmental concerns and implemented environmentally-friendly activities, so they have not yet identified many environmentally-related factors.

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The Application of Geophysical Methods in Foundation Failure Investigation a Case Study of Metro Hostel, Camp Area, Abeokuta, South Western Nigeria.

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Abstract: This study was carried out to assess the causes(s) of the foundation failure of the Metro Hostel Building opposite Mechanic Village, Camp Area, Abeokuta, Nigeria, using combined geophysical techniques which comprises of Vertical electrical sounding (VES) and Seismic Refraction methods. The major affected structure is a two storey building leaning and having severe foundation based cracks. The PASI – Earth (16 GLN) resistivity meter was used for resistivity data collection and ABEM Terraloc MK -6 Seismograph for velocity data collection. The result of the vertical electrical sounding gives a maximum of three sequences: topsoil, weathered layer (clayey sand/sandy clay) and fractured rock/fresh basement with a maximum value of 10.38 m depth to the basement. The result was complemented and corroborated by seismic refraction method which also gives three main velocity layers with the second layer velocity ranges from 680 and 950 m/s with thickness value ranging from 6.80 – 8.27 m and a total depth -to-bedrock of 10.27 m. The presence of clayey materials identified in the study area posed a threat to three buildings erected. It is concluded from the study that the building structure failed due to incompetent clay layer and improper foundation design on some part of the building which is pronounced by the observed tilting and cracks.

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Keywords: Clayey materials, Foundation failure, Seismic Refraction method, Vertical Electrical Sounding.

1. Introduction

Geophysical data is an important parameter in contributing to the design and construction of Civil Engineering structures such as buildings, roads and dams. Hence, the major considerations in the design of such structures are the pre-construction investigation of the subsoil at the proposed location in order to ascertain the fitness of the host earth materials.

The geophysical methods that suit such investigations are the electrical resistivity, gravity and seismic refraction (Olorunfemi and Meshida, 1987; Olorunfemi et al, 2005; Akintorinwa and Adeusi, 2009; Fatobal et al, 2010; Oyedele et al, 2012 and Coker et al, 2013). The electrical resistivity method is the most commonly used method out of all the geophysical method as it combines speed, accuracy and cost-effectiveness in the localization of faults, fractures, vertical rock contacts, buried metallic pipes and seepage paths.

In this work a combined geophysical method was used that is, electrical resistivity method integrated with seismic refraction method so as to improve the quality of the results. Seismic refraction methods have been extensively used in petroleum,

mineral and engineering investigations and to some extent for hydrologic applications during the past 30 years. Recent advances in equipment, sound sources and computer interpretation techniques make seismic refraction methods highly effective and economical for obtaining data for shallow investigations. This method used a surface technique that can image the subsurface profile in two dimensional (2D) perspectives and reduced the ground damageability thus creating a sustainable environment during the mapping stages. (Abidin et al, 2013).

According to Clayton et al; (1995), although the method requires a ground contact, it remains minimal and damage to the site will normally be negligible. On the basis of this, an integrated method approach was used to investigate the causes(s) of the foundation failure of the buildings in the premises of Metro hostel at Camp area, Abeokuta, South western Nigeria.

2. Study area, Physiographic and Geologic Setting

The study area is located along Abeokuta-Ibadan express way at Camp area, opposite Mechanic village, Abeokuta. The study area (figure 1) lies

between longitude $3^{\circ}43'35''$ and $3^{\circ}43'38''$ E and latitude $7^{\circ}18'57''$ and $7^{\circ}18'60''$ N.

The topography is relatively plain and bounded by a perennial tributary of a swampy area to the southern part of the premises.

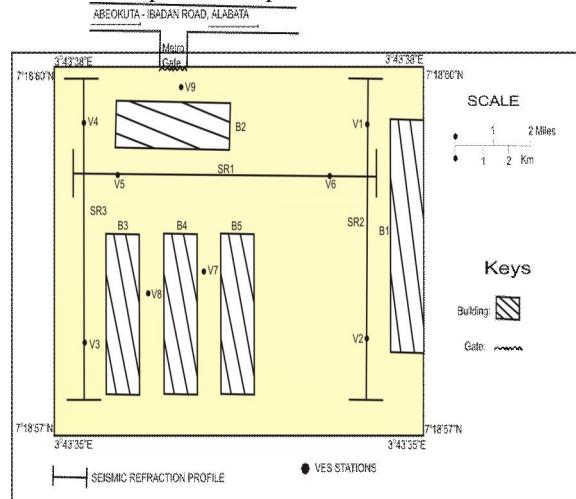


Figure 1: Data Acquisition Map of the Study Area Showing Vertical Electrical Sounding (VES) points and Seismic Refraction Traverses.

The geology of Ogun State comprises sedimentary and basement complex rocks, which underlie the remaining surface area of the state. It also consists of intercalations of argillaceous sediment. The rock is soft and friable but in some places cement by ferruginous and siliceous materials (Badmus and Olatinsu, 2009). The sedimentary rock of Ogun State consists of Abeokuta formation lying directly above the basement complex (figure 2). This in turn is overlain by Ewekoro Oshosun and Ilaro formations, which are all overlain by the coastal plain sands (Benin formation).

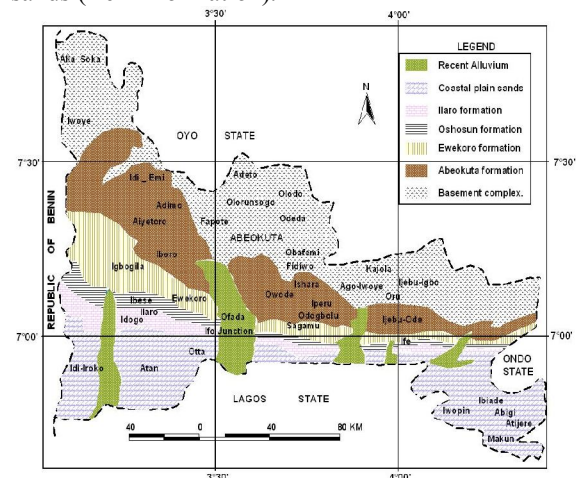


Figure 2: The geological map of Ogun State.

3. Methodology

The methods used involved data acquisition which usually carried out on the field and data processing done in the laboratory or outside the field arena.

Data Acquisition and Processing using Schlumberger Array

In this work the Schlumberger array was employed because it requires less man- power and it is less sensitive to the effects of near surface lateral inhomogeneities than the Wenner arrangement (Roy and Apparao, 1971; Jones, 1985). These advantages bring about a realistic quantitative interpretation of field data obtained.

A rod is hammered into the ground when a site is located, which serves as the mid point from which AB/2 spacing can be measured in both directions by means of measuring tape with respect to the required spacing from 1m to 100m.

The two current (C_1, C_2) and two potential (P_1, P_2) electrodes are now driven down into the ground at the desired spacing as indicated along the measuring tape. The rechargeable 12V battery is connected to a PASI-Earth (16GLN) resistivity meter; also the current and potential electrodes are connected to the Terrameter with the four short cables by their clips to connect the positive and the negative terminals i.e. C_1, C_2 and P_1, P_2 on the terrameter to the two potentials reels and current cables.

AB/2 was measured in both directions from 1.0m to 100m using the base station as the midpoint. Similarly MN/2 was also measured on both sides with values varying from 0.25m to 5m. The number of cycles of averaging desired is then set on the terrameter and the current is turned down to the least ampere value i.e. 0.5 Amps, this passed through the current electrodes into the ground while terrameter is turned on to measures electrical resistance R i.e. the first reading after the measure button has been depressed. Depending on the number of cycles set (say 3), at the end of the third beep the last value of resistance is recorded. After each reading, the current electrodes are moved to a pre-calculated position or electrode spacing before subsequent reading, the potential electrodes are also moved from time to time.

For each electrode combination for which a sounding was made and reading of resistance R of the volume of earth material within the electrical space of the electrode configuration was obtained, a configuration factor G was calculated using equation 1. The product of G and R was then made to obtain the apparent resistivity of the said earth material. This was subsequently done on all the point data obtained

for each VES station to give the set of apparent resistivity values.

Data Acquisition and Processing using Seismic Refraction Method

Seismic refraction method is one of the most effective geological techniques for defining hard rock aquifer, for determine depth-to-bedrock, competence of bedrock, depth to the water table, or depth to other seismic velocity boundaries (North West Geophysical Associates Inc, 2002).

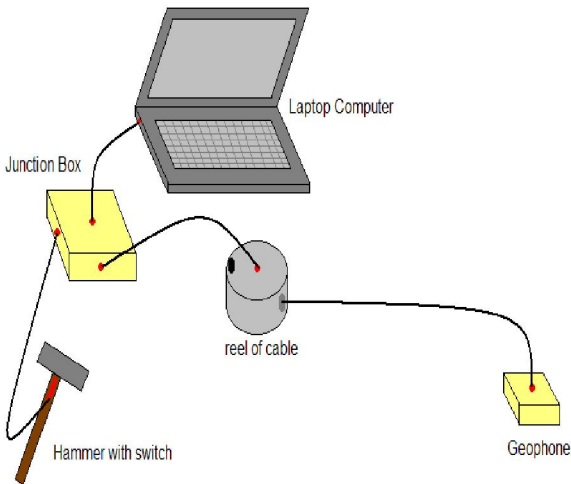


Figure 4: Separate components of the seismic design

To carry out a seismic refraction survey using the designed equipment (Source, Detector and Recorder) above in figure 4, follow these steps: first a survey line needs to be set out. The hammer plate placed at one end. Plug the sledge hammer connector (Source) into the correct socket on the junction box. Plug the output of the junction box into the line in socket on the laptop using the stereo cable. Place the geophone at the smallest separation from the source and secure to the ground using the tent pegs. Connect the reel to a 24 channel of 28Hz vertical geophone (Detector) and the reel to the geophone socket of the junction box. Turn the laptop on and open the goldwave program and create a new file. Turn on the junction box, checking the LED is illuminated.

Now press record on the goldwave program – ABEM Terraloc MK-6 Seismograph (Recorder) and hit the plate with the hammer. After the plate has been struck press stop on the goldwave program and the data collected will have been recorded. You may want to hit the hammer more than once and an average of the first arrival travel times can be taken. Save the file with a name that relates to the geophone position and then move the geophone, open a new file and repeat until data is collected for the whole survey line. The first arrival time data in each

geophone is then plotted in the graphic of relationship between the geophone numbers versus the first arrival time of P-waves for each shooting point. It should be a plot with two straight line sections, the first from the direct wave and the second from the refracted wave. From the graph, the curve of time arrival of each geophone is then picked in order to generate the intercept time graph.

In the picking analysis, the knowledge of the seismic waves propagations are needed in order to differ the arrival waves from the refracted P-wave and the other seismic waves such as Rayleigh waves and S-waves. The final process is calculating the velocity of P-waves and the thickness of each layer in the site. The final result interpretation is displayed using the software program called Pickwin (Pick First Breaks or Dispersion Curves) and Plotrefa (Refraction Analysis, Version 2.73).

4. Results and Discussions

The result of the VES has a maximum three layered type curves. The curve types identified within the study area include H and A type with the H as the predominant curve type. The typical curve types are as shown in figures 5 and 6. Table 1 shows the summary of the VES interpretation.

Discussion on Vertical Electrical Sounding (VES) Results

Beneath VES 1 to 9, Table 1 interpreted in this location, the lithology consists of maximum of three layers: topsoil, weathered layer (clayey sand/sandy clay) and fractured rock/fresh basement.

The topsoil of the lithology has a relatively low resistivity between the range 177 and 356 ohm-m and thickness range of 2.37 to 3.5m, the low resistivity values of the topsoil is attributed to the location found in the swampy area.

The weathered layer ranges from clayey sand and sandy clay of an incompetent materials with a thin thickness of range 4.30 and 7.42m and resistivity of values 147 and 385 ohm-m respectively. The last layer is underlain by fractured basement and fresh basement of resistivity 806-1624 ohm-m with a range of depth to basement values between 6.67 and 10.38m. It should be noted that major parts of the area consist of sandy clay and clayey sand at shallow depths which pose a serious threat to structural work constructed in the area especially on the fractured rock. The buildings (3 numbers of 2 storey's) in that location was found tilted and sinking with many major cracks which resulted to the abandoning of the buildings.

Table 1: Summary of the VES Interpretation Results

1 H	1	177.44	2.58	2.58	Top soil
	2	372.29	5.40	7.98	clayey sand
	3	1624.11	-	-	fresh Basement
2 H	1	318.37	3.54	3.54	Top soil
	2	166.42	6.20	9.74	sandy clay
	3	858.63	-	-	fractured rock
3. A	1	193.92	2.37	2.37	Top soil
	2	385.00	4.30	6.67	clayey sand
	3	806.25	-	-	fractured rock
4 H	1	324.80	3.25	3.25	Top soil
	2	158.00	6.11	9.36	sandy clay
	3	1578.11	-	-	fresh Basement
5 H	1	356.42	2.80	2.80	Top soil
	2	169.31	5.71	8.51	sandy clay
	3	1000.65	-	-	fresh Basement
6 H	1	310.64	3.28	3.28	Top soil
	2	147.25	7.01	10.29	sandy clay
	3	908.90	-	-	fractured rock
7. A	1	207.31	2.61	2.61	Top soil
	2	332.6	5.94	8.55	clayey sand
	3	1008.82	-	-	fresh Basement
8 H	1	276.45	2.96	2.96	Top soil
	2	182.92	7.42	10.38	sandy clay
	3	875.24	-	-	fractured rock
9 H	1	289.45	2.83	2.83	Top soil
	2	157.32	6.50	9.33	Sandy clay
	3	831.96	-	-	Fractured rock

Table 2: Summary of the Seismic Refraction Interpretation Results

Layer	P-wave ms^{-1}	Aver-age Thick-ness (m)	Depth (m)	Lithology
1	320	2.00	10.27	Soil
2	750	8.27		Weathered
3	1450	-----		Saturated Sand and Gravel
1	330	2.30	9.74	Soil
2	680	7.44		Weathered
3	1500	-----		Sandstone
1	390	2.55	9.35	Soil
2	950	6.80		Clay
3	1500	-----		Sandstone

Table 3: Typical primary velocity (V_p) of some of the earth materials

Material / Author	P-wave velocity (m/s)
Soil (Sheriff, 1991 and Reynolds, 1997)	100 to 500
Dry sand and gravel (Sheriff, 1991 and Reynolds, 1997)	450 to 950
Saturated sand and gravel (Sheriff, 1991 and Reynolds, 1997)	1,250 to 1,850
Clay (Sheriff, 1991 and Reynolds, 1997)	900 to 2,700
Sandstone (McCarthy, 2007; Sheriff, 1991 and Reynolds, 1997)	1,500 to 4,000
Shale (McCarthy, 2007; Sheriff, 1991 and Reynolds, 1997)	1,200 to 4,300
Igneous Rock / Hard Rock (Sheriff, 1991 and Reynolds, 1997)	4,500 to 6,000
Weathered, fractured, or Partly decomposed (Peck et al, 1974 and Lee, 2002)	610 to 3048

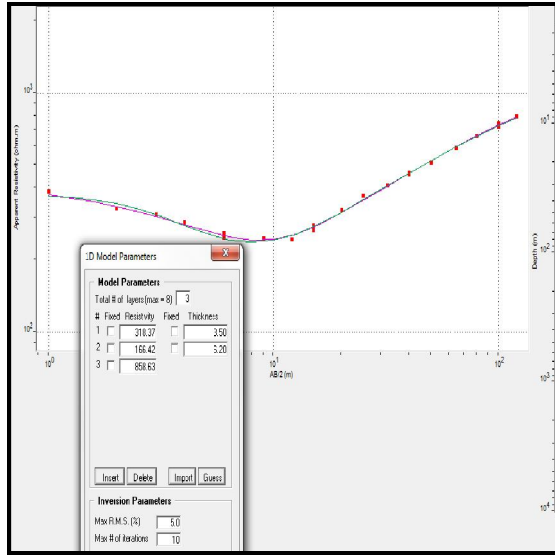


Figure 5: Typical H-Type Sounding Curve

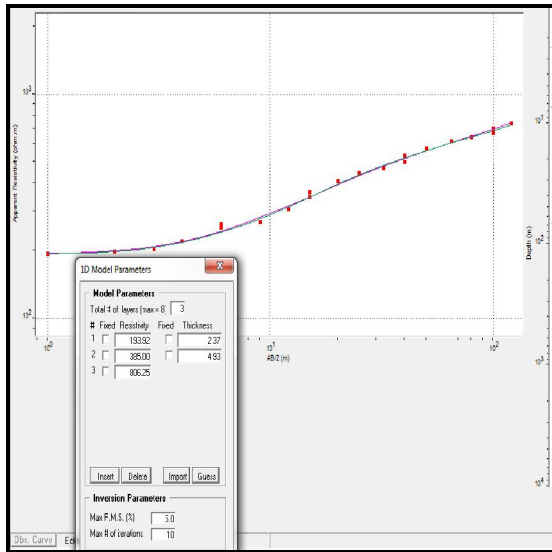


Figure 6: Typical A-Type Sounding Curve

Discussion on Seismic Refraction Method

Seismic refraction method has been extensively used in petroleum, mineral and engineering investigations and to some extent for hydrologic applications, during the past 30 years (Haeni, 1986 and Joshua et al, 2004).

In this research, seismic refraction method was used to corroborate other geophysical methods called Vertical electrical sounding (VES).

Results from profile 1 to 3 (Table 2) gives three major layer of velocity representing three types of geomaterial with different characteristics (figures 7 to 9). The first layer was identified as unconsolidated material of residual soil with some pore/voids within the layer. The topsoil velocity ranged from 320 – 390m/s with a thickness ranging

from 2.00 – 2.55m compared with the thickness of (2.37-3.50m) recorded in electrical resistivity method. Thus both results reliably indicate that this topsoil is very thin.

The Second layer has velocity and resistivity values in the range 680-950m/s and 147-385 Ohm-m respectively. Thus, a low velocity values was identified in this intermediate layer and a fractured/fault is suspected. Both geophysical methods corroborated give an incompetent weathered layer with clayey materials in profile 3 or partly decomposed as interpreted in profiles 1 and 2 according to some authors (McCarthy, 2007; Peck et al, 1974; Lee, 2002; Sheriff, 1991 and Reynolds, 1997) in standard textbooks as shown in table 3.

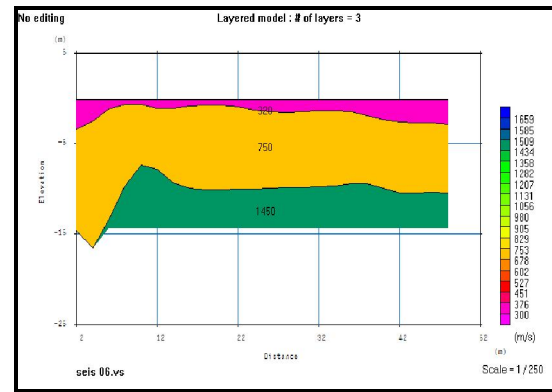


Figure 7: Inverted Seismic Layer for Traverse 1

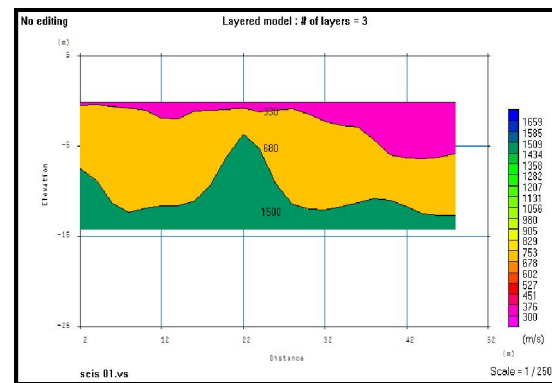


Figure 8: Inverted Seismic Layer for Traverse 2

According to Dearman et al, (1995), major new fractures may form or be extended, incipient fractures may lose tensile strength and the discontinuities rock wall may weaken, leading to reduce shear strength and stiffness. Lee (2002) says the intense rainfall will raise groundwater level rapidly condition to the ground surface and this would result in a sudden increase in pore pressure which would reduce the shearing resistance of geomaterial and finally lead to a failure. The third layer had a velocity ranging from 1450 – 1500m/s

with a maximum depth of 10.27m to the bedrock and was in agreement with 10.38m recorded in electrical survey.

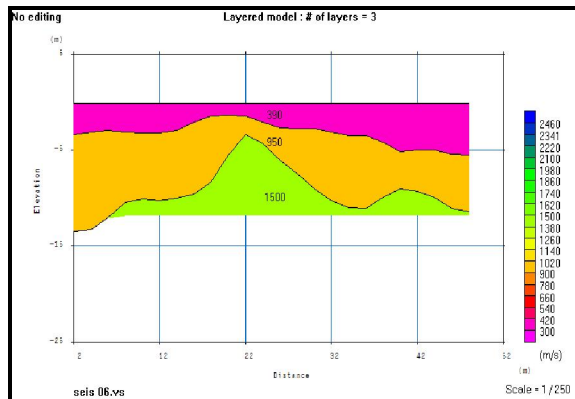


Figure 9: Inverted Seismic Layer for Traverse 3

5. Conclusions

Geophysical investigation involving Vertical Electrical Sounding (VES) and Seismic refraction methods was carried out in the premises of Metro hostel to assess the cause(s) of the foundation failure of the buildings. The geoelectric sections reveal three distinct subsurface layers for both electrical resistivity survey and seismic refraction methods which include the topsoil, the weathered layer and the bedrock.

The topsoil has Seismic P-wave velocity in the range 320 to 390m/s and electrical resistivity from 177 to 356 ohm-m with thickness ranging between 2.00 and 3.50m for both. The second layer is interpreted as the weathered layer with an incompetent clayey material which threatens the buildings sitting on top of the weakened host material pronounced as cracks, leaning and sinking of the buildings.

The third layer resistivity ranges between 806 and 1624 ohm-m interpreted as fractured rock/fresh basement with a shallow depth of value 10.38m to the bedrock corroborated with the seismic refraction method of layer velocity ranges from 1450 and 1500m/s with value 10.27m depth- to- bedrock.

In the light of these results, it becomes clear that the failure of the foundations of the buildings at Metro hostel are due to differential settlement of the suspected incompetent (weak) clay material on which it was located. It is suggested that reinforcement, concrete packing and buttress pillars should be done around the buildings especially in areas with more pronounced subsidence to avoid total collapse. It is thus concluded that the combination of the two methods has reduced the ambiguity inherent in using a single geophysical techniques.

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Monitoring of multi-class pesticide residues in green grape and their potential risk for Egyptian consumer

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Abstract: The residual concentrations of 100 pesticides in 32 fresh grape samples collected from local markets at eight Egyptian governorates during 2011' summer season were monitored based on QuEChERS extraction followed by analysis using liquid chromatography– tandem mass spectrometry (LC-MS/MS) and gas chromatography– tandem mass spectrometry (GC-MS/MS). The potential health risks associated with the exposure to violated pesticides were estimated as well. Mean recoveries ranged between 71 and 96.3%, while the repeatability expressed as relative standard deviation (RSD) was < 19.8%. Limits of quantification (LOQ) was 0.01 mg kg⁻¹, which is equal or below the Maximum Residue Limits (MRLs). Of the analysed samples, 81.25% contained detectable residues, of which 21.88% exceeded their MRLs. Out of 35 pesticides that were detected in grape samples, carbendazim, acetamiprid, boscalid, λ -cyhalothrin, profenofos and pyraclostrobin were the most frequently pesticides detected. No residues of organochlorine pesticides and their metabolites were detected in any analysed samples. This study showed also that the estimated daily intake (EDI) of the violated pesticides by the Egyptian population through the consumption of grape did not exceed the toxicological acceptable level.

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Key Words: Pesticide residues, QuEChERS, grape, estimated daily intake.

1.Introduction

Grape is a nutritionally important fruit crop of international trade significance and consumed both as fresh and processed products (Sinha *et al.*, 2012). It receives frequent application of a huge number of pesticides throughout the cropping season to control a variety of pests. As a result, considerable amounts of harmful pesticide residues often remain in the harvested grape, which may ultimately reach the consumer and slowly cause healthy hazards. The periodical monitoring of pesticide residues in marketed grape has an important role to play by: a) providing data on the pesticide residues status of the fresh produce supply. b) checking on pesticide use by growers, c) checking on compliance with good agricultural practice in the use of pesticides. d) take appropriated advisory or regulatory actions to ensure excessive residues do not recur (Dogheim *et al.*, 1999; Eissa, 2005).

Accordingly, there is a need for rapid, feasible, eco-friendly and reliable analytical technique to analyze pesticides residual levels in grape. Nowadays, the most universal extraction method to analyze a wide range of pesticides is the QuEChERS method which stands for quick, easy, cheap, efficient, rugged and safe. This method was first introduced by Anastassiades *et al.*, (2003). The increase of fruit and vegetable intake contributes to

the prevention of chronic diseases, but could also significantly increase pesticide exposure and may thus be of health concern (Drouillet-Pinard *et al.*, 2011). The effects that result from long-term exposure to low doses of pesticide residues in food are hard to distinguish, detect and quantify. Thus, risk assessment is necessary in order to ascertain the effects due to regular intake of pesticide residues in food (Darko and Akoto, 2008). A causal link between chronic exposure to pesticides and their possible health effects is difficult to establish because consequences appear years after a generally intense exposure or after repeated low-intensity exposures over many years (Multigner, 2005). Current standardized methods of dietary risk characterization for consumers are based on the comparison of exposure data with toxicological reference values that vary widely from one pesticide to another (European Commission, 2010). Similarly, for a given pesticide, dietary exposure greatly depends on the population diet and on residue levels in food, closely correlated to agricultural practices (FAO/WHO, 2008). If potential exposure of consumers to pesticide residues is below the relevant health-based guidance value (acute reference dose ARfD and acceptable daily intake ADI, for acute and chronic exposure, respectively), the use of that pesticide in crop protection is considered acceptable (WHO, 1997;

Boobis *et al.*, 2008). Dietary risk assessment of exposure to pesticide residues is traditionally performed for single compounds (Boon *et al.*, 2008).

Therefore, the aim of this study was to monitor pesticide residues in fresh green grape samples collected from local markets in eight Egyptian governorates during 2011' summer season, and to estimate the potential health risks associated with intakes of each violated pesticide residue on grape.

2. Material and Methods:

2.1. Pesticides and chemicals:

Certified reference standards of pesticides were of >98% purity and purchased from Dr. Ehrenstorfer GmbH (Augsburg, Germany). The selected pesticides included most of the insecticides, fungicides and herbicides, which are currently recommended in Egyptian agriculture as well as those, which require monitoring in samples for export. A total of 100 pesticides were thus initially considered for this study, out of which 76 pesticides were analysed using LC-MS/MS (i.e., abamectin, acetamiprid, atrazine, azoxystrobin, benalaxyl, boscalid, bromacil, bupirimate, carbaryl, carbendazim, chlorfluazuron, chlorpyrifos, cyfluthrin, cypermethrin, cyproconazole, cyprodinil, cyromazine, deltamethrin, diafenthiuron, diazinon, difenoconazole, dimethoate, dimethomorph, diniconazole, emamectin, ethion, ethirimol, famoxadone, fenarimol, fenhexamid, fenitrothion, fenpropathrin, fenpyroximate, flusilazole, flutolanil, hexaconazole, hexythiazox, imazalil, imidacloprid, indoxacarb, kresoxim-methyl, lufenuron, malaoxon, malathion, metalaxyl, methamidophos, methomyl, methoxyfenozide, myclobutanil, omethoate, oxamyl, penconazole, permethrin, phenthoate, phosalone, piperonyl butoxide, profenofos, promecarb, propamocarb hcl, propargite, propiconazol, pyraclostrobin, pyridaben, pyriproxyfen, spinosad, spiroticlofen, tetraconazole, thiabendazole, thiacloprid, thiamethoxam, thiobencarb, thiophanate-methyl, tolylfluanid, triadimenol, trifloxystrobin and triticonazole), while the remaining 24 pesticides were analysed using GC-MS/MS (i.e., atraton, bifenthrin, biphenyl, bromopropylate, cadusafos, captan, chlorfenapyr, chlorothalonil, chlorpropham, λ -cyhalothrin, *p,p*'-DDD, *p,p*'-DDE, *p,p*'-DDT, dicofol, fludioxonil, α -HCH, β -HCH, δ -HCH, γ -HCH (lindane), heptachlor, iprodione, ortho phenylphenol (OPP), procymidone and sulfur). All other HPLC-grade organic solvents and chemicals were purchased from standard commercial suppliers.

2.2. Sampling:

A total number of 32 green grape samples were collected four times biweekly from local markets in eight Egyptian governorates (i.e., Cairo,

Giza, Kalyobiya, Gharbiya, Sharkiya, Fayoum, Minufiya and Ismailia) during 2011' summer season. Actually, four local fruit markets were selected from each governorate. The samples from each market were collected separately in four packets of approximately 500 g each. The composite samples were prepared by the systematic mixing of the four packets and transferred into the jar of the blender and homogenized for 3 min., then accurately weighed 10 g of homogenized samples from each governorate were extracted.

2.3. Extraction and clean up:

Pesticides were extracted from grape using QuEChERS method. In this method ten grams of grape samples were weighed in a 50-ml PFTE tube, and 10 ml of acetonitrile was added and shaken vigorously for one minute. After addition of 4g of magnesium sulfate, 1g of sodium chloride and buffering citrate salts (pH 5 to 5.5), the mixture was shaken intensively and centrifuged at 4000 rpm for 5 minutes for phase separation. An aliquot of the organic phase was injected directly to LC-MS/MS system for analysis.

Another aliquot of the organic phase was cleaned-up by dispersive solid phase extraction (D-SPE) employing bulk sorbents as well as magnesium sulfate for the removal of residual water. Following cleanup with primary secondary amine sorbent (PSA) extracts were evaporated and redissolved in injection standard for GC-MS/MS analysis. Quantification was performed using aldrin as an internal standard, which was added directly before injection in GC-MS/MS system.

2.4. Determination:

2.4.1. LC-MS/MS analysis:

An Agilent 1200 series liquid chromatograph system equipped with Applied Biosystems (API 4000 Qtrape & API 5500 Qtrape) tandem mass spectrometers with electrospray ionisation (ESI) interface was used. Separation was performed on a C18 column ZORBAX Eclipse XDB-C18 4.6 mm x 150 mm, 5 μ m particle size. The injection volume was 25 μ l. A gradient elution program was at 0.3 ml/min flow rate, in which one reservoir contained 10 mM ammonium formate solution in MeOH:H₂O (1:9, v/v) and the other contained methanol. The ESI source was used in the positive mode, and Nitrogen was used as nebulizer gas, curtain gas, heater gas and collision gas according to manufacturer's settings; source temperature was 300°C, ion spray potential 5500 V, decluster potential and collision energy were optimized using a Harvard apparatus syringe pump. The Multiple Reaction Monitoring mode (MRM) was used in which one MRM was used for quantitation and other was used for confirmation.

2.4.2. GC-MS/MS analysis:

Agilent Gas Chromatograph 7980A equipped with tandem mass spectrometer 7000B Quadrupole, EI source was used to perform analysis by using HP-5MS 5% phenyl methyl siloxane capillary column (30 m length x 0.25 mm id x 0.25 µm film thickness). Samples were injected in a splitless mode and helium was used as carrier gas (1 ml/min). Injector temperature was 250°C, transfer line temperature was 285°C, ion source temperature was 280°C and quadrupole temperature was 150°C. The GC oven temperature was programmed to initially held at 70°C for 2 min then increased to 150°C at 25°C/min (held for 0 min), and raised to 200°C at the rate of 3°C/min (held for 0 min), then went up from 200 to 280°C at 8°C/min (held for 10 min). This resulted in a total run time of 42 min and complete separation of all the analytes.

2.5. Quality assurance:

Analytical method and instruments were fully validated as part of a laboratory quality assurance system and were audited and accredited by the Centre for Metrology and Accreditation, Finnish Accreditation Service (FINAS), Helsinki, Finland. This quality system is referred to as SFS-EN ISO/IEC 17025:2005. Recovery study was performed in triplicates, by adding known quantities of pesticide standard solutions to aliquots of 10 g of homogenized grape (grapes grown without application of any pesticide). The samples were then analysed according to the aforementioned method in order to calculate the extraction efficiency. The average recoveries of the tested compounds in grape samples varied between 71 and 96.3%. The repeatability expressed as relative standard deviation (RSD) was <20%, while the limits of quantification (LOQ) was 0.01 mg kg⁻¹, which is equal or below the Maximum Residue Limits (MRLs). The measurement uncertainty expressed as expanded uncertainty (at 95% confidence level) was found to be within the range of ± 30%.

3. Results and discussion:

3.1. Monitoring of multi-class pesticide residues in fresh grape:

The pesticides included in this analytical scope were prioritized in relation to their high frequency of application, high toxicity and detection in previous monitoring programs. Moreover, most of the pesticides identified as those that are commonly in use were included. Of the analysed samples, 81.25% contained detectable residues, of which 21.88% exceeded their Maximum Residue Limits (MRLs). The violated pesticides were chlorfluazuron, difenoconazole, dimethoate, λ-cyhalothrin, methamidophos, omethoate, profenofos and pyraclostrobin (Table 1).

Out of 35 pesticides that were detected in grape samples, carbendazim, acetamiprid, boscalid, λ-cyhalothrin, profenofos and pyraclostrobin were the most frequently pesticides detected. Among the detected residues, fungicides effective against grey mould, powdery mildew and downy mildew, followed by the insecticides were prevailed. Fungicides represent one of the most relevant groups of pesticides applied to vineyards. Most of the concentration levels found for the pesticide residues were below MRLs, thus causing no problems in terms of food safety. It is also observed that 15 from the detected pesticides were not registered on grape, and these pesticides were acetamiprid, chlorpyrifos, cypermethrin, deltamethrin, diazinon, dimethoate, chlorfluazuron, fenarimol, fenpropathrin, imidacloprid, λ-cyhalothrin, lufenuron, methomyl, methoxyfenozide and profenofos. In addition, three from the detected pesticides were found to be not registered in Egypt. Since the use of methamidophos, hexaconazole and triadimenol is no longer authorized in Egypt, it is recommended to check the possible misuse of the product containing these pesticides at national level.

Multiple residues are expected on grape because various classes of pesticides must be alternated to prevent resistance developing in the pests. The presence of pesticide residues in the marketed fresh grape may be attributed to the excessive use of pesticides on grape for which they were either registered or not registered; disregard of recommended preharvest intervals (PHI); in addition, applied rates often exceeded manufacturers recommendations in the belief that more is better for pest control (Eissa, 2005). It might also be notice that farmers literacy rate is very low which lead to the improper and non-judicious use of pesticides, whereas the majority of the farmers relied on pesticides seller or on their own experiences, and little of them give attention for extension officers or reading written directions on the package (Bhanti *et al.*, 2004).

The results of the current study, in which no residues of organochlorine pesticides such as DDT, HCH, and their metabolites were detected in any analysed samples, were comparable with the results of Dogheim *et al.*, (2001). Comparing our findings with those found by Doghiem *et al.*, (2002), revealed that the percentages of the contaminated and violated samples of grape increased from 39.3 and 8.2% in 1997 to 81.25 and 21.88% in the current study, respectively. The results of the current study mainly correspond with the outcomes of other authors. A liquid chromatography–electrospray ionization–tandem mass spectrometry (LC–ESI–MS–MS) was used for the analysis of 10 multi-class pesticides

residues (imidacloprid, thiamethoxam, chlorpyrifos, dimethoate, monocrotophos, metalaxyl, methomyl, hexaconazole, myclobutanil and carbendazim) in fresh grape samples collected from an agricultural area in Hyderabad, South India. The results revealed that the concentrations of studied pesticide residues in grape samples were in the permissible limits except monocrotophos (Venkateswarlu *et al.*, 2007). The residues of cypermethrin, permethrin, chlorpyrifos, metalaxyl and etophenprox were detected in grape samples collected from farm-gates and local markets of Pune district, India at below

MRLs (Dasgupta *et al.*, 2010). 13.3% of grape samples collected from Xiamen, China, during the October 2006 to March 2009 monitoring campaign contained pesticide residues (i.e., chlorpyrifos, cyfluthrin, cypermethrin, deltamethrin, dichlorvos, fenvalerate, omethoate and methamidophos) exceeding the MRLs (Chen *et al.*, 2011). The residues of chlorpyrifos were detected in 40% of grape samples harvested directly from five different farms of Nashik, India and the concentrations were below the respective EU-MRL (Banerjee *et al.*, 2013).

Table (1): Pesticide residues detected in 32 grape samples collected from local markets located in eight Egyptian governorates during 2011' summer season.

Contaminated samples (n=32)		Detected pesticides	Pesticide level (mg/kg)		Mean mg/kg	Frequency		MRLs (mg/kg)	No. of violated compound		No. of violated samples	
No.	%		Min. mg/kg	Max. mg/kg		No.	%		No.	%	No.	%
26	81.25	Acetamiprid	0.01	0.31	0.0771	7	21.88	0.5			7	21.88
		Azoxystrobin	0.11	0.22	0.165	2	6.25	2				
		Boscalid	0.01	1.13	0.386	7	21.88	5				
		Carbendazim	0.05	2.86	0.883	13	40.63	3				
		Chlorfenapyr	0.01	0.01	0.01	1	3.13	0.05 *				
		Chlorfluazuron	0.02	0.02	0.02	1	3.13	0.01 *	1	100		
		Chlorpyrifos	<LOQ	0.04	0.02	5	15.63	0.1				
		Cypermethrin	0.02	0.16	0.076	5	15.63	0.2				
		Cyprodinil	0.02	0.1	0.06	2	6.25	3				
		Deltamethrin	0.04	0.04	0.04	1	3.13	0.2				
		Diazinon	0.01	0.01	0.01	1	3.13	0.01 *				
		Difenoconazole	0.33	0.33	0.33	1	3.13	0.1	1	100		
		Dimethoate	0.05	0.05	0.05	1	3.13	0.02 *	1	100		
		Diniconazole	0.01	0.01	0.01	1	3.13	0.2 *				
		Fenarimol	<LOQ	<LOQ	<LOQ	1	3.13	0.3				
		Fenhexamid	0.04	0.05	0.045	2	6.25	15				
		Fenpropathrin	<LOQ	1.52	0.433	5	15.63	5				
		Fludioxonil	0.07	0.07	0.07	1	3.13	2				
		Flusilazole	<LOQ	0.02	0.02	2	6.25	0.2				
		Hexaconazole	<LOQ	<LOQ	<LOQ	1	3.13	0.1				
		Imidacloprid	0.1	0.1	0.1	1	3.13	1				
		Iprodione	0.01	0.8	0.413	4	12.5	10				
		λ -cyhalothrin	<LOQ	0.26	0.078	7	21.88	0.2 *	1	14.28		
		Lufenuron	<LOQ	<LOQ	<LOQ	1	3.13	1 *				
		Metalaxyl	<LOQ	0.01	0.01	3	9.37	1				
		Methamidophos	0.49	0.49	0.49	1	3.13	0.01 *	1	100		
		Methomyl	0.09	0.14	0.115	2	6.25	0.3				
		Methoxyfenozide	0.01	0.17	0.06	4	12.5	1				
		Myclobutanil	<LOQ	0.11	0.06	3	9.37	1				
		Omethoate	0.05	0.05	0.05	1	3.13	0.02 *	1	100		
		Penconazole	<LOQ	<LOQ	<LOQ	1	3.13	0.2				
		Profenofos	<LOQ	0.4	0.178	7	21.88	0.05 *	3	42.86		
Pyraclostrobin	0.01	2.09	0.655	6	18.75	2	1	16.67				
Sulfur	0.01	0.69	0.33	4	12.5	N.S.						
Triadimenol	0.03	0.03	0.03	1	3.13	2 *						

The limit of quantification (LOQ) was 0.01 mg kg⁻¹. MRLs: Maximum Residue Limits According to Codex Alimentarius Commission (FAO/WHO, 2004) and * for European Union MRLs (EU MRLs) N.S. means MRL has not been established.

3.2. Estimated daily intake of violated pesticides:

The results of the monitoring in combination with food consumption data were taken into consideration to evaluate whether the estimated daily intake (EDI) of violated pesticides through grape consumed by the local inhabitants is a cause of toxicological concern according to the recommended dose by the FAO/WHO. The calculated daily intakes were obtained by multiplying the mean concentrations of violated pesticides detected and the amount of grape consumed based on WHO/Global Environment Monitoring System-Food Contamination Monitoring and Assessment Program average consumption cluster C diets (WHO/GEMS/FOODS, 2006). The long-term risk assessments of the intakes compared to the pesticide toxicological data were performed by calculating the hazard index (HI), by dividing the estimated daily intake with the relevant acceptable daily intake (ADI) (EFSA, 2007).

The estimated daily intakes (EDIs) ranged from 0.18% of the ADI for chlorfluazuron to 2.26% of the ADI for dimethoate and 7.53% of the ADI for omethoate. The most critical pesticide is methamidophos, contributing 22.13% to the hazard index (HI) (Table 2). The results show that despite a high occurrence of pesticide residues in grape, it

could not be considered a serious public health problem.

In other words, an exposure assessment, based on pesticide residues levels detected in the grape analysed in this study, confirms that the intake of the violated pesticides through grape consumption in Egypt does not represent a health risk to consumers, i.e., the estimated daily intake (EDI) is less than the acceptable daily intake (ADI). Česnik *et al.*, (2008) analysed 47 grape samples at harvest from Slovenia for the presence of 67 pesticides by gas chromatography-mass spectrometry (GC-MS). Results revealed that folpet (97.9%), cyprodinil (51.1%), dithiocarbamates (44.7%), chlorothalonil (23.4%), chlorpyrifos (19.1%) and pyrimethanil (14.9%) were the most frequently found pesticides in grapes. Risk assessment showed also that the exceeded concentrations of cyprodinil and fludioxonil did not represent any risk for consumer's health (the national estimate of short-term intake as a percentage of the acceptable daily intake was below 100%). On the contrary to our results, Sinha *et al.*, (2012) showed that chlorpyrifos, triazofos, imidacloprid, fenitrothion and quinalphos were detected in all the samples of grapes collected from Hyderabad, India, and people eating grapes are at high risk due to exposure to these pesticides.

Table 2: Estimated daily intakes (EDIs) of violated pesticides residues found in grape.

Pesticides	Mean Conc. (mg/kg)	EDI (mg/kg body weight)	ADI (mg/kg)	Hazard index (EDI as a % of ADI)
Chlorfluazuron	0.02	9.03333E-06	0.005	0.180666667
Difenoconazole	0.33	0.00014905	0.01	1.4905
Dimethoate	0.05	2.25833E-05	0.001	2.258333333
λ-cyhalothrin	0.078	0.00003523	0.005	0.7046
Methamidophos	0.49	0.000221317	0.001	22.13166667
Omethoate	0.05	2.25833E-05	0.0003	7.527777778
Profenofos	0.178	8.03967E-05	0.03	0.267988889
Pyraclostrobin	0.655	0.000295842	0.03	0.986138889

Grape food consumption 27.1 g/person/day; Body weight 60 kg

It should be emphasized that dietary pesticide intakes estimated in this study considered only exposures from grape and did not include other food products such as vegetables, fruits, grains, dairy, fish, and meats. As such, estimates are not considered as total dietary exposure to the pesticides, nor do we consider drinking water, residential, or occupational exposures. It should also be noted that not all registered pesticides in Egypt were measured in this study due to budget constraints. Therefore, it is an underestimation of the total exposure of pesticides studied. On the other hand, processing factors were ignored, resulting in an overestimation of the actual exposure to pesticide residues.

4. Conclusions

It could be concluded that the use of permitted pesticides, the consideration of pesticide concentrations and the pre-harvest interval importantly diminish the health risk for consumers. The data suggest the need for regular monitoring of the pesticide residue levels in marketed fruits, which should be extended periodically and the number of samples analysed per item needs to be increased for a better representation of contamination in the markets. Although the consumption data used here is the most updated available, there is a need for data which reflects real food consumption patterns in Egypt. The

effect of grapes washing as the standard procedure before consumption on the residue concentration is required to assess real consumer exposure.

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Drought Monitoring over Egypt by using MODIS Land Surface Temperature and Normalized Difference Vegetation Index

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Abstract: Drought is a serious climatic condition that affects nearly on all climatic zones worldwide, with semi-arid regions being especially susceptible to drought conditions because of their low annual precipitation and sensitivity to climate changes. In the present work, we use the Vegetation Health Index (VHI) as drought indices to monitoring the drought over Egypt. The Moderate Resolution Imaging Spectrometer (MODIS) on the terra satellite has been used the normalized difference vegetation index (NDVI) and land surface temperature (LST) to calculate the Vegetation Condition Index (VCI), Temperature Condition Index (TCI) and vegetation health index (VHI) over Egypt, for the seasons from 2000/2001 to 2010/2011. The time series of (VCI) and (TCI) show that; in certain years they were corresponded to each other, while in other years they were one counter the other and their resultant determined the occurrence and severity of drought, which is reflected in the Vegetation Health Index (VHI). The results show that; the effect of drought on vegetation varies noticeably between areas, a pattern that is determined mainly by the location of land-cover types. The drought frequency increased during the last four years. The agricultural seasons 2000/2001 and 2010/2011 were the highest agricultural area affected by high drought while the 2006/2007 was the lowest agricultural area affected by high drought.

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Keywords: drought, Vegetation MODIS, NDVI, VHI, VCI and TCI

Introduction

Drought is a slow-onset natural disaster, an insidious and creeping phenomenon which occurs in virtually all climatic regimes. Drought is also related to the timing and the effectiveness of the rains, thus, each drought year is unique in its climatic characteristics and impacts. And also Drought is a major nature hazard affecting large areas and millions of people every year. Drought can be described by three characteristics: intensity, duration and spatial coverage (Wilhite and Glantz 1985, American Meteorological Society 1997). Intensity refers to the degree of precipitation shortfall and is closely linked to duration in the determination of its impacts. To some extent, drought occurs with uncertainty at a micro-scale, and drought occurrence sites vary from time to time when studying spatial distributions of drought (Wang and Wei 1998). Meteorologically based drought monitoring refers to point-based analyses, which might include simple presentations of specific events relative to their long-term historical averages (often denoted as 'normal'). The point-based drought indices have been used extensively for monitoring drought and for making operational water

management decisions. Regional drought assessment is conventionally based on drought indices for the identification of drought characteristics, such as its intensity or severity, duration and its areal extent. Drought indices are mainly special combinations of indicators which are based mainly on meteorological and hydrological data. A complete analysis of drought indices is provided by Hayes (2004) and Wilhite (2005), give a comprehensive overview of the drought indices. Drought impacts are usually first apparent in agriculture. Agriculture production is closely linked to actual crop evapotranspiration, which is usually monitored by the water balance of the whole crop growing cycle. Therefore, a drought index, which closely describes temporal and spatial variations of crop water use status, is suitable for monitoring drought. Satellite remotely sensed data offer considerable advantages and should be an integral part of drought monitoring, especially for the temporal and spatial evolution of drought. Since 1981, Advanced Very High Resolution Radiometer (AVHRR) data collected from the National Oceanic and Atmospheric Administration (NOAA) series of satellites have been used to generate vegetation

indices such as the Normalized Difference Vegetation Index (NDVI) and to retrieve Land Surface Temperature (LST). NDVI not only maps the presence of vegetation on a pixel basis, but also provides the density of vegetation within a pixel. LST is a good indicator of the energy balance at the Earth's surface because it is one of the key parameters in the physics of land-surface processes on regional and global scales. AVHRR NDVI was applied successfully to classify land vegetation types (Menenti *et al.* 1993), and monitor vegetation growth conditions from excellent to stressed (Kogan 1990, Prince 1991). A successor to AVHRR is the MODIS (Moderate Resolution Imaging Spectroradiometer) instrument, an advanced narrowband- width sensor, from which composited reflectance data are made available at no cost every 8 days by NASA and USGS, through the Earth Resources Observation Systems (EROS) data center (Justice and Townshend 2002a). The MODIS remotely sensed data can be used to produce NDVI imagery at 250m resolution, and to retrieve LST at the global scale (Wan and Li 1997). NDVI and/or LST time series plots have been used to identify and monitor drought evolution (Kogan 1995, Chen *et al.* 1994, Lozano-Garcia *et al.* 1995, Liu and Kogan, 1996). Liu and Ferreira (1991) reported a good correlation between monthly total rainfall and monthly cumulative NDVI with a time lag of one month. The combination of NDVI and LST has provided better understanding of drought events with their close inter-relations with surface drought status. The objective of this study is to monitoring the agriculture drought over Egypt by using Vegetation Health Index (VHI) indices during the period from 2001 to 2011 for months from October to May.

The Study Area

Egypt lies primarily between latitudes 22° and 32°N, and longitudes 25° and 35°E, and the country's maximum distances are 1,024 km from north to south, and 1,240 km from east to west. Egypt is boarded by the Mediterranean Sea to the north, by Sudan to the south, by the Red Sea, Palestine to the east, and by Libya to the west.

The total area of Egypt is 1,001,450 km², with a land area of 995,450 km² and a coastline of 3,500 km on the Mediterranean and the Red Sea. The surface level extremes range from 133 m below sea level in the Western Desert to 2,629 m above sea level in Sinai Peninsula. The general climate of Egypt is dry, hot, and desertic, most of Egypt's rain falls in the winter months. South of Cairo, rainfall averages only around 2 to 5 mm per year and at intervals of many years. On a very thin strip of the northern coast the

rainfall can be as high as 410 mm, mostly between October and April.

Data and Method

The 16-day composite NDVI product is based on MODIS Terra surface reflectance corrected for molecular scattering, ozone absorption and aerosols, and adjusted to nadir and standard Sun angles with the use of the Bidirectional Reflectance Distribution Function (BRDF) models (Van Leeuwen *et al.* 1999). The Land Surface Temperature (LST) product is generated from MODIS data every 8-day including geolocation, calibrated radiance, cloud masking, atmospheric temperature and water vapour (Wan and Li 1997).

Tucker (1979) used NDVI as an index of vegetation health and density (Thenkabail and Gamage *et al.* 2004).

NDVI has been used to detect drought in various parts of the world in the recent decades. Normalized difference vegetation index (NDVI), taking the ratio between the difference between the Near-Infrared Radiation (NIR) and Visible Red Radiation and their sum.

$$NDVI = \frac{(NIR - Red)}{(NIR + Red)} \quad (1)$$

The Vegetation Condition Index (VCI), the Temperature Condition Index (TCI), and the Vegetation Health Index (VHI) have been developed further using the following equations as:

$$VCI_j = \frac{(NDVI_j - NDVI_{min})}{(NDVI_{max} - NDVI_{min})} * 100 \quad (2)$$

$$TCI_j = \frac{(LST_{max} - LST)}{(LST_{max} - LST_{min})} * 100 \quad (3)$$

$$VHI = 0.5 * VCI + 0.5 * TCI \quad (4)$$

Where NDVI, NDVI_{min}, and NDVI_{max} are the monthly average of smoothed NDVI, its multiyear absolute minimum and its maximum respectively; LST, LST_{min}, and LST_{max} are similar values for temperature (Kogan, 2001). For the present study, NDVI and LST data for the months from October to May of 11 seasons from 2000/2001 to 2010/2011 have been used. Both indices characterize the status of crop development. The first index (VCI) is based on the relation between the actual value of NDVI and the values of NDVI that represent the best (NDVI_{max}) and the worst (NDVI_{min}) crop growing conditions for 11 seasons. The second index (TCI) represents the relation between the actual value of temperature and the temperature that occurred for the potential (LST_{min}) and stress (LST_{max}) crop conditions within the same period.

Results and Discussion

The Vegetation Healthy Index (VHI) as drought index has been calculated from October to May months for the seasons from 2000/2001 up to 2010/ 2011. The analysis illustrated the drought variability spatial distribution in time and space. The main drought classes are as follows: Extreme Drought (0-10%), High Drought (10-20 %), Moderate Drought (20-30%), Slight Drought (30-40%) and No Drought (> 40%). The distributions of eight months from October to May during the period from 2000/2001 to 2010/2011 have been shown in figure (1) for illustration. The effect of drought on December month among all studied seasons was very low except at 2004, where its effect was high compared by other years, while the effect of drought on May month was ranged from moderate to extreme drought during all seasons except at 2006 and 2011, where those effects were very low. Also it's observed that, the effect of drought at 2010 was very high among all months while it was low effect at 2006. The extreme drought was most effect in the years 2001 during the months from January. to May, 2008 in November and from March to May, 2009 in October., January., February and April, and 2010 in October, November, January, February and April. The seasonal Vegetation Health Index (VHI) over Egypt during the seasons from 2000/2001 to 2010/2011 has been shown in figure (2) for illustration. The agricultural seasons 2003/2004, 2005/2006 and 2006/2007 were the best season compared by other seasons. The drought frequency increased during the last four years. The total agricultural area affected by drought during study period has been shown in figure (3) according to its classified. It has been found that, the season 2006/2007 has the highest agricultural area not affected by the drought while season 2009/2010 has the lowest agricultural area not affected by the drought figure (3 A). The agricultural season 2004/2005 has the highest agricultural area affected by low drought while season 2009/2010 has the lowest agricultural area affected by low drought figure (3 B). The agricultural season 2008/2009 has the highest agricultural area affected by moderate drought while season 2000/2001 has the lowest agricultural area affected by moderate drought figure (3 C) and The agricultural seasons 2000/2001 and 2010/2011 have the highest agricultural area affected by high drought while season 2006/2007 has the lowest agricultural area affected by high drought figure (3 D). The results could summarized that Egypt should concentrate on the agriculture activity in the Nile valley and Delta by supplementary irrigation during the winter season to improve the crop productivity of this area (**Yousif, 2011**), to

increase the food security in case of cultivating wheat, barley, feeders and etc. For strategic action, the supplementary irrigation could calculate annually depending on the potential cultivated area, the crop, climatic data (perception and ETo). This paper has demonstrated, in line with other studies (**Wilhelmi and Wilhite, 2002; Wu and Wilhite, 2004**), that the impact of vegetation on climate variability, including drought, can vary spatially. A similar behavior has been reported in the shrub and pasture-lands of the centre of the Ebro valley, areas that have undergone major human modifications. Even during years of normal rainfall, these vegetation communities have difficulties in developing their activity and in advancing towards more mature stages (**Braun-Blanquet and Bolo's, 1957**). Thus, during drought episodes, these communities suffer the effects of water shortages with even greater intensity. Differences in the correlation coefficient values have also been recorded within the same land-cover type as a function of the average NDVI and climatic aridity. The impact of climate variability and drought on vegetation activity is most marked in the most arid areas. In semi-arid regions, vegetation responds rapidly to spatio-temporal variations in soil moisture (**Le Houerou, 1984; Bonifacio et al., 1993; Sannier and Taylor, 1998**). In general, vegetation located on the limits of its environmental distribution is more vulnerable to climatic variability than that which is located in areas of adequate climate conditions for vegetation activity (**Fritts, 1976**).

Conclusion

The complexity of the drought phenomenon hinders our full understanding of their impact. This paper highlights the changes in the vegetation cover in Egypt from 2001 to 2011, the results had shown that; the effects of drought on vegetation can be highly diverse, varying with different factors including the month, land-cover type, vegetation characteristics and temperature conditions. The Vegetation Healthy Index (VHI) is one of the drought indices which are more widely used for monitoring drought. Results indicated that, monitoring drought by remote sensing technique, reflect the dynamic changes of the land coverage area. The Vegetation Healthy Index (VHI) has shown that; the agricultural seasons 2000/2001 and 2010/2011 had the highest agricultural area affected by high drought while the 2006/2007 had the lowest agricultural area affected by drought. Further studies on the drought monitoring by connecting the data from these satellite images could be compared with actual field survey. The use of such maps should improve drought management

plans and play a large role in mitigating the impact of such episodes.

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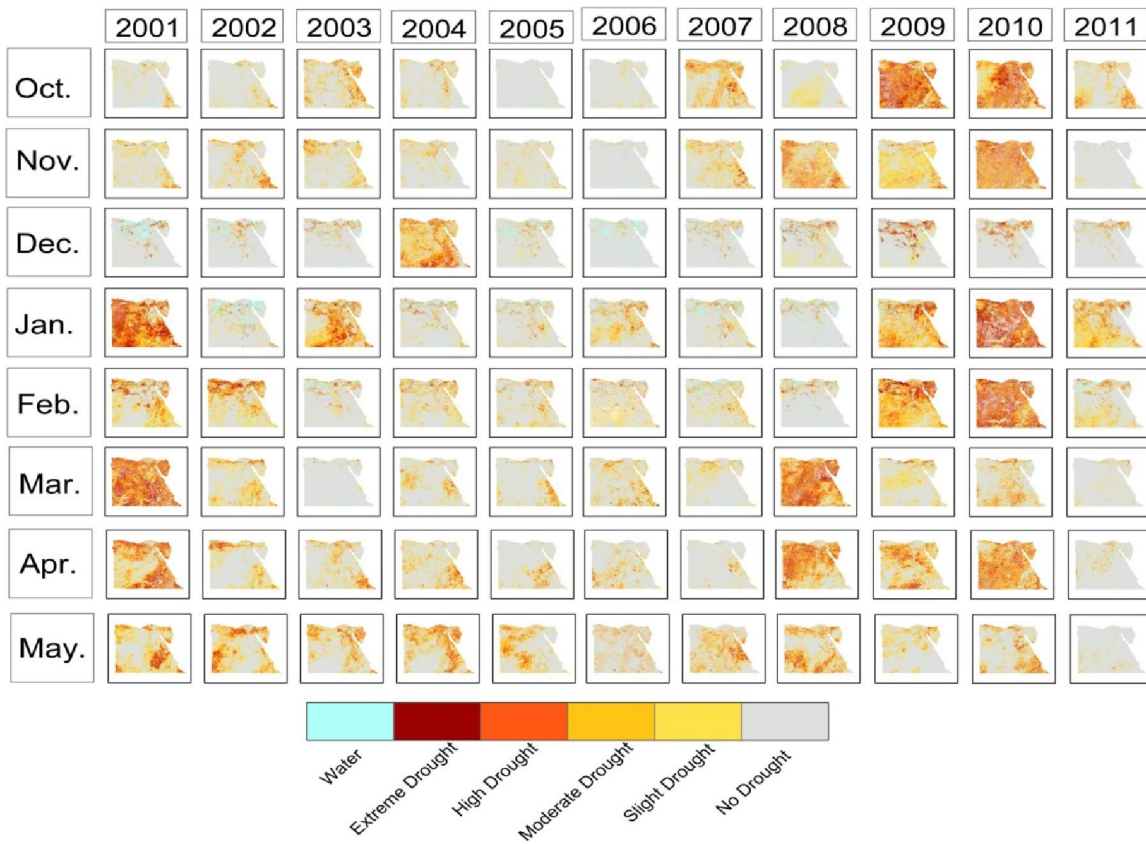


Fig. (1) Classified Vegetation Health Index over Egypt from 2000/2001 to 2010/2011 during months October-may (agricultural season)

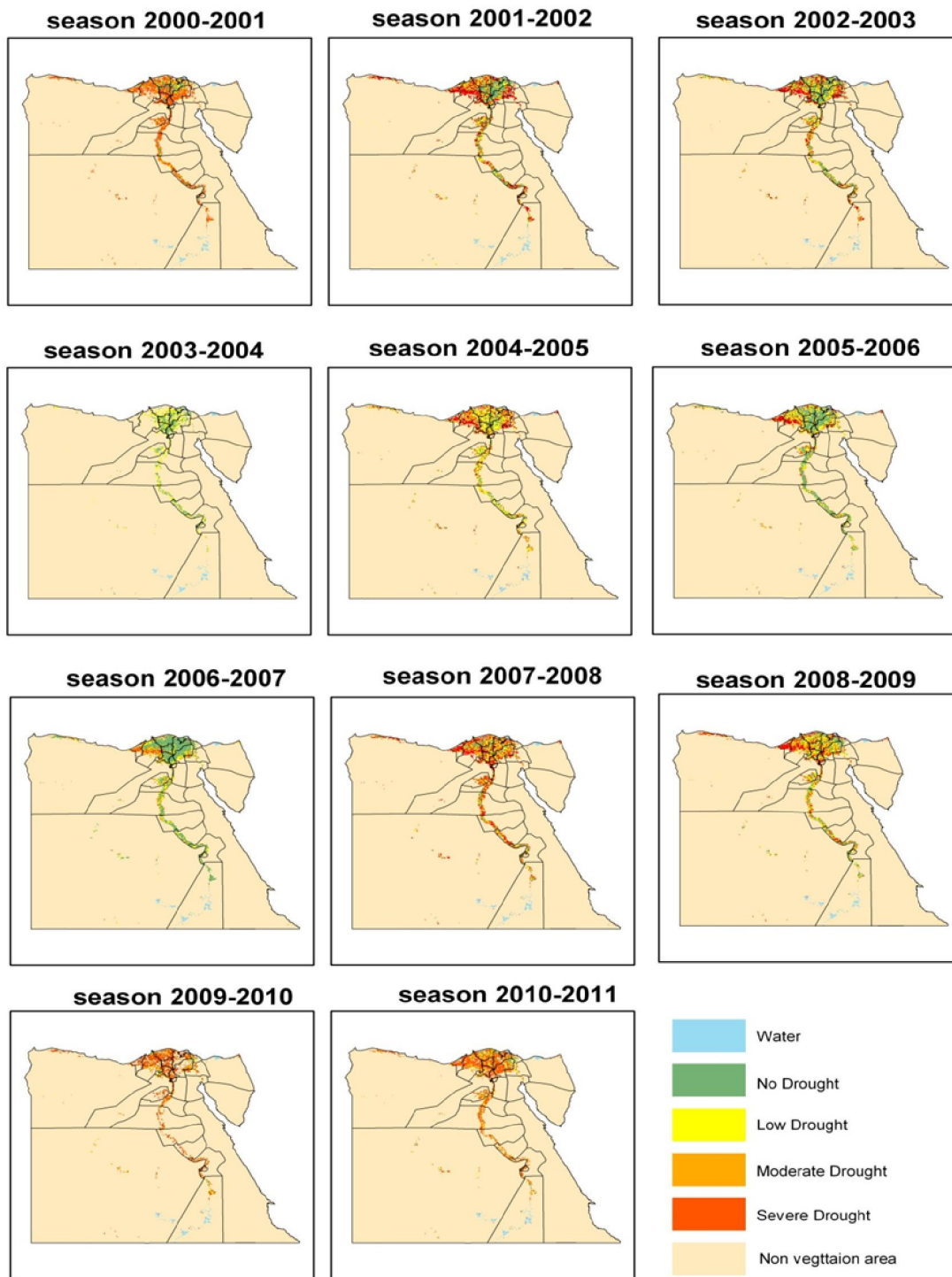


Fig. (2) Seasonal Vegetation Health Index (VHI) over Egypt during the period from 2001 to 2011

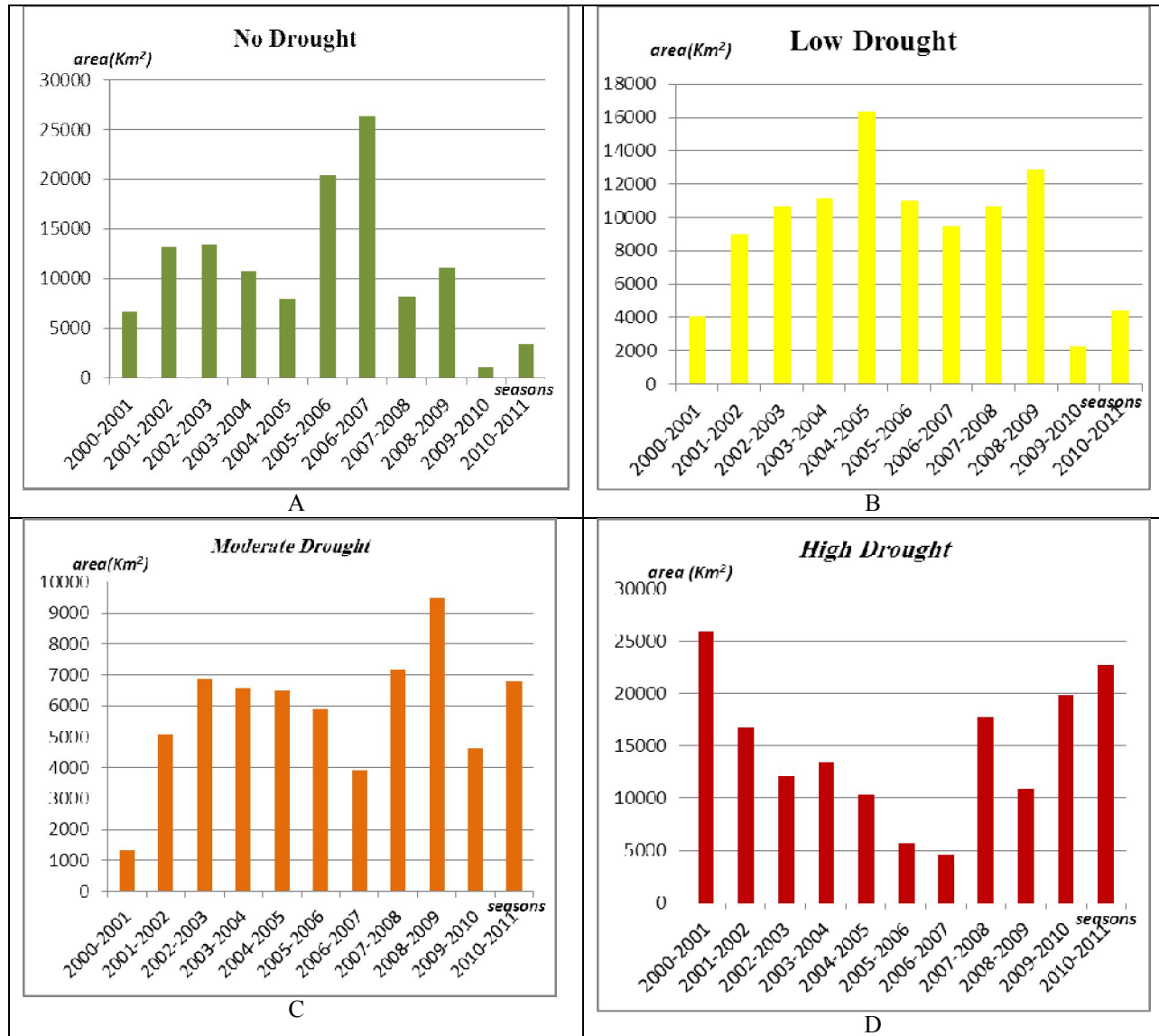


Fig. (3) The total area of different seasonal drought classes during the period from 2001 to 2011

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An Analytical Economic Study of Wheat Gap in Egypt

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Abstract: The wheat crop one of the most important strategic crops in the Egyptian agriculture, the area represents about 18% of the total crop area, and more than 43.9% of the winter crop area, where the total area cultivated with wheat was about 3.23 million Feddan in 2012, with an increase of approximately 39.6% of what was in 1991. The output reached about 8.07 million tons, with an increase of about 28.7% for the same year. The state aims to use modern techniques in agriculture to increase production and stability through more efficient using of production factors, improving the management and maintenance of the available farm resources. The study aims is to analyze the economic situation of the wheat crop including the cost structure of wheat distributed on the production requirements, as well as to estimate the function of the cost of wheat. In addition to, the analysis of the structure of production and yields of wheat crop and assess the function of wheat consumption in Egypt, as well as estimating the wheat gap, the proportion of self-sufficiency and means of narrowing the wheat gap in Egypt. The study showed that the most important elements of the cost of production of wheat in terms of the relative importance is human labor, employment and automated work, chemical fertilizer and seed, expenses, pesticides, farmyard manure, and animal working, which contribute to those elements in the variable costs of Feddan of wheat, equivalent to approximately 33.9%, 22.7%, 18.1%, 9.7%, 9.2 %, 4.2%, 3.5%, 0.3%, respectively. The study found that the fixed costs (rental value), and variable costs of Feddan of wheat accounted for about 40.5%, 59.5%, respectively of the average of the total costs for wheat. Also, contribute to farm work, and production requirements in the variable costs of wheat per Feddan estimated at 56.9%, 43.1 %, respectively. This means that the higher total costs for Feddan of wheat in Egypt came from higher variable costs and fixed costs (rental value), especially after the application of the law relating to rental between landlord and tenant. As the study showed that, the average yield per Feddan amounted to about 17.76 ardabs / Feddan (ardab=179kg), which means that all farmers outnumbered the ideal size, and they can use high levels of technology to increase production , reduce costs, and maximize profit. The average net return of Feddan of wheat is about 2674.5 Egyptian pounds, represents about 42.9 % of the total return, the net return per Feddan of wheat amounted to about 58.2 %, and to 42% of the total return of Feddan of wheat in both 1991 and 2012. This explains the decrease in net earnings for Feddan of wheat changing high production costs in general, the most important production inputs, high fixed costs represented in the rent. It was found that the most important factors affecting the overall wheat production is the amount of seed (X3) in kg, chemical fertilizer (x4) by Nitrogen unity, each of which increased by 10 % leads to an increase in total output by about 5.2 %, 4.8 %, respectively. The consumption of wheat crop amounted to 8.87 million tons in 1991, and grew until it reached about 18.10 million tons in 2012, with an increase of about 6.40 %, and the national consumption of wheat decreased with an annual rate of statistically significant amounted to 6.3 million tons, representing about 40.1 % of the average national consumption of wheat crop and of around 15.1 million tons. The most important factors affecting the consumption of wheat is 1 - Inhabitants: - has increased from 55.6 million in 1991 as a minimum to about 87.2 million people in 2012 as Maximum with an increase percentage of 63.7%, 2 - personal income : has increased from 824.4 Egyptian pounds in 1991 to about 1902.5 Egyptian pounds in 2012, with an increase percentage of about 33.8% ,3 - retail Price: the ardab of wheat in real terms has decreased from 43 Egyptian pounds in 1991 to about 35.9 Egyptian pounds in 2012, a reduced rate of about 22.8 % .The average per capita consumption of wheat: - has amounted to about 159.5 kgs in 1991, and then taking in volatility, rose to about 207.5 kgs in 2012, with an increase of about 30.1%. which, show that there is an annual increase statistically significant in average per capita consumption of wheat amounted to about 1.7 kgs, and the influential factors on the national consumption of wheat is to increase the population by 10 % leading to an increase in the amount consumed of wheat by 13.8 % . As the personal income increased by 10 % leads to an increase in the amount consumed of wheat by 5.3 %, as well as, the increase of the price of wheat per ardab in real terms by 10% leads to a lack of quantity consumed of wheat increased by 13.5%. While, the wheat gap amounted to 4.39 million tons in 1991, and then took in the oscillation until amounted to 10.03 million tons in 2012, with an increase of about 28.5 %, and the proportion of wheat self - sufficiency in these two years amounted to about 50.5 %, 44.6 %, respectively. That means to overcome the wheat gap is the supply response to the wheat crop: i.e. the increase in the price of ardab of wheat by about 100 Egyptian pounds, leads to increase the area of wheat by about 818 thousand Feddans in the following year. This area leads to increase the total production of wheat, which estimated at 2.17 million tons, which works to fill about 30 % of the size of the wheat gap in Egypt. In addition to reduce the area of alfalfa sustained, where they can bring untraditional feed especially maize silage instead of clover, where a high nutritional value. A feddan corn gave about 15 tons of silage of corn

after transactions by venire and urea. The study concluded that the state, must apply growing of the horizontally expansion of wheat crop in each of the new reclaimed land to increase the cultivated area, and the abolition of compulsory supply. While, in the old lands reducing alfalfa area by cultivating area with wheat. In addition to apply the vertical expansion in wheat by following the technical recommendations on new varieties, irrigation, fertilization, planting dates and reducing production costs. Also, increasing the awareness of farms to reduce wastage of wheat during and after harvest, rationalizing consumption of wheat and adopting appropriate pricing policy to increase the cultivated area, the announcement of the price of wheat before the date of agriculture by enough time and replacement of silage maize instead of alfalfa in animal feed. Finally the full emancipation of the prices of production inputs and the abolition of support in return for full liberalization of the final product prices according to market mechanisms and the abolition of the crop composition, as well as the expansion in the development of new varieties and breeds suitable for high productivity and bear the high temperature region of Upper Egypt and the desert land.

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Keyword: Wheat gap, Economic situation, self-sufficiency, Egypt.

Introduction:-

The problem of food shortage in Egypt is one of the main problems facing the national economy, due to the widening gap between production and consumption, trying to overcome this gap by increasing imports, which require a great deal of foreign exchange as reflected in its impact on the rates of economic development. A wheat crop plays a key role in the value and size of the food gap, where the wheat crop is one of the main crops, in the Egyptian agriculture, representing a total area of about 18 % of the crops, and more than 43.9 % of the winter crop area. Wheat crop represents a particular importance of the Egyptian society, where the bread is presenting the main meal of the population, and the main source of energy that they receive.

The amount of wheat imports are counted by about 11.7 million tons, as wheat imports represent the greatest value of total food imports which are counted by about 13241.4 million Egyptian pounds in 2012, which is one of the burdens of the state.

To cultivate larger areas of wheat, it require changing some of the agricultural policies, and cutting off some winter crops which compete with wheat. Where the total area cultivated with wheat was about 3.23 million Feddans (Feddan=4200 m²) in 2012, the production of wheat has reached about 8.07 million tons in the same year.

The study shows the relative importance of the provinces of wheat production grown in the Valley about 2.81 thousand Feddans (represent about 91.5 %), while the remaining were distributed by (8.5 %) outside the Valley. The Sharqia Governorate has come successfully ranked as the first. The wheat area had a relative importance of 12.25 %, followed by the Dakahlia Governorate with a relative importance of 9.77 %, then the Beheira Governorate by about 9.49%, and Kafr el - Sheikh Governorate by about 7.57%. The results showed that the Giza Governorate

has achieved a maximum productivity per Feddan, amounting to an average of about 2.99 tons / Feddan.

The State aims at using modern techniques in agriculture to increase production and stability, through more efficient use of factors of production, improving the management and maintaining the available farm resources.

Problem of the study: -

The state now attaches great expansion in the cultivation of wheat in the new lands or the expansion of the old land at the expense of reducing some competition winter crops areas, like barely, faba bean, and alfalfa or vertical expansion of the cultivation of high productive modern varieties. However, the quantity of wheat production was still unable to pursue the continuous increase in the consumption, where the total amount of wheat output was of about 8.07 million tons, while the quantities consumed from wheat was about 18.1 million tons. This means that the deficit amounted to about 10.03 million tons of wheat, which equates to about 55% of the amount of domestic consumption during the period 1991-2012. This deficit forced the state to import wheat to cover the deficit, and this requires a great deal of foreign exchange annually, which is a burden on the state budget and balance of payments in the Egyptian economy.

Objective of the study: -

The study aims at identifying the productive alleged situation for the wheat crop and the determinants of its production in Egypt, including that the development of each of the area, productivity and production. As well as, the possibility to increase productivity to meet the growing demand, in addition to analyze the economic situation of the wheat crop including the cost structure of wheat distributed production requirements. Also, to estimate the function of the cost of wheat, and the analysis of the structure production and wheat crop yields. In

addition to estimate the functions of wheat consumption, the wheat gap, self-sufficiency and the means of narrow wheat gap in Egypt.

Methodology and data sources:-

The study relied on methods of descriptive and quantitative economic analysis, in addition to methods of statistical analysis, style of the general trend and simple and multiple regression to estimate the production function. As the study relied on secondary published and unpublished data, which was assembled as a series of time during the period 1991 - 2012 through bulletins of Central Agency for Public Mobilization and General statistics, bulletins of economic sector of the Ministry of Agriculture and land Reclamation. The real income indices were calculated for living expenses, and the real price indices for wholesale prices.

Discussion of Results: -

First: the analysis of production and returns of wheat crop: -

The development of the area of the wheat crop:

As shown in Table (1) that, the area of wheat in Egypt amounted to about 2.22 million Feddans in 1991, and increased until it reached 3.2 million Feddans in 2012, with an increase of about 39.6% in 1991. As shown in equation (1) and in table (2) that there is a general trend Ascending statistically significant at the level (0.01) in the wheat area of 0.061 million Feddans, representing about 1.8% of the average area of wheat in Egypt and about 2.9 million Feddans during the study period, as the coefficient of determination rate (R^2) was about 0.07.

Development of the wheat Productivity per Feddan:

As shown in Table (1) that, the productivity of wheat per feddan amounted to 2.02 tons in 1991, and increased amounted to about 2.60 tons in 2012, with an increase of about 28.7%. As shown in equation (2) and Table (2) that, there is a growing trend, statistically significant at the level of significance (0.01) in the production of wheat in Egypt by 0.031 ton/Feddan, representing about 1.16% of the average productivity of wheat per Feddan of about 2.66 tons during the study period, the total rate coefficient of determination (R^2) was about 0.0712.

Development of the overall productivity of wheat:-

As shown in Table (1) that the total production of wheat amounted is about 4.48 million tons in 1991, and is growing to 8.07 million tons in 2012, with an increase of approximately 80.1%. As shown in equation (3) and in table (2) that, there is a general trend of growing and statistically significant at the level of (0.01). The total production of wheat increased by 0.188 million tons, representing about

2.98% of the average wheat production in Egypt of about 6.3 million tons during the study period. Moreover, the coefficient of determination R^2 was around 0.884

The development of total yield of wheat crop:

As shown in Table (1) that the overall return of wheat amounted to about 1345 Egyptian pounds in 1991, and grew until it reached about 7953 Egyptian pounds in 2012 with an increase of approximately 591.3%. As shown by equation (4) and table (2) that, the total return of wheat increased at an annual rate, statistically significant at the level of significance (0.01) amounted to 300.94 Egyptian pounds/Feddan, representing about 4.82% of the average of the total return of the wheat crop of about 6235.1 Egyptian pounds/Feddan during the study period, as the coefficient of determination rate (R^2) was about 0.951.

Evaluation of the net yield of wheat crop:

As shown in Table (1) that, the net yield of wheat crop amounted to about 782.6 Egyptian pounds / Feddan in 1991, and grew until it reached about 3221 Egyptian pounds / Feddan in 2012, with an increase of about 411.5%. As shown by equation (5) and in the table (2) that, the net yield of wheat crop increased with an annual rate, statistically significant at the level of significance (0.01) amounted to 131.35 Egyptian pounds/Feddan, representing about 4.91% of the average net yield of wheat crop of about 2674.5 Egyptian pounds/Feddan during the study period, which represent around 42.8% of the total yield of wheat Feddan. As the coefficient of determination rate R^2 was about 0.715. It is clear that the net Feddan of wheat yield of about 58.2%, 42% of the total yield of wheat per Feddan in 1991, 2012, respectively, and explains this decline in net Feddan of wheat yield high production costs in general, and changing the most important production inputs, high fixed costs represented in the rent.

Second:

Analysis of the costs of wheat production in Egypt:

Wheat production costs consist of human, animal and automated works, and production supplies include seed, farmyard manure, chemical pesticides and others.

Evaluation of farm labor costs: -

As seen from the table (3) that, the cost of farm labor amounted to about 289.9 Egyptian pounds/Feddan for the wheat crop in 1991, then rose to about 1583 Egyptian pounds / Feddan in 2012, with an increase of about 54.6 %. The average cost of labor farm during the study period (1991 -2012) was about 1196.3 Egyptian pounds / Feddan of wheat, accounting for about 56.9 % of the average variable costs of Feddan of wheat, of about 2101.7 Egyptian pounds. As the human cost of the work, was about 170 Egyptian pounds / Feddan of wheat in 1991, then

rose to around 975 Egyptian pounds / Feddan in 2011, representing an increase of about 57.4 %. As shown in equation (1) and in the table (4) that, the cost of human labor for wheat was cultivated with an annual rate of at statistically significant at level (0.01) amounted to about 33.50 Egyptian pounds/Feddan, representing about 7.7% of average human work the cost of about 707.6 Egyptian pounds Feddan, which represents about 33.9 % of the average variable costs for wheat Feddan of about 2101.7 during the same study period, as the coefficient of determination rate R^2 was about 0.77. Moreover, the cost of animal work was about 5.2 Egyptian pounds / Feddan of wheat in 1991, and rose to about 8.0 Egyptian pounds / Feddan in 2012, with an increase of about 15.4 %. As shown in equation (2) and in the table (4) that, the cost of animal work for wheat was declining at an annual rate not statistically significant. Moreover, the cost of the automated work is about 114.7 Egyptian pounds / Feddan of wheat in 1991, rose to about 600 Egyptian pounds / Feddan in 2012, with an increase of about 52.3%. As illustrated in equation (3) and in the table (4) that, the cost of automation for cultivating wheat, with annual rate statistically significant at the level of significance (0.01) was about 4.1 % of the average labor cost for automated wheat crop of about 476.7 Egyptian pounds / Feddan, which represent about 22.7 % of the average variable costs for wheat Feddan, during the study period as coefficient of determination rate R^2 was about 0.84. So, it is clear that the cost of human labor and automation is the most influential factor in the cost of farm labor and hence in variable costs.

Development of production supplies:

As seen from the table (3) that the cost of production inputs amounted to about 176.9 Egyptian pounds / Feddan of wheat crop in 1991, then rose to about 1229 Egyptian pounds / Feddan in 2012, with an increase of about 69.5% .

These costs are distributed over seeds, farmyard manure, chemical pesticides and total cost of seed for about 44.4 Egyptian pounds / Feddan in 1991, then rose to around 246 Egyptian pounds / Feddan in 2012, an increase of about 55.4 % .

As shown equation (4) in the table (4) that the cost of seed of wheat is cultivated had an annual rate, statistically significant at the level of significance (0.01) was about 53.4 Egyptian pounds / Feddan , representing about 26.1% of the average cost of wheat seeds of about 204.2 Egyptian pounds / Feddan, which represents about 9.7 % of the average variable costs of wheat per Feddan of about 2101.7 Egyptian pounds during the same period of the study, as was the coefficient of determination R^2 average was about 0.79.

The total cost of farmyard manure about 20.5 Egyptian pounds / Feddan of wheat in 1991, rose to about 128 Egyptian pounds / Feddan in 2012, an increase of about 62.4 %.

As illustrated in equation (5) in the table (4) that the cost of farmyard manure for wheat is growing at an annual rate significant statistically at level of significance (0.01), was about 9.4 Egyptian pounds / Feddan (represent about 12.5% of the average cost of farmyard manure for wheat) of about 74 , 5 Egyptian pounds / Feddan, which represents 3.5 % of the average variable costs for wheat Feddan during the same study period, as was the coefficient of determination R^2 average was about 0.77.

The total cost of chemical fertilizer for wheat is about 73.1 Egyptian pounds / Feddan of wheat in 1991, then rose to about 465 Egyptian pounds / Feddan in 2012, with an increase of about 63.6 %.

As shown in table (3) and the equation (6) in the table (4) that the cost of chemical fertilizer for wheat is growing at an annual rate of statistically significant at the level of significance (0.01) was about 3.24 Egyptian pounds / Feddan (represents about 0.85% of the average cost of chemical fertilizer for wheat) of about 379.1 Egyptian pounds / Feddan, which represent 18.1 % of the average variable costs of wheat per Feddan during the same study period, as was the coefficient of determination average R^2 was about 0.62.

The total cost of pesticides, about 2.3 Egyptian pounds / Feddan of wheat in 1991, then rose to about 125 Egyptian pounds / Feddan in 2012, with an increase of about 54.3%.

As shown in table (3) and equation (7) in the table (4) that the cost of pesticides for wheat is growing with an annual rate statistically significant at the level of (0.01), amounted to about 16.75 Egyptian pounds / Feddan, (represents about 19.1 % of the average cost of pesticides for wheat) of about 87.8 Egyptian pounds / Feddan , which represent 4.2 % of the average variable costs of Feddan of wheat during the same study period , as was the coefficient of determination average R^2 was about 0.74.

The total cost of overheads is about 36.6 Egyptian pounds / Feddan of wheat in 1991, then rose to about 265 Egyptian pounds / Feddan in 2012, with an increase of about 73%.

As shown in table (3) shows equation (8) table (4) that the expenses of wheat which is growing, at an annual rate statistically significant at the level of significance (0.01) was about 5.19 Egyptian pounds / Feddan, (represents about 2.6 % of the average cost of overheads for wheat) of about 193.1 Egyptian pounds / Feddan, which represents 9.2 % of the average variable costs per Feddan of wheat during the study

period, as was the coefficient of determination average R^2 was around 0.78.

As seen from the foregoing that the most important elements of the cost of production of wheat in terms of the relative importance is human labor and employment, automated, chemical fertilizer and seeds. As well as, the expenses, pesticides, farmyard manure, and working animal, which contribute to those elements in the variable costs of Feddan of wheat equivalent to about 33, 9%, 22.7%, 18.1%, 9.7%, 9.2%, 4.2%, 3.5%, 0.3%, respectively.

Average variable costs for wheat crop:

As seen from Table (5) that the average variable costs for the crop of wheat amounted to about 466.8 Egyptian pounds / Feddan in 1991, and grew until it reached about 2634 Egyptian pounds / Feddan in 2012, with an increase of about 56.4%.

As shown by equation (1) in the table (6) the variable costs of the wheat crop increased with an annual rate, statistically significant at the level of significance (0.01), was about 95.4 Egyptian pounds / Feddan, (representing about 4.5% of the average variable costs for the wheat crop) of about 2101.8 Egyptian pounds / Feddan during the study period, which in turn represents about 59.5% of the average total costs of wheat, which amounted to about 3523.2 Egyptian pounds / Feddan, as the coefficient of determination rate R^2 was about 0.79.

Average fixed costs for wheat crop:

As seen from Table (5) that the average fixed costs of crop of wheat amounted to about 95.8 Egyptian pounds / Feddan in 1991, and grew until it reached about 1860 Egyptian pounds / Feddan in 2012, with an increase of approximately 194.5%. As shown by equation (2) in table (6) that the fixed costs of the wheat crop increase with an annual rate of significant statistically at the level of significance (0.01), was about 77.1 Egyptian pounds / Feddan, (representing about 5.4% of the average fixed costs of the wheat crop) of about 1427.94 Egyptian pounds / Feddan during the study period, which is in turn about 40.5% of the average total cost of wheat as the coefficient of determination rate R^2 was about 0.89.

Average total costs for wheat crop:

As seen from Table (5) that the average total costs of the crop of wheat amounted to about 562.4 Egyptian pounds / Feddan in 1991, and grew until it reached about 4672 Egyptian pounds / Feddan in 2012, with an increase of about 830%.

As shown by equation (3) in Table (6) that the total cost of the wheat crop is growing at an annual rate insignificant statistically significant at the level of significance (0.01) amounted to 172.13 Egyptian pounds / Feddan of wheat, (representing about 4.9% of the average total costs of the wheat crop) of about 3523.2 Egyptian pounds / Feddan during the study

period from 1991 to 2012 as coefficient of determination rate was about 0.84.

As shown above, that the cost structure, of Feddan of wheat production in Egypt has several changes during the study period and the most important of these changes that have occurred in fixed production costs, which is represented in the rental value, where it reached its relative importance to 40.5% of the average total costs for the production of Feddan of wheat, representing the total costs of Feddan of wheat, which is the most important work farm, production requirements as contribute to the variable costs of wheat crop at about 56.9%, 43.1%, respectively.

As can be seen that the rise in the total costs of the production of Feddan of wheat may be due to the rise in all of the variable costs, the most important the human labor, the automation, the value of chemical fertilizers, and fixed costs (rental value) after the liberation of the relationship between landlord and tenant.

Wheat crop production costs function:-

As show in the following equation that the relationship between the total costs of Feddan of wheat and production in the image of Cubism, and the value of calculated (F) stresses about 38.142 statistically significant function. While, showing the value (R^2) that changes in production explain about 78% of the changes in the overall costs, and finding the middle of the total costs, then find first derivative costs of the medium and equal it by zero, found the optimal amount for wheat production estimated at 14.554 ardabs / Feddan. It can be obtained the marginal cost of calculus first function of the total costs and equality of marginal cost price and then find the maximum amount of profit, which was estimated at 42.19 ardebs / Feddan. Comparing the maximum amount for profit of average productivity per Feddan of about 17.7 ardabs / Feddan, showing that the average productivity per Feddan of wheat decreased for the amount by about 1.4 ardabs. Which, means that farmers still able to use high levels of technology until increasing production and less costs and thus increase net revenue and profit maximization, while it was observed that the average productivity per Feddan of wheat exceeded the optimal amount of production.

$$TC = 808.815 + 22.758 y - 13.186 y^2 + 0.560 y^3$$

$$(0.598) \quad (-0.351) \quad (0.364)$$

$$R = 0.815 \quad R^2 = 0.851 \quad R^2 = 0.782 \quad F = (38.142) **$$

Production function:

The most important factors estimated affecting of the total output of wheat were: the work of human (X1), automated work (X2) per hour, the amount of

seeds (X3) in kg, and chemical fertilizers (X4) per unit of nitrogen, and the soil (X5).

The trade-off between models was estimated according to the logic of economic, the logarithmic form was the best models as in the equation: -

$$\text{Log } Y = 0.57 + 0.62 \text{ Log } X3 + 0.59 \text{ Log } X4$$

(3.56)** (3.21)**

$$R^2 = 0.95, F = 759.1, \text{ Overall flexibility} = 1.00$$

It was found that the total flexibility amounted to about 1.0 means that, the function of the type-win, means that the increase in resources of the function by 10% leads to an increase in the output of wheat, with an increase of 10%. It has been shown that the most important factors affecting the total wheat production is the amount of seeds (X3)kg, chemical fertilizer (x4) nitrogen units, if each of them increased by 10% leads to an increase in total output by about 6.2%, 5.9%, respectively. The function was statistically significant at the level of significance (0.01) and the value of calculated (F) for the model was 759.1 as the coefficient of determination rate was about 0.95. This means that these factors function, explain about 95% of the changes in the total output of wheat Feddan in Egypt.

National consumption of wheat:

As shown in Table (7) that, the consumption of the crop of wheat amounted to 8.87 million tons in 1991, and grew until it reached about 18.1 million tons in 2012, with an increase of about 40.6%.

As shown by equation (5) in table (8) that, the national consumption of wheat crop decreased with an annual rate of statistically significant amounted to 6.3 million tons, accounting for about 40.1% of the national average consumption of wheat crop of about 15.6 million tons during the study period, as the coefficient of determination rate R^2 was about 0.016

Third:

factors affecting the wheat consumption in Egypt: Average per capita consumption of wheat in developed countries is estimated at 121 kg / year, while in developing countries, about 137 kg / year. Nevertheless, in Egypt is estimated at 190 kg / year at the discretion of the year 2011, which requires the rationalization of consumption of wheat in Egypt. The demand influenced by any several factors that may be different, political, social, economic, and behavioral, as well as the number of consumers and their incomes and commodity prices and competition, the following is addressing the most important of these factors then estimating the consumption function for wheat in Egypt.

The Evaluation of the most important factors affecting the consumption of wheat: -

1 - Inhabitants:

As it can be seen from Table (7) that, the population has increased from 55.6 million in 1991 as

minimum, to about 87.2 million people in 2012 as maximum, with an increase of 63.7%. The equation (1) in the table (8) shows that the population in Egypt is growing by significant annual rate of about 1.2 million, representing about 1.9% of the average population of about 81.4 million people during the study period from 1991 to 2012. The coefficient selection amended (R^2) has reached to 0.98.

2 - Personal income: -

As can be seen from in Table (7) the personal income increased from 824.4 Egyptian pounds in 1991, to about 1902.5 Egyptian pounds in 2012, with an increase of about 33.8%. The equation (2) in table (8) shown that, there is a statistically annual significant increase in per capita income amounted to about 44.1 Egyptian pounds, representing about 2.8% of the average per capita income of about 1565.6 Egyptian pounds during the study period has reached the rate coefficient of determination (R^2) to 0.85.

3 - The retail price of wheat: -

As seen from Table (7) that the retail price of ardabs of wheat in real terms has decreased from 43 Egyptian pounds in 1991, to about 35.9 Egyptian pounds in 2012 by decreasing amounted to about 22.8%. equation (3) in table (8) shows the retail price of one ardab of wheat has decreased annually by 0.47 Egyptian pounds, this decline statistically significant and represents about 1.31% of the average price of wheat ardabs of about 35.8 Egyptian pounds in real terms, has reached the rate of the coefficient of determination (R^2) to 0.57.

4 - The average per capita consumption of wheat:

As shown in Table (7) that the average per capita consumption of wheat has reached about 159.5 kg in 1991, and then taking in volatility, rose to about 207.5 kg in 2012, with an increase of about 30.1%. As shown in equation (4) in table (8) that, there is a statistically annual increase statistically insignificant for the average per capita consumption of wheat amounted to about 1.7 kg. The coefficient of determination rate (R^2) has reached around 0.34, it is worth mentioning that per capita wheat consumption in developed countries is estimated at 121 kg per year, while in developing countries is estimated to about 137 kg per year, while the average in Egypt about 190 kg in 2011.

Estimate the wheat consumption function:

As it turns out that's logarithmic form is the best form from a statistical point of view, the author will address the impact of each of the above factors on the national consumption of wheat individually and collectively.

1 - The impact of population on the quantity of wheat consumed:

Study of the equation (1) in table (9) shows that the amount of consumption estimated from wheat (Y_i)

as the dependent variable, and the number of population (X22) independent variable, it may indicate that the function is significant at the level (0.01). Also, shows a direct correlation between the number of residents and the amount consumed of wheat, with a models of elasticity to 1.38, i.e. the increase in population by 10% leads to increase the quantity consumed of wheat by 13.8%, as the coefficient of determination (R²) was 0.51. That means that the 51% of the changes in the quantity consumed wheat are due to the change in the number of population, while about 49% of those variables are due to other variables not included in the model.

2 - Effect of average income per capita on the quantity of wheat consumed:

As seen from equation (2) in table (9), the existence of a positive relationship between the amount of wheat consumption estimated (Yi) as the dependent variable, and the average income per capita real (X2i) in pound is an independent variable. It has been shown to function is significant at the level (0.01). The total explanatory elasticity factor of the variable 0.531, i.e. that increased personal income by 10% leads to increase the quantity consumed of wheat by 5.3%, as the coefficient of determination (R²) was 0.65. This means that 65% of the changes in the quantity consumed of wheat were due to the change in personal income, assuming all other factors were constant.

3 - The impact of the real price of wheat ardabs on the quantity of wheat consumed:

As seen from equation (3) in table (9) that there is an inverse relationship between the amount of wheat consumption estimated (Yi) per million tons as the dependent variable, and the real price (P2) Egyptian pound as an independent variable, the function was significant at the level (0.01). The total explanatory models of elasticity of the variable 1.356, i.e. that the wheat ardabs price increase in real terms by 10% leads to a lack of quantity consumed of wheat increased by 13.56%. The total coefficient of determination (R²) was about 0.82 i.e. 82% of the changes in the quantity consumed of wheat due to change in the real price of wheat ardabs assuming all other factors are constant.

4 - The effect of the above factors combined:

To study the relationship between the amount of the total consumption of wheat (Yi) per million tons as the dependent variable, and the number of population (X1) independent variable, real income per capita (X2i), the real price of wheat ardebs (X3i) pound variables explained, and the annual per capita consumption (X4), it shows that the existence of a positive relationship between the amount of consumption estimated wheat and population density. as demonstrated the existence of a positive

relationship between the amount of consumption estimated of wheat and the real per capita income, while the relationship is inverse between the estimated amount of wheat consumption and the real ardab price of wheat. While, the relationship direct correlation between the amounts of the estimated wheat consumption and annual per capita, the function was significant at the level (0.01), and reached the coefficient of determination (R²) to 0.95 i.e. 95% of the changes in the quantity consumed of wheat was due to the change in the previous factors combined.

$$Y_i = - 9.25 + 0.64 X_1 + 0.08 X_2 - 0.41 X_3 + 0.85 X_4$$

$$(17.2) ** (2.9)* (- 2.6)* (38.2) **$$

$$R^2 = 0.95 \quad F = 215.6$$

As shown above, that the most important factors affecting the consumption of wheat in Egypt are the number of the population, the average real income per capita, the price of ardabs of wheat in real terms and annual per capita consumption, where the consequent increase in any of them by one unit, increase in the total consumption of about 0.64, 0.08, -0.41, 0.85 respectively.

• Wheat gap in Egypt:

Wheat gap is estimated by the difference between the amount consumed of wheat and the quantity produced. As seen from the table (10) that the wheat gap amounted to 4.39 million tons in 1991, and then took in the oscillation until amounted to 10.03 million tons in 2012, with an increase of about 28.5%, the percentage of self-sufficiency in wheat in those two years amounted to about 50.5%, 44.6%, respectively.

Means to overcome the wheat gap:

1 - Response of the supply to the wheat crop: -

The model of the supply response to the wheat crop in Egypt was estimated during the study period using the method of multiple regressions in the following equation, which included model explanatory variables that affect the cultivated area, such as net earnings and price-farm of wheat crop in the previous year and net yield of crops competition for wheat. The equation illustrated a positive relationship between the cultivated area with wheat in the current year and the farm price of wheat in the previous year at current prices. As the price of ardab of wheat increase by about 10 Egyptian pounds leads to an increase in the Feddan of wheat estimated at 81.8 thousand per Feddan in the next year, and that this increase is statistically significant at the level (0.01) as shown above. It must follow the pricing policy to increase the Feddan of wheat, as the increase in the ardab price of wheat by about 100 Egyptian pounds, leads to increase feddans of wheat by about 818 thousand Feddan in the following year, and this area leads to increase total production of wheat by

about 2.17 million tons, which works to fill about 30% of the volume of wheat gap in Egypt.

$$Y_i = 1570.215 + 8.180 P_i$$

$$(5.914) **$$

$$F = 57.85 \quad R^2 = 0.87$$

2 - Reducing the area of sustainable clover:

Study the needs of green forage in the winter season for cows and buffaloes in Egypt, where it was converted as numbers of cows and buffaloes to the unit's animal, the typical needs of those units of animal to winter fodder was estimated. As illustrated in table (12) that the total number of units of cows and buffalos animals was about 7538 thousand units in 2001 estimated the needs of green forage in the winter season about 45.23 million tons, as the number of units of animal cows and buffalos around 10054 thousand units, the estimated needs of green forage in

the winter season of 2012 to 60.324 million tons. By comparing the needs of forage green product of this feed shows that the amount produced from these feeds in excess of actual needs, but this increase is not dependent upon in overcoming the wheat gap.

To minimize the area of clover, we can cultivate untraditional feed and silage like corn, rather than where the clover has a high nutritional value. The corn production per feddan is about 15 tons of corn silage per feddan after transactions by venaise and urea. Therefore every feddan of corn silage leads to dispense with 1.27 feddan of alfalfa. The reducing alfalfa area and planted with wheat works to fill about 63 % of the volume wheat gap. As well as, a quantitative hay and what is produced from coarse bran (apostasy) and can be made in manufacturing concentrated feed for the animals.

Table (1): The area, production, total production, total return and net return per feddan of wheat in Egypt during the period (1991 -2012)

Years	Area (Million/Feddan)	Productivity (ton/Feddan)	Total production (Million/Feddan)	total return Egyptian pound/Fed)dan)	Net return (Egyptian pound/Feddan)	Farm price (Egyptian pound/ardab)
1991	2.22	2.02	4.48	1345	782.6	74.72
1992	2.09	2.21	4.62	1435	770.6	79.02
1993	2.17	2.23	4.84	1582	641.3	79.33
1994	2.11	2.10	4.43	1566	58.0	80.17
1995	2.51	2.28	5.72	1717	681.3	8.40
1996	2.42	2.37	5.74	2009	922.1	96.06
1997	2.49	2.35	5.85	2090	963.4	100.04
1998	2.42	2.52	6.10	2258	705.1	102.00
1999	2.28	2.67	6.09	2409	876.3	103.40
2000	2.46	2.67	6.57	2408	897.6	104.20
2001	2.34	2.67	6.25	2419	896.4	105.10
2002	2.45	2.70	6.62	2530	972.6	107.70
2003	2.51	2.73	6.85	2731	1016	114.00
2004	2.45	2.75	6.74	3570	1666	150.00
2005	2.95	2.73	8.05	3937	1956	186.00
2006	3.06	2.70	8.26	4006	1863.0	169.00
2007	2.71	2.71	7.34	4213	1769	173.00
2008	2.92	2.73	7.97	7101	3956	383.00
2009	3.14	2.71	8.52	5649	2190	242.00
2010	3.22	2.75	7.25	6624	2483	272.00
2011	3.04	2.71	8.30	7600	3140	352.00
2012	3.10	2.65	8.07	7953	3221	380.00
average	2.9	2.66	6.3	6235.1	2674.4	289.1

Source: - collected and calculated from the Central Administration of the Agricultural Economy, the Economic Affairs Sector, records of the General Administration of Statistics.

Table (2) Equations factors for the general temporal trend of the evolution of both area, productivity, total production, total return and net return per feddan of wheat in Egypt during the period (1991 -2012)

Dependent variable (Yi)	Equation no.	Yi =A +BXi		Average	The relative rate of change	R2	Calculated F	F modeling	Significance
		A	B						
Area (million/Feddan)	1	2.020	0.04	2.9	1.68	0.798	9.17	84.1	**
Productivity (tone/Feddan)	2	2.182	0.03	2.66	1.16	0.712	7.28	53.099	**
Overall production (million/Feddan)	3	4.404	0.18	6.30	2.98	0.884	12.72	161.99	**
total return (Egyptian pound/Feddan)	4	46	300.9	6235.1	4.82	0.833	10.310	106.31	**
Net return (Egyptian pound/Feddan)	5	36.63	131.3	2674.4	4.91	0.715	7.329	53.72	**

Source: - collected and calculated from the table (4) study.

Xi= The estimated value of each of the area of wheat, productivity per feddan, the total production of wheat, total return and net yield of wheat per feddan in the first year; Xi= Variable time, (I) 1, 2 21

A, B = refer to constant and the regression coefficient of the equation, respectively.

(**) Indicates significant regression or form when the level of significance (0.01)

(*) To indicate when the significant level of significance (0.05)

(**) Indicates a lack of significance; R²= coefficient Rate of determinatio

Table (3) the average cost of production of wheat per Feddan spread over production requirements in Egypt during the period (1991 -2012)

Years	Human work cost	Animal work cost	Automated work cost	Total cost of farm work	Seed cost	Manure fertilizers cost	Chemical fertilizer cost	Pesticide cost	Expenditure	Production requirement cost	Average variable cost
1991	170	5.2	114.7	289.9	44.4	20.5	73.1	2.3	36.6	176.9	466.8
1992	187.3	4.1	144.0	335.4	54.5	19.8	105.3	11.4	42.6	233.6	569.0
1993	200.2	5.6	160.8	366.6	57.8	27.9	116.9	7.7	63.8	274.1	640.7
1994	218.2	7.0	175.5	400.7	56.1	33.2	132.5	9.0	48.5	279.9	680.6
1995	216.6	8.2	202.4	437.2	64.3	31.2	133.5	9.3	72.8	307.9	735.1
1996	228.2	7.6	212.3	448.1	71.8	40.4	136.0	15.3	77.5	333.5	781.6
1997	239.2	7.1	218.6	464.9	78.9	42.1	136.9	21.4	80.9	353.1	818.0
1998	244.2	3.1	241.2	488.5	68.0	32.2	152.5	13.2	84.2	361.5	849.5
1999	256.2	2.7	264.5	523.4	67.8	35.5	145.5	18.5	86.8	354.3	877.7
2000	265.0	2.4	253.4	520.8	75.0	45.1	134.5	19.4	86.6	353.2	874.2
2001	283.9	2.8	234.2	520.9	79.0	41.3	131.8	20.3	87.5	355.9	876.8
2002	292.6	2.7	233.2	528.5	89.0	50.5	138.6	24.0	91.2	383.3	911.8
2003	332.0	3.0	254.0	589.0	97.0	55.0	150.0	28.0	100.0	422.0	1011.0
2004	359.0	4.0	282.0	645.0	97.0	55.0	177.0	31.0	100.0	460.0	1105.0
2005	376.0	4.0	292.0	672.0	115.0	37.0	188.0	36.0	105.0	481.0	1153.0
2006	411.0	5.0	322.0	738.0	123.0	49.0	200.0	46.0	115.0	533.0	1271.0
2007	476.0	6.0	345.0	827.0	126.0	69.0	255.0	58.0	134.0	642.0	1469.0
2008	593.0	7.0	428.0	1028	201.0	39.0	378.0	103.0	171.0	692.0	1720.0
2009	648.0	7.0	456.0	1111	216.0	54.0	404.0	75.0	182.0	931.0	2042.0
2010	845.0	7.0	557.0	1409.0	278.0	78.0	435.0	93.0	222.0	1106.0	2515.0
2011	935.0	8.0	587.0	1530.0	206.0	108.0	445.0	109.0	235.0	1104.0	2634.0
2012	975.0	8.0	600.0	1583.0	246.0	128.0	465.0	125.0	265.0	1229.0	2812.0
Average	707.6	6.25	476.73	1196.3	204.2	74.55	379.1	87.8	193.01	905.48	2101.7
The relative importance	33.9	0.3	22.72	56.92	9.7	3.5	18.03	4.17	9.18	43.08	100

Source: - collected and calculated from the Central Administration of the Agricultural Economy, the Economic Affairs Sector, records of the General Administration of Statistics.

Table (4) Equations factors of general time trend of variable cost items for wheat production per Feddan spread over labor costs and production requirements in Egypt during the period (1991 -2012)

Dependent variable (Yi)	Equation no.	Yi =A +BXi		The relative variable rate	mean	R ²	T calculated	T (modeling)	Significant
		A	B						
Human work cost	1	12.53	33.50	7.7	707.6	0.768	8.414	70.79	**
Animal work cost	2	4.56	0.067	1.07	6.25	0.015-	0.98	0.966	**
Automated work cost	3	69.65	19.94	4.1	476.6	0.836	10.40	108.30	**
Seed cost	4	88.04	53.435	26.1	204.2	0.795	9.091	82.65	**
Manure fertilizers cost	5	6.532	9.35	12.5	74.5	0.768	8.398	70.53	**
Chemical fertilizer cost	6	12.316	3.24	0.85	379.1	0.618	5.92	35.05	**
Pesticide	7	17.91	16.75	19.07	87.8	0.742	7.84	61.58	**
Expenditure	8	18.84-	5.099	2.64	193.1	0.784	8.79	77.43	**

Source: - collected and calculated from the table (3) study.

(**) Significant at the level of significance (0.01)

(*) Significant at the level of significance (0.05)

Yi = the estimated value of the terms of the costs of production in the first year

(**) Indicates significant regression or form when the level of significance (0.01)

(*) To indicate when the significant level of significance (0.05)

R²= coefficient Rate of determination

Table (5) Average total and fixed costs and variable for wheat per Feddan in Egypt during the period (1991 - 2012)

Years	Variable cost (Egyptian pound)	Fixed cost (Egyptian pound)	Total cost (Egyptian pound)	Productivity (Egyptian pound/feddan)
1991	466.8	95.6	562.4	13.47
1992	569.0	95.4	664.4	14.73
1993	640.7	300.0	940.7	14.87
1994	680.6	300.4	981.0	14.00
1995	735.1	300.6	1035.7	15.20
1996	781.6	305.3	1086.9	15.80
1997	818.0	308.3	1126.6	15.67
1998	849.5	703.4	1552.9	16.80
1999	877.7	655.0	1532.7	17.80
2000	874.2	636.2	1510.4	17.80
2001	876.8	645.8	1522.6	17.80
2002	911.8	646.6	1558.4	17.80
2003	1011.0	704.0	1715.0	17.80
2004	1105.0	799.0	1904.0	18.0
2005	1153.0	828.0	1981.0	18.20
2006	1271.0	872.0	2143.0	18.00
2007	1469.0	975.0	2444.0	18.07
2008	1720.0	1260.0	2980.0	18.21
2009	2042.0	1456.0	3459.0	18.06
2010	2515.0	1626.0	4141.0	18.30
2011	2634.0	1826.0	4460.0	18.52
2012	2812.0	1860.0	4672.0	17.33
Average	2101.8	1427.9	3523.2	17.76
The relative importance	59.5	40.50	100	-

Source: - collected and calculated from the table (3) study

Table (6) factors of time trend equations to the terms of the costs, fixed and variable costs and total production of wheat acres in Egypt during the period (1991 -2012)

Dependent variable (Yi)	Equation no.	Yi = A + BXi		The relative variable rate	mean	R ²	T calculated	T (modeling)	Significant
		A	B						
Variable cost per pound	1	121.94	95.37	2101.8	4.5	0.791	8.97	80.54	**
Fixed cost per pound	2	- 104.72	77.08	1427.9	5.4	0.890	13.13	172.57	**
Total cost per pound	3	19.275	172.13	3523.2	4.9	0.844	10.734	115.23	**

Source: - collected and calculated from the table (3) study. (**) Significant at the level of significance (0.01)

(*) Significant at the level of significance (0.05); Yi = the estimated value of the terms of the costs of production in the first year

(**) Indicates significant regression or form when the level of significance (0.01)

(*) To indicate when the significant level of significance (0.05); R²= coefficient Rate of determination

Table (7): shows the national and individual consumption, the retail price, the number of population and average per capita income in Egypt during the period (1991 -2012)

Years	National consumption of wheat (Million ton)	Population (million)	Average per capita real income in pounds **	Real retail price* (Pounds/ardab)	Average per capita consumption of wheat Kg
1991	8.87	55.6	824.40	43.0	159.5
1992	9.29	56.9	936.20	46.0	163.3
1993	8.45	58.3	918.70	41.1	144.9
1994	11.93	59.6	961.20	40.8	200.0
1995	10.52	60.8	943.70	39.6	173.0
1996	10.83	62.1	953.90	41.0	174.4
1997	10.41	63.2	1012.90	42.0	164.7
1998	11.19	64.5	981.40	43.6	173.5
1999	9.63	65.7	995.70	42.5	146.6
2000	11.11	66.2	1010.20	42.0	167.8
2001	9.82	66.7	1030.20	43.7	147.2
2002	11.63	70.5	1075.30	40.9	165.0
2003	10.94	71.3	1105.4	38.3	153.4
2004	11.75	71.9	1250.80	44.0	163.4
2005	13.36	73.0	1283.50	37.6	183.0
2006	13.67	74.3	1307.4	33.9	184.0
2007	14.60	76.7	1385.40	33.2	190.4
2008	14.94	79.5	1415.46	33.7	187.9
2009	15.16	81.7	1522.50	33.9	185.6
2010	16.92	83.8	1696.50	34.3	201.9
2011	17.16	85.9	1799.45	35.2	199.7
2012	18.10	87.2	1902.55	36.9	207.5
Average	15.6	81.4	1565.64	35.8	191.75

Source: -

1 – Central Agency for Public Mobilization and Statistics, Bulletin consumption numbers are different.

2 - Central Agency for Public Mobilization and Statistics, Statistical Yearbook, various issues.

3 - Central Agency for Public Mobilization and Statistics, the quarterly bulletin for retail prices, different numbers *

- the real price indices weighted wholesale prices 1986/1987 = 100

** - Real personal income figures for standard living expenses 1986/1987 = 100

Table (8) equations factors of general temporal trend of the evolution of the number of population and national income, national and per capita consumption and retail price in real terms and per capita wheat in Egypt during the period (1991 -2012)

Dependent variable Yi)	Equation no.	Yi =A +BXi		The relative variable rate	mean	R ²	T calculated	T (modeling)	Significant
		A	B						
Population (million)	1	133.11	1.26	7.69	81.4	0.981	32.20	1036.92	**
Real per capita income (pound)	2	689.95	44.06	2.81	1565.6	0.85	11.12	123.77	**
Real retail price * (pound/ardab)	3	44.48	0.47-	1.31	35.8	0.57	5.40	29.24	**
Per capita consumption (million tons)	4	154.12	1.76	0.92	191.70	0.340	3.44	11.83	**
National consumption (million tons)	5	133.11	6.26-	40.1-	15.6	0.016-	0.811-	0.606	**

Source: - collected and calculated from Table (6) study.

Yi = all of the population (Millions), per capita income (Egyptian pound) and average per capita consumption in kg and the retail price in real terms Pounds / ardebs and the amount of wheat consumed in the first year per Million Tons.

Xi= Variable time, (I) 1, 2 21

A, B = refer to constant and the regression coefficient of the equation, respectively

P2i = ardab price of wheat in real terms pounds / ardebs in the year (I)

(**) Indicates significant regression or form when the level of significance (0.01) (* Indicates a significant at the level of significance (0.05)

(**) Indicates a lack of significance, R²= coefficient Rate of determination

Table (9) Regression equations of the most important factors affecting the quantity of wheat consumed in Egypt during the period (1991 -2012)

Dependent variable	Equation no.	Equation	Elasticity	R ²	F Calculated	Significance
Population /wheat consumption	1	$LY_i = -1.181 + 1.238L X 1_i$ (-2.575)** (5.221)**	1.389	0.512	25.188	**
Real per capita income (pound)	2	$LY_i = -1.19 + 0.58 X 2_i$ (-2.349)** (4.584)**	0.531	0.65	45.658	**
Real price for wheat consumed per ardab	3	$LY_i = 4.165 - 1.278 L P2_i$ (6.754)** (-4.350)**	1.356	0.812	18.515	**

Source: - collected and calculated from Table (7) of the study.

Yi = amount of discretionary wheat consumed in Egypt million tons in the year I

X1i = number of the population in Egypt million people a year (I), X2i = average per capita income in pounds per year (I)

P2i = ardab price of wheat in real terms pounds / ardab in the year (I), I = years 1, 2 21

L = Log

(**) Significant at the level of significance (0.01), (*) Significant at the level of significance (0.05)

Table (10) the development of both consumption and wheat gap in Egypt during the period (1991 -2012)

Years	Total production (million ton /1)	Total consumption of wheat (million tone/2)	Self-sufficiency % (2/1)	wheat gap (million tone)1 - 2
1991	4.48	8.87	50.51	4.39
1992	4.62	9.29	49.73	4.67
1993	4.84	8.45	57.28	3.61
1994	4.43	11.93	37.13	7.50
1995	5.72	10.52	54.37	4.80
1996	5.74	10.83	53.00	5.09
1997	5.85	10.41	56.20	4.56
1998	6.10	11.19	54.51	5.09
1999	6.09	9.63	63.24	3.54
2000	6.57	11.11	59.14	4.54
2001	6.25	9.82	63.65	3.57
2002	6.62	11.63	56.92	5.01
2003	6.85	10.94	62.61	4.09
2004	6.74	11.75	57.36	5.01
2005	8.05	13.36	60.25	5.31
2006	8.26	13.67	60.42	5.41
2007	7.34	14.60	50.27	7.26
2008	7.97	14.94	53.33	6.97
2009	8.52	15.16	56.20	6.64
2010	7.25	16.92	42.84	9.67
2011	8.03	17.16	46.79	9.13
2012	8.07	18.10	44.58	10.03
mean	7.66	15.55	49.89	7.39

Source: - Ministry of Agriculture - and Land Reclamation, Economic Affairs Sector, Records of the General Administration of Statistics.

Table (11) the area in the sustainable production of alfalfa in Egypt during the period (1991 -2012)

Years	Clover (thousand Feddan)	Production quantity (thousand tons)
2001	1935	54655
2002	1996	58583
2003	1966	57916
2004	1906	56946
2005	1603	48714
2006	1657	49530
2007	1689	450487
2008	1619	48554
2009	1518	43997
2010	1813	69425
2011	1588	46342
2012	1539	46121
Mean	1650	51379

Source: - Ministry of Agriculture - and Land Reclamation, Economic Affairs Sector, Records of the General Administration of Statistics.

Table (12) seasonal needs of the animal units of green fodder in Egypt during the period (1991 -2012)

Years	Sum of animal units per thousand unit	Requirement of winter and summer of green fodder		
		Winter green fodder* (Thousand tons)	Summer green fodder* (Thousand tons)	Total requirement of fodder for animal during one year
2001	7538	45338	3015	48243
2002	8012	48072	3205	51277
2003	82.3	49218	3281	52499
2004	8413	50478	3365	53743
2005	8557	51342	3423	54765
2006	8724	49344	3490	53834
2007	9019	54114	3608	57722
2008	9345	56070	3738	59808
2009	9598	57588	3839	61427
2010	9850	59100	3940	63040
2011	9978	59868	3991	63859
2012	10054	60324	4021.6	64345.6
Mean	9529.5	60324	4021.6	64345.6

* Calculated on the basis of seasonal needs: the need for winter animal unit = 6 tons of green fodder, the summer need for animal unit = 0.4 tons of green fodder.

Source: - Animal Production Research Institute, Department of Animal and Poultry feed, the foundations of modern scientific and feed and fodder.

Recommendations: -

The study recommends the following: -

- Must expansion in grow horizontally for wheat crop in each of the new reclaimed land by increase the cultivated area, and the abolition of compulsory supply. As well as, in the old lands reducing alfalfa area and cultivated with wheat.
- Vertical expansion in wheat and following the technical recommendations on new varieties, irrigation, fertilization, planting dates and reducing the cost of wheat production using mechanization in production, and take care of the dates of planting, harvesting and purity of weeds.
- Farms awareness to reduce wastage of wheat during and after harvest, as well as rationalize consumption of wheat and adopt appropriate pricing policy to increase the cultivated area. In addition to the announcement of the price of wheat before the date of cultivation by enough time as well as the replacement of corn silage instead of alfalfa in animal feed.
- Full emancipation of the prices of production inputs and the abolition of support in return for full liberalization of final product prices according to market mechanisms and the abolition of the crop composition, as well as leave complete freedom in determining the spaces of farms cultivated crop.
- Expansion in the development of new varieties and breeds with suitable and high productivity, as well as bear the high temperature region of Upper Egypt and the desert territory.

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Review and prioritization of the external environment factors affecting the strategic capabilities in the banking industry with foresight approach: Case Study of Sepah Bank, 2013

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Abstract: Highly dynamic business environment in the banking industry has caused maintaining and developing strategic capabilities in this industry to be a major challenge for managers in the banking industry, especially for state-owned banks, and foresight as the most modern tools to meet this challenge, has assisted managers in today's organizations. In spite of the necessity of this matter. With respect to this matter, a special study has not been done so far in this regard. This study which is an applied - survey research associated with the complex research methods has the administrators, teachers and activists in the banking industry as its statistical population. This study tries to adapt the factors involved in the strategic capabilities based on interviews with 15 experts in Sepah Bank with industry space under review and then, 188 experts of Sepah Bank were identified and through incessant verbal and non- verbal negotiations, 134 of them were willing to cooperate. It should be noted that the survey sample, is the conventional method for the experts that is being introduced from other experts. Using TOPSIS software and SPSS for rankings test, environmental factors of the banking industry affecting the strategic capabilities were identified and prioritized.

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Keywords: Organization's external environment, Strategic capabilities, Prioritization factors, Foresight approach

1. Introduction

To achieve long- term vision and plan for the banking industry is not possible without study of the organizational environment and considering the increasing changes. On the other hand, focusing on strategic capabilities based on a new concept of futures studies is necessary. In order to monitor organizational environment which is needed in the long-term planning, taking advantage of the new management model, the futures studies, and its application in strategic studies is a serious requirement, and this research is trying to move in this direction. Thus, even a small step, is taken toward helping theoretical frameworks in management in an interdisciplinary research, by linking the two concepts of strategic management and futures studies. Reviewing the studies in Iran indicate that management research conducted in relation to this research with futures studies approach is in its infancy, and despite the necessity of this, serious research has not been done in this regard so far.

2. Literature Review

2.1. Strategic Capabilities

Strategic capabilities is defined to help organizations develop competitive advantage; since the main focus of the research in strategic fields has been to prove the hypothesis that achieving the optimal and ideal competitive position would lead

organizations that step in this direction to achieve to a high level of positioning in comparison with their competitors. This objective can be clearly seen Table (1) below.

Table 1: Strategic Objectives

neutral	Minimizing the destructive effects	Being at the same level with competitors
supportive	High confidence support of the organization's strategy	Providing resources for establishing and developing competitive performance
	internal	external

Source: (Barnes, Rowbotham, 2003)

In this regard, providing the strategic factor and resources which result in creating and developing competitive advantage in organization should be relied on. These resources are mentioned as "supportive" in the strategic literature (Barnes, Rowbotham, 2003). In this research, organizational strategic capabilities have been studied in terms of external factors. These factors include market and customer dynamics, technology dynamics, competitors, social and cultural factors, political, and economic factors and laws.

2.2. Organization's Environment

The organization's environment include a set of factors that affect the organization's mission, goals, and correspondingly the organization's strategy, and are more or less affected by organization's functions, but the organization does not have much control over them. The main factors of recognizing the environment, which should be assessed separately for each of the components, are as follows:

A - Complexity: This factor is concerned with conflict and heterogeneity of different components of the environment. This means that each of the components must be examined viewed in terms of the relationship with the organization and the relationship with other components of the environment to determine the extent and degree of complexity.

B - Dynamism: it comes from when the parts of the environment are constantly changing and cannot be taken as fixed and unchanged in the analyses. Moreover, the vast majority of these changes is unpredictable and thus pinpoints what's coming to them and therefore the environment is not easy. Thus, each of the components in these areas should also be reviewed and categorized to determine the dynamics of the environment.

C - Toughness: each of the components alone or in partnership with other components, have access to the parts of necessary resources of the organization. Therefore, access to these resources depends on the mode of action of these components, these resources can be of importance for organization and easy access to different organizations; hence, the impact of these resources on the organization and degree of desirability of attaining them for the organization totally show toughness of environment. If any part of the environment is categorized in this regard, of course, the tenacity and toughness of environment is characterized.

Here's an important point that should be noted, that how much the environment of an organization is tougher and more dynamic, naturally requirements that are imposed to the organization are more, and then restrictions and coercions of to the organization are more. Such an environment is called environment with strong force and requirements, and by determining the environmental conditions for each organization, its high level of requirements can be realized (Shahmansuri, Norouzi, 2012).

Banks in order to optimize the performance of their activities and have participation in the development of the country now and in the future, requires timely and accurate information from reliable sources about the environmental have impact on their processes. This information is part of the banking industry to protect the bank from increasing

tension caused by environment changes. It should be noted that there is a wide range of information in the banks. However, in countries such as Iran, banking industry faces many uncertainties and bank managers often have experienced lack of information about the external environment. (POPOOLA, 2000).

2.3. Foresight

Almost in all fields of management, managing the future plays an important role. However, this concept has different meanings in management. This concept is widely used in deciding making. Upon the type and amount of information that is available to decision makers, taking decisions has three categories, including (1) decision making under certainty, (2) decision making under risk, and (3) decision making under uncertain conditions. The first describes the situation in which the decision maker knows that it can predict exactly what will happen in the future. In the second case, the decision maker cannot see future improvements, but is aware of the possible developments and considers how this development may be possible. In this case, the future is an open concept, but is defined only in a certain range. In the third case, the decision maker knows only future development is possible, but its probability is beyond the scope of the second case. In this case, the decision-makers' goal is making relationships between the organization's current status and future developments (Seidl, Aaken, 2004). The third case is about the future Term foresight entered in the late 1980s, into management sciences, and social sciences and were used by the organization (Anderson, 1997). Experts tend to the foresight for three separate reasons and the intersection of these three different aspects form the foresight. These three areas are: a) strategic planning, b) futurist and c) Networking (Miles, 2002) visible in Figure 1.

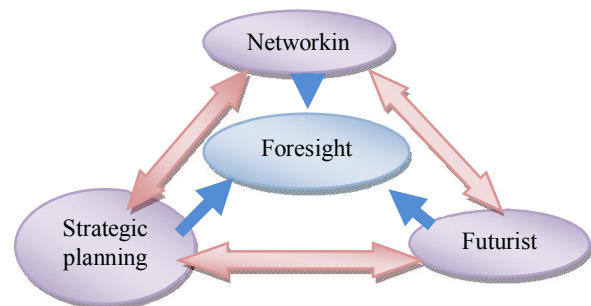


Figure 1: The origin of foresight (Miles, 2002)

This process of certain focus on senior manager's cognitive mechanisms facilitates decision making respectively through networking, collective understanding of the factors involved in the issues, the impact of each of these factors on each other, the major issue in another time, and modeling. Based on

the presented final model, the strategic planning is carried out, and the steps necessary to implement the program in time horizon is determined (Bootz, 2010,3).

1.2.3. Networking

As the foresight definition shows, output of this process is to better anticipate and shape the long-term future. Among the wide range of opinions and perspectives of experts (consensus) on each dimension of the problem at hand is needed (Apšvalka et al., 2008). Networking is among the measures necessary as prelude to the process of futures studies. The team started its activities at this time is responsible for establishing and managing the network better in terms of constructive communication among members for the effectiveness of its work. Members of this network can be divided into two groups, each of which have a significant impact on the decision making process, the industry experts whose members are selected among academicians, artisans, government officials and senior scientific advisors. The second group includes stakeholders, policymakers and external stakeholders who are indirectly influenced by the decisions made by the first group (Anderson, 1997).

There are no clear rules on how to select the number of participants in the network does not have the foresight. Depending on the number of factors: the size of the project or plan, decision quality, time and resources are available for data collection. With the advent of information technology in recent decades, the development of a network for consensus among members was created and by employing this technology, the speed of decision making is increased and the effectiveness of communication is also increased, and the exchange of information among members is facilitated. Some new forms of networking and facilitating communication between members are the followings:

1. Email tool is widely used to update their information and invite experts to attend meetings and conferences.
2. Activation of electronic portals to publish news about recent developments in technology, changes in customer demand and requirements, along with analyzes of the News.
3. Causing official websites of foresight that provides access to a number of reports and notices of futures studies programs.
4. Experimental Marketing Website to facilitate communication between customers and other stakeholders of the company, to assess their needs and to design products according to customers' demands about their views
5. Brainstorming international community set up the company which enables a large number of experts,

customers and stakeholders to participate in the presentation of an electronic survey (Smith, Mason, 2004).

2.2.3. Futurist

Futurist can be defined as activities with short term, but a continuous period, for the main process of futures studies, which juxtaposition of these sub- activities, determine the general trend of foresight. Among the features that foresight will have through this is scientific credibility, being structured, Macro perspective, the wide and long term, and continuous view on activity, a framework of cause and effect, tool for knowledge transfer, less attention to processes of output, focusing on human resources and incentives, and efforts to promote the formation of consensus among members (Technology Foresight for Organizers, 2003).

3.2.3. Planning

One of the messages that the foresight have for managers and many scholars have approved and stressed it is considering the fact that there is no need for detailed knowledge of the future, it is sufficient just to be prepared for the future. This message explicitly represents the need to deployment of strategic management for planning in this process. Strategic management approach is based on the identification of the main factors affecting the company's objectives and performance over a long period, and analyzing the potential impact of these factors on the organization's mission, and finally tracing the development of landscapes created by the transformation of these factors. Strategic thinking seeks to explore the underlying assumptions and pursue the process of changes from the present to the future, passes its evolution and in order to achieve the development associated with these changes, accommodate planning which is required (Jackson, 2011).

3. Research Background

Petti & Zhang (2011) in their study on the theoretical review of models of entrepreneurship in technology, review a model that represents the concept that internal and external organizational factors and organization's mission have a direct impact on the strategic capabilities. Jabbour et al. (2010) in their study argue that examining institutional environment is imperative for the organizations with stable and unstable strategies and considering the knowledge-based capabilities to provide high quality products and services and customer satisfaction. Three strategies on external environment are faced the organizations. The organizations on the basis of their strategy choose one of those strategies. The first one is being a function of the environment (reactive approach), the second one is integration of internal factors with

respect to changes in external factors (preventive approach), and the third one is integration of internal and external factors (proactive approach). This research is based on the theoretical aspects and has not found the application yet. Fergusson & Langford (2006) in their study have examined the impact of environmental factors on the ability to develop models and strategies have been studied in this context are discussed. The results indicated that six environmental factors including the dynamics of the technology, market and customer dynamics, policy making and legislation, economic, cultural, and social and competitors influence the strategic capabilities of the organization. Lenz & Engledow (1987) in relation to environmental factors affecting organizational strategy, consider the governmental, social and competitive factors as the most important factors in organizations associated with educational institutions and universities. According to Hedari's studies, (2009) environmental factors affecting the competitive advantage include of the market dynamism, technology dynamism and competition severity, and according to the space of the industry under study, other environmental factors can be added to them. Finally, factors related to competitive performance include the marketing capability, technological capability, a relational capabilities, production capabilities, and knowledge-based capabilities. Doustyari and Nourbakhsh (2006) argue that one of the main concepts in the literature on strategy is the environment. Strategic management is basically a response to environmental challenges and chaos. In the prosecution of their missions, organizations are faced with two main questions; the first question is what they are and how their quality is? And the second question is where they are standing and what their relation with their surrounding is. The answer to the first question requires an evaluation of the internal factors and the answer to the second question requires evaluation of external factors. However on the discussion of strategies for "issues "of public administration, distinction between environmental factors (opportunities and threats) often creates problems and confusion.

4. Research Methodology

In terms of goal, this research is an applied research, since it seeks to achieve a desired scientific objective and its emphasis is on the present and future situation's desirability (Delavar, 2010). In terms of method of data collection, the study is considered as descriptive - survey research, since it deals with the issue in which the researcher has not possibility to intervene with the subjects (Sarmad et al., 2006). The research methodology is based on a "blended futures studies study". The ultimate results

of research are a combination of approaches rather than a specific method. This approach combines three methods of survey research, library data, and semi-structured interviews with 15 experts of Sepah Bank and the members of 134expert panels through two rounds of semi-structured questionnaires of the original group of industry experts. The questionnaire consisted of 18 closed questions and one open question, with Cronbach's alpha of 0.8226 / 0, that examines a complex and uncertain situations in the future which would not be possible with a single method. It should be noted that the reliability of the questionnaire was confirmed by a number of professors from the Department of Management.

4. 1. Rating of Environmental Factors – strategic capabilities

The most common method for ranking the relations in management science is using TOPSIS method. TOPSIS (technique similar to prioritize the positive ideal solution) is known as one of the classical methods, which was developed in 1981 by Hwang and Yoon to solve problems on the basis of the ideal. The selected option must have the shortest distance from the positive ideal and the maximum distance from the negative ideal in other side (Hwang & Yoon, 1981). The history of using TOPSIS model in the Iran is beginning of 1991 decade and the use of fuzzy status is limited to a few years.

Step 1 - obtain the weight vector $w \sim j$ (using entropy method)

Step 2 - normalizing the matrix derived from expert opinions.

Step 3 - The Formula 4 is formed by weighted matrix:

$$\tilde{V} = [\tilde{v}_{ij}]_{m \times n}, \quad i = 1, 2, \dots, m, \quad j = 1, 2, \dots, n$$

$$\tilde{v}_{ij} = \tilde{r}_{ij} \otimes \tilde{w}_j$$

Step 3 – Therefore the weighted matrix is:

$$\tilde{V} = [\tilde{v}_{ij}]_{m \times n}, \quad i = 1, 2, \dots, m, \quad j = 1, 2, \dots, n$$

$$\tilde{v}_{ij} = \tilde{r}_{ij} \otimes \tilde{w}_j$$

Step 4 – Determining the Fuzzy positive ideal solution \tilde{v}_j^* and Fuzzy negative ideal solution \tilde{v}_j^- :

$$\tilde{v}_j^- = \begin{cases} \min_{i=1, \dots, m} \tilde{v}_{ij}; j \in B \\ \max_{i=1, \dots, m} \tilde{v}_{ij}; j \in C \end{cases} \quad \tilde{v}_j^* = \begin{cases} \max_{i=1, \dots, m} \tilde{v}_{ij}; j \in B \\ \min_{i=1, \dots, m} \tilde{v}_{ij}; j \in C \end{cases}$$

Step 5 - Calculating the distances of measurements

Step 6 - Calculating the relative closeness to the ideal and ranking

$$CI_i = \frac{d_i^-}{d_i^- + d_i^*}$$

5. Expert's Consensus

5.1. The first round of foresight

5.1.1. Adaptation of factors with the industry's environment

Since the list extracted from the theoretical studies has been related to the results of the overseas studies, for the localization and depth review of these factors and the situation in which we are placed. (Mirzaei Rubber et al, 2011, 4). Some of these factors also do not affect the present study's results.

5.1.2. Justifying the experts about the subject

The first practical step in the expert's consensus on the foresight is establishing the research subject and providing the necessary documentation required to answer the interview questions, so that we can achieve the high level of conceptual agreement on the overall dimensions of the problem and related concepts between the experts and researcher (Smith, Mason, 2004, 6). Therefore, some related documentations are sent to the experts before the interview.

5.1.3. Refining the list of factors

It seems necessary to review the research indicators with a small number of experts familiar with the banking industry. 15 experts, among the 23 of them, were willing to cooperate in the interview that lasted for 12 hours.

Table 2: Factors and sub-factors

Environmental factors						strategic capabilities		Sub-factor
customers' dynamism	Market and competitors	Social and cultural	Las and policies	economic	Technology	knowledge-based	marketing		Technology

5.2. The second round of foresight

5.2.1. Selection of members (industry experts)

After refining the list of factors relevant to the strategic capability in terms of the organization's external environment, with the help of experts in the banking industry the main process of futures studies starts. The first step is to determine the desired expert to acquire information and consensus opinion of experts through a semi-structured questionnaire for them. In this study, the indicators for identification of industry experts include management experience, people who have academic and research activities

this field, and the main actors in this industry that are introduced by other experts.

5.2.2. Re-justifying the experts about the subject

In this step, providing the necessary documentation needed to answer questions of the experts seems essential. Then we can achieve a high level of conceptual agreement about the overall dimensions of the problem and related concepts between the experts and researcher. Therefore, some related documentations are sent to the experts before or during the presentation of the questionnaire.

6. Analysis

6.1. Establishment of relationships by the experts

In this step, a semi-structured questionnaire is used in order to obtain the exact opinion of the experts for establishing the relationships between the factors. In summary, only the initial and final tables are presented.

Table 3: Matrix of environmental factors - strategic capabilities

	strategic capabilities		
	Technology	marketing	knowledge-based
Technology dynamism	4/3059	4/477	4/1716
economic	4/2910	4/014	2/4179
Social and cultural	1/9850	3/828	4/2164
competitors	4/3880	3/977	4/5
Market and customers' dynamism	4/2761	3/843	4/2537
Las and policies	3/2164	4/283	2/1865

Table 4: Weights of indicators (entropy method)

	Technology	marketing	knowledge-based
Weight	0/449102	0/028433	0/522465

Table 5: Ranking of environmental factors

	environmental factors	Chi
1	competitors	0/935851
2	Market and customers'	0/914814
3	Technology dynamism	0/911634
4	economic	0/497025
5	Social and cultural	0/46723
6	Las and policies	0/37431

Table 6: Results of Friedman's test at a significance level of environmental factors in the organization's strategic capabilities

Number	134
Chi square	282/042
Degrees of freedom	5
Significant	0/000

Average Rating for competitive variable is 4.6 which show that this variable is more important than other variables. The variables of market and customer dynamics, technological dynamics, economic, cultural and social factors and laws and policies have the next priorities respectively. In conclusion we can say that competitive factor has more role than other contributing factor in the organization's strategic capabilities, and according to the fact that the significance level in Friedman test is 0.000, with 99 percent of confidence and one percentage of error can be concluded that competitive factor is the most important factor in strategic capability of the organization.

The third round of foresight

6.2. Confirming the previous step's results and re-accountability

After analyzing the questionnaires of the previous step, the results and another copy of the questionnaire are returned back to the experts, so that they can provide their additional comments.

Table 7: Matrix of environmental factors - strategic capabilities

	strategic capabilities		
	Technology	marketing	knowledge-based
Technology dynamism	4/32089	3/8432	4/26119
economic	4/30597	4/0522	2/41791
Social and cultural	2	3/8358	4/20149
competitors	4/44776	3/9925	4/5
Market and customers' dynamism	4/44776	4/5895	4/31343
Las and policies	3/18656	4/2462	2/17910

Table 8: Weights of indicators (entropy method)

	Technology	marketing	knowledge-based
Weight	0/450	0/0323	0/51761

Table9: Ranking of environmental factors

	environmental factors	Chi
1	competitors	0/992435
2	Market and customers'	0/957676
3	Technology dynamism	0/912374
4	economic	0/521361
5	Social and cultural	0/458292
6	Las and policies	0/230371

Table 10: Results of Friedman's test at a significance level of environmental factors in the organization's strategic capabilities

Number	134
Chi square	319/304
Degrees of freedom	5
Significant	0/000

Average Rating for competitive variable is 4.8 which show that this variable is more important than other variables. The variables of market and customer dynamics, technological dynamics, economic, cultural and social factors and laws and policies have the next priorities respectively. In conclusion we can say that competitive factor has more role than other contributing factor in the organization's strategic capabilities, and according to the fact that the significance level in Friedman test is 0.000, with 99 percent of confidence and one percentage of error can be concluded that competitive factor is the most important factor in strategic capability of the organization.

7. Conclusion

According to the step by step procedure of the research, the results are divided into the three parts of the foresight process's first round, second round and third round.

The first round of foresight process:

Environmental factors: Experts' consensus for the effect of technology dynamism factor on the banking industry is 80 %, the economic conditions factor is 87 %, social and cultural factors is 74 %, competitive factor is 100, market and customers' dynamism factor is 100 % and laws and policies factor is 93.40 %. These figures indicate the fact that the factor of market and customers' dynamism has the most value and the factor of social and cultural has the least value amongst the other environmental factors.

Factors of Strategic capabilities: Agreement of experts for factors of strategic capabilities in the banking industry. Experts agree on the technological capabilities of the banking industry for 73 percent, the market capabilities for 93 percent, knowledge-based capabilities for 87 % and finally relational capabilities for 13 %, which indicates the fact that factor of marketing capability has the highest value and social and cultural factors have the lowest value among the other environmental factors. As the percentage of agreement between the experts is less than 70 % only for relational capabilities factor, this factor is removed from factors associated with strategic capabilities.

Competitive performance factors:

The second round of foresight process:

Environmental factors directly affect the strategic capabilities. The competitors is the main factor in organization's competitive performance and after that market and customers dynamics, technological dynamics, economic, cultural and social conditions and finally legislation and policies are ranked.

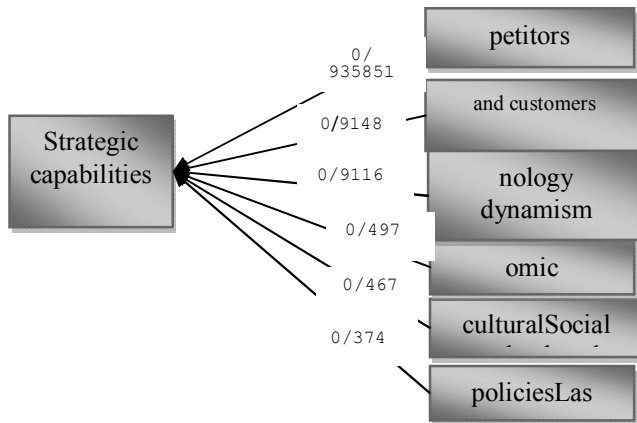


Figure 2: Ranking based on the first round questionnaire

The third round of foresight process:

The third round of futures studies process is completely consistent with the results of the previous stage, and at this point, environmental factors directly affect the strategic capabilities. The competitors is the main factor in organization's competitive performance and after that market and customers dynamics, technological dynamics, economic, cultural and social conditions and finally legislation and policies are ranked.

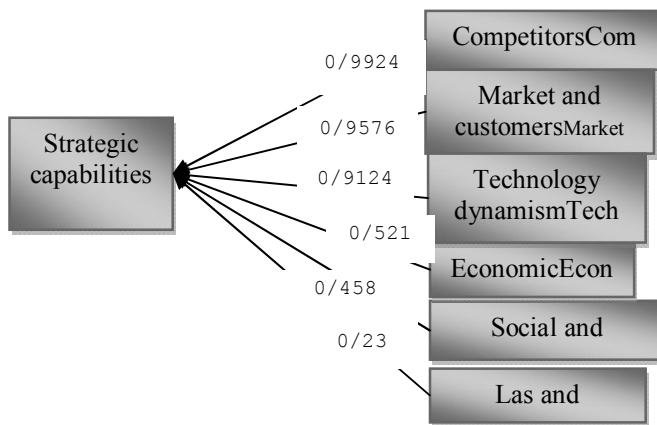


Figure 3: Ranking based on the second round questionnaire

Suggestions based on research findings

According to the findings of this research, in the current era, environmental and organizational knowledge has the main importance in proceeding the strategic goals and programs to promote the organization's competitive position level, it is therefore recommended that organizations try to pay attention to this important issue and institutionalize acquiring the up-dated environmental and

organizational knowledge in the whole organization and even industry.

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Prevalence and Monetary Loss due to Bovine Fasciolosis in Juba Slaughter House South Sudan

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Abstract: Study on Prevalence and Monetary Loss from liver condemnations due to bovine fasciolosis was conducted in Juba main slaughter house for three months as of May to July 2012. A total of 4,642 indigenous Nilotic and exotic Ankole cattle breeds were investigated. Nilotic cattle revealed high prevalence of 96.8% compared to 2.5 % in Ankole cattle attributed to *Fasciola gigantica* during post-mortem examination. Likewise, fecal examination revealed a prevalence of 89.6% in Nilotic and 2.9 % in Ankole cattle breed. This significant difference in prevalence rate between the two breeds might be attributed to de-worming regimens taken prior to importation of Ankole cattle from Uganda to South Sudan. Fasciolosis was found to be responsible for a condemnation of 36.4% inspected livers suggesting fasciolosis as one of the priority diseases of economic importance in South Sudan. The sum of monetary losses revealed 45,180 SSP (15,227.5 USD) and 17,560 SSP (5,918.4 USD) in total and partial liver condemnations, respectively. Further epidemiological and molecular studies are needed to develop strategies for the control of bovine fasciolosis in South Sudan.

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Key words: Prevalence, Monetary Loss, Liver Condemnations, Bovine Fasciolosis, Nilotic, Ankole, cattle breeds, South Sudan

1. Introduction

Bovine fasciolosis due to *Fasciola hepatica* and *F. gigantica* is one of the economically important snail-borne parasitic diseases of cattle in tropical and subtropical countries that limits animals productivity (Dechasa *et al.*, 2012). The snails *Lymnaea natalensis*, the intermediate hosts of *F. gigantica*, commonly occur in northern Gezira and southern Khartoum State, Sudan culminating in high prevalence of fasciolosis (Atta Elmanan *et al.*, 2001). Recent evidence has shown that bovine fasciolosis is endemic in swampy areas of Northern Bahr el- Ghazal, Jonglei, Lakes and Central Equatoria States (Anon, 2010). Furthermore, previous reports in the then southern Sudan showed higher incidence of the disease as 33%, 56% and 47% in Equatoria, Bahr El Ghazal and Upper Nile Provinces, respectively (Karib, 1962).

The economic losses due to bovine fasciolosis are enormous. They are attributable to a number of factors including livers condemnation, increased susceptibility to secondary infections and expense of control measures (Ibrahim *et al.*, 2010). However, no or little progress has been made to investigate the prevalence and estimate the monetary loss due to bovine fasciolosis in Central Equatoria State (CES), South Sudan.

The purpose of the study was to determine the prevalence of the disease and estimate the monetary losses due to livers condemnation among indigenous

Nilotic and exotic Ankole cattle in Juba main Slaughter House, South Sudan.

2. Material and Methods

2.1 Study Area

Juba lies in the tropical climate at 0346475 and 0346484 °N and 0535105 and 0535139 °E, and at the elevation of 460 meter using global positioning system (GPS). Annual ambient temperature ranges from 24.7°C to 34.5°C, the mean relative humidity stands at 55% and the rainy season usually commences in April and ends in November. Livestock are brought daily for marketing and slaughter purposes from various locations such as Rumbek, Terekaka, Bor, Pibor and the neighbouring Uganda.

2.2. Study Design

A total of 4,642 adult cattle which included 713 indigenous (Nilotic) and 3,929 exotic (Ankole) breed imported from Uganda were investigated. 150 fecal samples were collected from 48 indigenous Nilotic and 102 exotic Ankole cattle for detection of fasciola eggs employing sedimentation techniques. The study was designed based on cross sectional type to determine the prevalence rate and estimate monetary loss due to liver condemnations using anti-mortem and post-mortem examinations for each adult indigenous and exotic cattle. Estimation of monetary losses was assessed through participatory approaches including meetings and interviews with retailers, cattle owners and butchers. The prices were taken from the current retail price of 40 SSP per 1 Kg of liver. The

calculation was made from 439 partially and 251 totally condemned livers.

2.3 Data Management and Analysis

Data from the Slaughter house figures during meat inspection were recorded on daily basis. Data analysis was made using a computerized programme package.

3. Results

3.1 Prevalence of fasciolosis

The prevalence of the disease in indigenous Nilotic cattle ranged from 85.3% to 99.2% with an average of 96.8%. Similarly, such a prevalence in the exotic Ankole breed ranged from 2.3% to 2.8% with an average of 2.5%. (fig. 2 and tab.1). However, the overall prevalence of fasciolosis in the study area was 17.0 % (790/4,642). In indigenous breed, the prevalence was high compared to the exotic cattle breed. Fasciola eggs were detected in 46 fecal samples of which 30.7% showed fasciolosis. Comparatively, Ankole cattle showed only 3 positive cases (2.9%) while Nilotic cattle had the majority of 43 cases (89.6%) as depicted in table 2.

3.2 Monetary Losses

Monetary loss due to condemnation of 251 out of 713 livers amounted to 45,180 South Sudanese pound (SSP) and 17,560 SSP for total condemnation and partial condemnation, respectively.

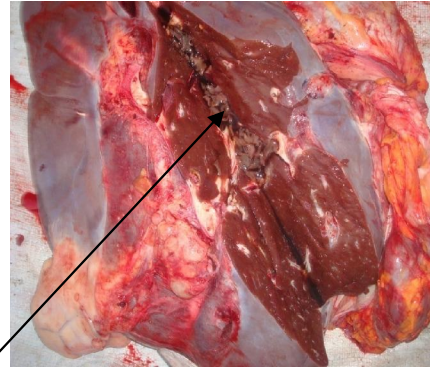


Figure 1: *Fasciola gigantica* in a bile duct of a condemned liver at Juba main S/House.

Table (1) : Prevalence of Bovine fasciolosis in indigenous Nilotic and exotic Ankole cattle examined at Juba main Slaughter House, May - July 2012.

Month	Post-mortem Examination						Total	
	Ankole cattle	No. +ve	Prevalence % (Mean)	Nilotic cattle	No. +ve	Prevalence % (Mean)	No. of Cattle examined/month	Overall Prevalence % (Mean)
May	1,273	29	2.3	198	169	85.4	1,471	13.5
June	1,316	37	2.8	264	257	97.3	1,580	18.6
July	1,340	34	2.5	251	249	99.2	1,591	17.8
Total	3,929	100		713	690		4,642	
			2.5			96.8		17.0

Table (2) : Apparent prevalence of Bovine fasciolosis from fecal examination at Juba Slaughter House, May –July, 2012.

Month	Fecal Examination						Total	
	Ankole cattle	No. +ve	Prevalence % (mean)	Nilotic cattle	No. +ve	Prevalence % (mean)	No.of cattle examined/month	Overall Prevalence (%)
May	21	0	0.0	19	17	89.5	40	42.5
June	36	2	5.6	12	10	83.3	48	25.0
July	45	1	2.2	17	16	94.1	62	27.4
Total	102	3		48	43		150	
			2.9			89.6		30.7

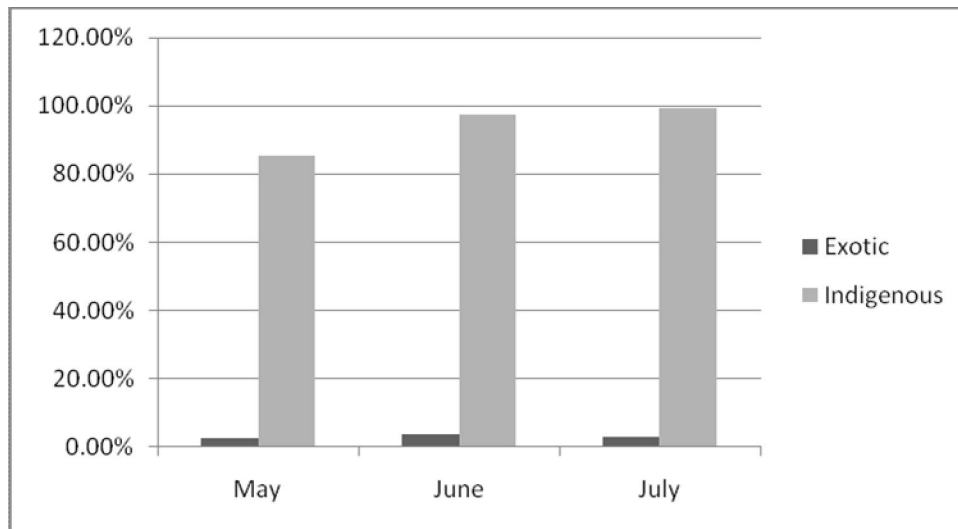


Figure 2: Monthly prevalence of *Fasciola gigantica* infection in Exotic(Ankole) and Indigenous (Nilotic) cattle during post mortem examination at Juba main S/House, May - July 2012.

4. Discussion

The significantly higher prevalence of Bovine fasciolosis in indigenous Nilotic than the exotic Ankole cattle breed might be attributed to lack of control strategy applied to fasciolosis for the past three decades besides inadequate veterinary services delivery system in South Sudan. This is exacerbated by the presence of permanent, extensive swamps in some areas and seasonal flooding of grazing land adjacent to swamps and rivers which collectively provide suitable habitats for snails in swampy areas. Moreover, humid, warm conditions in the main cattle-rearing areas of South Sudan are conducive for the survival of the aquatic snails that act as the intermediate hosts for *F.gigantica*. The significant low prevalence among the exotic Ankole cattle may be explained by de-worming regimens taken for the imported livestock in Uganda. Literature review indicated that the prevalence of fasciolosis in Uganda revealed 10% (Ozung *et al.*, 2011).

The high prevalence of bovine fasciolosis comparable to previous works done in the Sudan might be due to agro-ecological and climatic differences. In Ethiopia, Kenya Tanzania and Nigeria reports showed prevalence of 39.6%, 8.6%, 16.3% and 31.7%, respectively (Kithuka *et al.*, 2002; Ibrahim *et al.*, 2010; Malleu *et al.*, 2010 ; Ozung *et al.*, 2011). In Malakal, Upper Nile State, South Sudan, the prevalence of liver flukes in cattle revealed 37.0% (Eisa, 1963), who detected fluke eggs in 15.4% of cases in 365 cattle. Pathological lesion of the affected livers causes considerable loss. This economic loss is substantially higher than the average loss due to

fasciolosis in Ganawa slaughter house for 5 years which were 898,080 Sudanese Genieh (SDG) and 160 SDG at Al kadam slaughter house (Yasen, 2012). Scores of partial condemned livers revealed 63.6% which are greater than totally condemned livers (31.4%) indicating a continuous environmental contamination of infected snails in the vicinity of Nilotic cattle. The mechanical majority of the cattle inspected during the study have been hailed from Uganda suggesting that *F.gigantica* is the only species affecting cattle in Uganda. Similarly all cattle inspected at Juba main slaughterhouse suffered from *F.gigantica* infection and none was infected with *F.hepatica*. This may explain the exclusion of the latter in the epidemiology of bovine fasciolosis in South Sudan.

5. Conclusion

Fasciolosis is an important parasitic disease causing considerable loss of revenue due to condemnation of affected livers at Juba main slaughter house. Establishment of an effective control programme with regular treatment at 12-13 week intervals with flukicides is effective against both mature and immature flukes. This will eventually reduce and mitigate the intensity of infection in a herd over time and subsequent environmental contamination. Prospects for sustainable development of livestock need snail control and that should be added to the package of trematodes control aiming at *Fasciola* and other fresh water snails in South Sudan. Further studies on the molecular aspects and epidemiology covering a wider area, capturing all

seasons and involving large population of indigenous animals are needed for developing strategies for the control of fasciolosis in South Sudan.

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Investigating the Association between capital structure and financial performance of companies listed in Tehran stock exchange (TSE)

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Abstract: Capital structure of companies has a decisive role in investment decisions and thus, in financial performance of companies. The purpose of this study is to investigate the relationship between capital structure and financial performance of companies listed in Tehran stock Exchange. The statistical population of the present study consists of 380 companies listed on Tehran stock Exchange for a 11-year time period (2001-2013). To test the hypotheses, the pooled data regression method was used. F and T statistics were used to test the significance of patterns. Results indicate that the variable Roc (return on capital) is negatively and significantly associated with DCE. However, it has a positive significant relationship with SDCE. The variable ROA has a negative significant relationship with DA. There is no significant relationship between the variables capital structure and EPS. Furthermore, we found no relationship between other variables of capital structure and financial performance. [gholamreza Espireh, Alireza Dadgarnejad, Alireza JerJerzadeh. **Investigating the Association between capital structure and financial performance of companies listed in Tehran stock exchange (TSE)**. *Nat Sci* 2013;11(11):149-154]. (ISSN: 1545-0740). <http://www.sciencepub.net/nature>. 21

Key words: capital structure, financial performance, return on Assets(ROA), return on capital (ROC), Tehran stock Exchange.

Introduction:

Among the duties of financial managers are trying to increase the value of their business unit, funding, timely investment in profitable projects, and optimal allocation of existing resources. In fact, in this competitive world, the company's manager should make the best decision through examining and evaluating different investment projects. Suppose that the management first of all evaluates different existing projects and then chooses the best one. Now it should supply financial resources required for the investment using one of the various funding methods. Each single decision made by the management can affect the firm's capital structure. On the other hand, investors while making investment decisions consider different factors. But according to many financial management experts, the company's financial performance indicators are significant factors affecting the investor's decisions. Therefore, it is very important for both the investor and the companies and financial managers to determine factors affecting the performance of the firm.

Definitions related to capital structure: capital structure refers to the company's financial framework including debts and equities. Which are used to finance the company. Capital structure financially means a solution adopted by a company to supply its assets through combining equities, debts, or hybrid securities (saad,2010). understanding capital structure

is necessary, because it shows how a company could finance the funds needed for its current operations and growth.

Theories About capital structure

1- Modigliani –miller(MM) theory: until 1958, there was not a firm and clear theory associated with capital structure. In 1958m Modigliani and miller in their important and influential article proposed new discussions about capital structure. they started that including more debts in capital structure could not increase the firm's value, because benefits from cheaper debt are neutralized by increased risk of stocks. Hence, Modigliani and miller believe that in a world without taxes, the value of a company and its weighted average cost of capital would not be affected by capital structure (Bringham,2002).

2- Static trade-off theory :according to this theory, the optimal debt ratio of a company is supplied based on the trade-off of and benefits of costs and benefits of borrowing. in other words, in the framework of this theory, a company tries to make a balance between the value of interest tax savings and various costs of bankruptcy. however, there is still debate regarding how valuable are tax savings and which costs associated with financial issues are of importance. According to this theory, a company should substitute debt with stock and vice versa, and also set the debt ratio so that the company's value is maximized.3-pecking order theory: According to this

theory, companies prefer internal financing to external financing, and if bonds are issued, they prefer bonds ensuring debt to stocks. In the theory, there is no clear combination of debt-capital, since there are two kinds of capital, that is, internal and external one which is at the top of pecking order, and the other at the end of it. Observed debt ratio of any company reflects its total need for external financing. (javedan zadeh, 2009).

literature review: foreign studies: early studies on capital structure were conducted by David Durand (1952), and following him, a study was done by Modigliani and Miller (1958) in a modern and scientific way. These two for the first time in an article entitled "capital cost, financing, and investment theory" and using data from 43 electric companies and 42 oil companies for the years 1947, 1948, 1952, and 1953 stated that supposing the market is efficient, capital structure is not considered an effective factor in determining the value of a company, and they extend the issue of capital structure through presenting a theory in this regard. Raghuram G. Rajan & Luigi Zingales (1995) in an article entitled "what do we know about capital structure", using international data in the industrialized world (G7) attempted to fill the existing gaps in those days knowledge. The study was performed for the time period (1991-1987) and using data from 4554 non-financial companies belonged to 7 industrialized countries in the world (including the United States, Japan, France, Germany, England, Canada, and Italy). Results showed that firstly, England and Germany has the lowest leverage among (G7) countries. Secondly, among these nations, the United States, England, and Canada have used less foreign financing and they have referred more to domestic financial resources. Hovakimian, A., Opler, T., Titman, S. (2001) used multiple regression to explain the leverage of the companies, and they concluded that the target debt ratio may change over time following changes in stock price and profitability of a company. Lucas, Deborah J., & McDonald, Robert L. (1990), Baker, M., Wugler, J. (2001), Welch, Ivo (2004) have shown that current capital structure is highly associated with historical market value. Majumdar & Chibber (1999) in an article entitled "capital structure and performance". Investigated the relationship between debt levels in capital structure and performance of Indian companies. The sample consisted of 1000 companies listed on Mumbai stock exchange (BSE) for a 7-year time period (1988-1994). Results indicated that variables size, liquidity, and advertising cost ratio to total operating costs have a positive significant relationship with performance. In general, given that financial sectors in India almost entirely belong to the government, a negative relationship was found between capital structure and performance. Fama and French (1998) did a study

entitled "tax, financing decisions, and the company's value". They used sectional regression to investigate the relationship between the company's value and dividends and debts. The sample consisted of 28 companies during (1965-1992) in the United States. They concluded that debt would never lead to tax benefits. Ahmad, Abdullah, & Roslan (2012) in an article entitled "the Impact of capital structure on performance of companies" examined the impact of capital structure on performance of companies listed on Malaysia stock exchange. Results showed that (ROA) has a positive significant association with the variables (SGROW), (AGROW), and efficiency (EFF), while return on equities (ROE) has a negative significant relationship with short-term debt (STD) and total debt (TD). Rao, N.V., Al-yahyaee, K.H.M. and Seyed, L.A.M. (2007) found a negative significant association between financial leverage and performance of companies. Their more research showed that liquidity, age, and stability of capital have a considerable effect on performance of companies. Furthermore, results of studies by Kester, C.W., 1986, Friend, I. and Lang, H.P., 1988, Titman, S. & Weasels, R., 1988 showed that financial leverage is negatively associated with profitability. In contrast with these studies, Long, M.S. and I.B. Maltz (1985), and Wald, J. (1999) showed that financial leverage of companies is positively associated with profitability of companies. Shubita & Alsawalhah (2012) in an article entitled "the association between capital structure and profitability" investigated the impact of capital structure on profitability of firms listed on Amman stock Exchange (ASE) in Jordan. The sample consisted of 39 companies listed on Amman stock Exchange for a six-year time period (2004-2009). Results indicated that there is a negative relationship between capital structure (long-term debt to asset (LDAit), and short-term debt to total assets (SDAit) and profitability (or return earnings).

Domestic studies: Jahankhani & Yazdani (1995) in their study entitled "the Impact of type of Industry, Firm's size, commercial risk, and degree of operating leverage on the use of financial leverage in companies listed on the use of financial leverage in companies listed on Tehran stock Exchange" examined the impact of internal factors, or in other words, operating characteristics of companies on determining their capital structure. For hypothesis testing, they used time series and sectional data integration technique and multivariate regression. They concluded that type of industry is effective on financial structure. However, the variables "Firm's size, commercial risk, and operating leverage would not affect financial structure. Saeid Bagherzadeh (2003) in his article investigated main factors affecting capital structure of companies listed on Tehran stock Exchange (TSE).

Results showed that there is a positive significant relationship between Explanatory variables (profitability (EBit), tangible fixed assets (TANG), sales volume (LNS) and (financial leverage) debt ratio. Namazi & Heshmati (2007) in an article investigated the impact of effective factors and delayed data on changes in financial leverage of companies. Results show that there is a positive significant association between capital structure (financial leverage based on market value) and the variables profitability and fiscal deficit. Kimiagari & Einali (2008) examined factors affecting capital structure. The sample consisted of 78 companies listed on (TSE) during 2001-2006. Results indicated that profitability is among factors affecting capital structure and it has a negative significant association with capital structure. Arbabian & safari (2009) investigated the association between the the criteria of capital structure and profitability of companies through fitting multivariate regression models with panel data. Results shows that there is a positive relationship between (STD) ratio to asset and profitability of a company, as well as TD ratio to asset and profitability, however, there is a negative association between long term debt to asset and profitability. Masoud nadem

ET all (2011) found a positive significant relationship between capital structure and the variables ROI, size, TANG. However, they didn't find a significant association between capital structure and the variables PROF and NWA. In general, results of the investigated studies lie in 3 groups: Group one: in their studies, they concluded that capital structure and performance of the company are negatively associated. People included in this group are Raghuran G.Rajan & luigi zingales(1995), majumder&chibber(1997), Huang & song (2006), Ebur(2007), anolapo & kajola (2010), soumadi & hayajneh(2011), Gupta, srivastava, and sharma (2011), Muhammad umar Et al (2012), Rao, N.V, Al-yahyaee, K.H.M and syed (2007), farhad shahveisi Et all (2011).

Group two: in their studies, they found that there is a positive relationship between capital structure and performance of a company. Nour Abu-Rub (2012) belongs to this group.

Group three: in their studies, they concluded that either there is no association between capital structure and performance of a company or there is a weak association between them. Berger and Bonaccorsi (2006), Ebaid (2009), Iorpev, luper & Kwanum. Isacc (2012), sajadi et al (2010), and Nikbakht & Moghimi (2011) belong to this group.

Literature Methodology: all scientific studies are classified according to two bases of purpose and nature, and method. purpose-based studies are in turn classified into three groups including fundamental, applied, and practical research. more, based on nature and method, scientific research can be categorized in 5 groups including historical, descriptive, correlative, scientific, and experimental categories. According to the above mentioned classification, based on purpose, this is an applied research, and based on nature and method, this is a scientific and experimental research, because in the present research we have tried to help investors and other financial information users identify factors affecting capital structure and financial performance of the company and make economic decisions and correct investment through investigating the impact of capital structure factors on financial performance of the company.

Research hypotheses: the underlying hypothesis of this study is as follows: there is a significant relationship between capital structure and financial performance of selected companies listed on TSE (Tehran stock exchange). It includes the following hypotheses:

***Hypothesis (1):** there is a significant association between capital structure and ROA (return on asset)

***Hypothesis(2):** there is a significant association between capital structure and ROC(return on capital)

***Hypothesis(3):** there is a significant association between capital structure and ROE (return on equity)

***Hypothesis (4):** there is a significant association between capital structure and E PS (earnings per share)

Research statistical population and sample: statistical population of this study consists of companies listed in TSE. In the present study, in order to determine the statistical population, a specific relation was not used for estimating the sample size and for sampling, rather targeted elimination method has been used. In other words, those companies included in the statistical population having the following conditions were selected as the sample and other were eliminated:1- companies must keep their activity during the fiscal year. 2-companies must be among active companies in TSE. 3-companies must not be investment companies or financial intermediation companies. 4-information required by the companies must be available. 5-Equity section in balance sheet must not be negative.thus, 380 companies were selected among companies listed on TSE for a 11-year time period (2001-2011) as the sample of this study.

Research variables: variables are a specific piece of data with different values

Variables	Variable name	Symbol
Capital structure (independent variables)	Debt to asset ratio	DA
	Short-term debt to asset ratio	SDA
	Long –term debt to asset ratio	LDA
Company's performance (Dependent variables)	Debt to common equity ratio	DCE
	Short-term debt to common equity ratio	SDCE
	Long-term debt to common equity ratio	LDCE
	Return on capital	ROC
	Return on equity	ROE
	Return on asset	ROA
	Earnings per share	EPS

Research model: in this study, given the type of data and the existing statistical analysis, sectional –time series statistical method (pooled data) has been used, since in order to investigate capital structure and financial performance of companies, independent and dependent variables are examined from two different aspects. On one hand, these variables are tested among different companies, and on the other hand, in the time period(2001-2011). To determine the regression, the following relations are used:

$$ROA_{i,t} = \alpha_0 + \alpha_1 DA_{i,t} + \alpha_2 SDA_{i,t} + \alpha_3 LDA_{i,t} + \alpha_4 DCE_{i,t} + \alpha_5 SDCE_{i,t} + \alpha_6 LDCE_{i,t} + \varepsilon_1$$

$$ROE_{i,t} = \beta_0 + \beta_1 DA_{i,t} + \beta_2 SDA_{i,t} + \beta_3 LDA_{i,t} + \beta_4 DCE_{i,t} + \beta_5 SDCE_{i,t} + \beta_6 LDCE_{i,t} + \varepsilon_2$$

$$ROC_{i,t} = \delta_0 + \delta_1 DA_{i,t} + \delta_2 SDA_{i,t} + \delta_3 LDA_{i,t} + \delta_4 DCE_{i,t} + \delta_5 SDCE_{i,t} + \delta_6 LDCE_{i,t} + \varepsilon_3$$

$$EPS_{i,t} = \gamma_0 + \gamma_1 DA_{i,t} + \gamma_2 SDA_{i,t} + \gamma_3 LDA_{i,t} + \gamma_4 DCE_{i,t} + \gamma_5 SDCE_{i,t} + \gamma_6 LDCE_{i,t} + \varepsilon_4$$

In which, ROC, ROE, ROA, and EPS are dependent variables and SDCE, SDA, LDA, DA, DCE, and LDCE are independent variables, and coefficients and γ are intercepts, while ε_i is error value. : $\delta_0, \beta_0, \alpha_0$

Hypothesis testing: to test the hypotheses, they were estimated using regression model and then using t and f statistics, significance of the regressions was examined. Finally, the hypotheses were answered according to statistical assumptions and results. For hypothesis testing, statistical methods including person's correlation coefficient, coefficient of determination, adjusted determination coefficient, and regression line equation have been used. To estimate the models, SPSS software was used

descriptive statistics: table (1): central indicators and dispersion of components of capital structure and financial performance of companies listed on Tehran stock exchange (TSE).

Table (1): central indicators and dispersion of components of capital structure and financial performance of companies listed on Tehran stock exchange (TSE):

descriptive indicators							Research components
Max	min	Standard deviation)δ(	Median	mean) μ(	number) n(	Name	
74.86	145.43-	126	10.16	12.17	4180	ROA	Return on asset
920	761.53-	105.28	49.14	78.93	4180	ROC	Return on capital
528.11	438.60-	44.83	29.8	34.44	4180	ROE	Return on common equity
8780	2997.0-	687.29	29.7	448.28	4180	EPS	Earnings per share
.99	./4	./19	./65	./62	4180	DA	Debt to asset
.98	./1	./19	./54	./53	4180	SDA	Short term debt to asset
.89	0	./1	./5	./9	4180	LDA	Long term debt to asset
18/55	0./4	2.57	1.92	2.68	4180	DCE	Debt to common equity
9.81	0	./65	./18	./38	4180	LDCE	Long term debt to common equity
16.95	./1	2.32	1.53	2.3	4180	SDCE	Short term debt to common equity

*source: calculation by the researcher based on the research obtained in the above table, we can conclude that in the capital structure section, companies in Iranian capital market have mostly used debts (especially short-term debts) to finance themselves and this indicates a high risk that the companies are faced with. Also, in terms of financial performance, companies in Iranian capital market in the above mentioned time period had a low performance which result from various factors including inflection and financial crises existing in the majority of countries.

***Hypothesis testing:** to test the hypotheses, first we test the correlation between dependent and independent variables using Pearson correlation test, and then the results are analyzed. Next, the coefficients of multivariate linear regression equation are estimated through ordinary least square (OLS) method and the regression line equation is fitted.

***part one:** Pearson correlation test

Table (2): Pearson correlation between capital structure and financial performance of selected companies listed on Tehran stock exchange:

	DA	SDA	LDA	DCE	LDCE	SDCE
Pearson correlation coefficient	-0/369**	-0/281**	-0/132**	-0/344**	-0/226**	-0/314**
significance level	0/000	0/000	0/000	0/000	0/000	0/000
number(n) type of relation	4/80	4/80	4/80	4/80	4/80	4/80
(ROA)	negative	negative	negative	negative	negative	negative
Pearson correlation coefficient	-0/049**	0/012	-0/106	-0/050	-0/127	-0/017
significance level	0/003	.456	0/000	0/003	0/000	0/307
number(n) type of relation	4/80	4180	180	4180	4180	4180
ROC)(	negative	No relation	negative	negative	negative	No relation
Pearson correlation	0/042	0/080	-0/070	-0/019	-0/0103	0/009
coefficient significance level	0/011	0/000	0/000	0/256	0/000	0/575
number(n) type of relation	4180	4180	4180	4180	4180	4180
ROE)(	positive	positive	negative	No relation	negative	No relation
Pearson correlation	-/129	-0/060	-/116	-/127	-/147	-/098
coefficient significance level	0/000	0/000	0/000	0/000	0/000	0/000
number (n) type of relation	4180	4180	4180	4180	4180	4180
EPS)(	negative	negative	negative	negative	negative	negative

*significance at 0/05 level

**significance at 0/01 level

Given the results observed in the above table, the correlation between the variables capital structure and financial performance in selected companies listed on Tehran stock exchange is mostly significant at 0/05 level. Since the value of correlation coefficient is negative we accept an indirect relationship. Given that correlation coefficient between the variables ROA and DA is the largest of all(-/1369), we may conclude that the association between these two variables is stronger than that of other variables. Also correlation coefficient between DA ratio and ROC is the least of all(-/049), and thus we can conclude that the relationship between these two variables is weaker than that of other variables.

***part two:** fitting regression line equation :in order to confirm or reject the hypotheses, the following are examined in the regression equation :1-

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Identifying and Prioritization Effective Factors in New product development Using ANP & DEMATEL Methods in an Automotive Industry (Saipa industrial company)

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Abstract: In this study try to Identifying and Prioritization Effective Factors in New product development and the impact of these factors on each Using DEMATEL and ANP Methods. To identify critical influential factors, the authors studied and reviewed relevant literature from numerous fields of study associated with the essential issues of new product development. Results of the ANP method shows that Technological factors, Management and Staff factors, Commercialization, factors Organizational factors and Marketing factors are the most important factors in new product development. Results of the DEMATEL method show that Management and Staff have great impact on success of NPD implementation among main aspects. Among criteria of Management and Staff , Motivation in Product development team members has Great Influence on other criteria. Among criteria of Technological factor, Production in Time and cost Appropriate has Great Influence on other criteria. Among criteria of marketing factor, Focus on the customer has Great Influence on other criteria. Among criteria of Organizational factors , cooperation of Different levels has Great Influence on other criteria. Also , among criteria of Commercialization factor , Product superior to competitors has Great Influence on other criteria.

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1. Introduction

Today's world is characterized by major changes in market and economic conditions, coupled with rapid advances in technologies. Management is often confronted with the dilemma whether or not to invest in a particular stage of the new product development (NPD) program, given market and technology uncertainties surrounding such a decision in current markets, most of all technology-driven or high-tech markets (Moriarty and Kosnik, 1989). The new product development (NPD) and innovation are often recognized as the key processes of competition in a variety of markets (Brown and Eisenhardt, 1995; Drucker, 1999; Hamel and Prahalad, 1994; Jones, 1997; McQuater et al., 1998). Today, markets are generally perceived to be demanding higher quality and higher performing products, in shorter and more predictable development cycle-times and at lower cost (Maffin and Braiden, 2001). NPD is defined as the transformation of a market opportunity and a set of assumptions about product technology into a product available for sale (Krishnan and Ulrich, 2001).

NPD is an interdisciplinary activity (Davila, 2000) including marketing management, organizations, engineering design, operations management and requires contributions from nearly all the functions of an enterprise, whether it is an upgrade (an improvement of an existing product) or a

new concept either to the company or to the market (Haque et al., 2000). The core of the NPD process centers on knowledge, it's creation, utilization and the management of knowledge. Within the context of the knowledge-base firm, knowledge has a critical strategic value since it fosters organizational actions and helps the firm establish sustainable competitive advantage. Organizational knowledge is a unique asset and a scarce commodity of an organization. Yet, creating, replicating and transferring knowledge within NPD teams, between NPD teams, and between organizational units is difficult to carry out. Managing knowledge and knowledge creation is a complex task that gives rise to multiple organizing and management issues.

New product development (NPD) can originate from new technology or new market opportunities (Eliashberg et al., 1997). But irrespective of where opportunities originate, when it comes to successful new products it is the consumer who is the ultimate judge (Brown and Eisenhardt, 1995; Cooper and Kleinschmidt, 1987). So, in order to develop successful new products, companies should gain a deep understanding of 'the voice of the consumer'. Consumer research can be carried out during each of the basic stages of the NPD process: (1) opportunity identification, (2) development, (3) testing, and (4) launch (Suh, 1990; Urban and Hauser, 1993). It is most widely applied during the

development, testing and launch stages. Even the most technologically oriented companies use consumer research to verify that consumers will accept a new product when it will be launched at the market. NPD can be considered as an incremental process in which incremental investments provide options to proceed in the process. Moreover, when the R&D stages are completed, the option of market launching the new product is created.

Virtual NPD in SMEs is in its infancy in developing countries, and little research has been done on the introduction of the NPD in SMEs through a virtual team. So, we formed the topic that is somewhat lacking in the literature as a research gap. For many firms innovation is an important business driver. This being the case, managers are pressed to design effective organisational structures to support these activities – which unfortunately – also are widely known to be difficult to organize and manage.

2. NEW PRODUCT DEVELOPMENT (NPD)

New product development (NPD) is crucial in various industries for shortening a product's time to market and for improving the product's quality. The literature provided a number of definitions for what constitute a new product development. Product development definition is used by different researchers in slightly different ways (Ale Ebrahim et al., 2009). Generally, it is the process that covers product design, production system design, product introduction processes and start of production (Johansen, 2005). Loch and Kavadias (2008) in the "Handbook of New Product Development Management" define NPD to "consists of the activities of the firm that lead to a stream of new or changed product market offerings over time. This includes the generation of opportunities, their selection and transformation into artifacts (manufactured products) and activities (services) offered to customers and the institutionalization of improvements in the NPD activities themselves".

New product development is widely recognized as an essential property of the firm (Lam et al., 2007). Life cycle of products is decreasing every year and the customer demand, on the other hand, increased dramatically. With the need to respond quickly to customer requirements, increased complexity of product design and rapidly changing technologies, selecting the right set of NPD is critical to long-term success of the firm (Chen et al., 2008). NPD can be defined as a process including many "generic decision" points, likewise "decision perspective" of Krishnan and Ulrich (2001). In their related work, Urban and Hauser (1993) recommend a five-step decision process for NPD: opportunity

identification, design, testing, introduction and life cycle management.

New product development is of high importance for both large and small and medium sized organizations (Pullen, de Weerd-Nederhof et al. 2008)." "Small- and medium sized organizations (SMEs) have a number of typical problems with regard to their innovation process, especially in the shift from the development stages to the commercialization stages (Hanna and Walsh 2002)." Product innovation work is mainly driven by market needs and ultimately external customers. Thus, the product innovation work is primarily effectiveness-driven. Respectively, process innovation work is mainly driven by the needs of production (i.e. internal customers) and can be said to be primarily efficiency-driven. Important to note, these strict definitions and separation of product and process innovation activities do not, however, imply that there cannot be a combination of the two activities and objectives in an innovation project. There are a few investigators done to evaluate NPD performance. For example, (Cooper et al., 2004) discover different measures of NPD performance at the project levels and various plans (Cooper, Edgett et al. 2004). "Measures of the performance of the entire NPD program include the percentage of business profits from new products and the All of these measures show that NPD brings positive growths. With some exceptions, there is general agreement that the new product development (NPD) process is not adequately studied in small and medium enterprises (SMEs) and models and tools specifically focused for these units are lacking. This deficiency is particularly evident where SMEs located in industrial districts are concerned (De Toni and Nassimbeni 2003)."

3. Effective Factors in New product development

Proficiency in NPD can contribute to the success of many companies. According to Poolton and Barclay (1998), 'if companies can improve their effectiveness at launching new products, they can double their bottom line. It's one of the areas left with the greatest potential for improvement.' Lynn et al. (1999) developed a model of the determinants of new product development success. Lester's (1998) study identified a range of potential problems that can derail well-intentioned NPD efforts. By working through these problems, Lester discovered 15 CSFs in five areas of new product development. Poolton and Barclay (1998) identified a set of six variables that have consistently been identified in the literature as being associated with successful NPD. Cooper and Kleinschmidt (1995) studied hundreds of cases to reveal what makes the difference between winners and losers in the process of NPD. He extracted 12 common denominators of successful new product

project and seven possible reasons (blockers) offered by managers for why the success factors are invisible and why projects seem to go wrong or are otherwise not well executed.

Based on the previous literature review, we focus on five main aspects including Management

and Staff , Technical factors, Marketing factors, Organizational factors and Commercialization. From these main aspects, 21 Effective Factors in New product development are maintained. The classification of those main Criteria and their Sub-Criteria are shown in Table 1.

Table 1. Effective Factors in New product development

Criteria	Sub-Criteria	Reference
Management and Staff	Senior management commitment	Lynn et al. (1999), Lester (1998), Poolton and Barclay (1998), Cooper (1999) Sun and Wing (2005)
	Flexibility and responsiveness to change	Cooper (1999) Sun, Poolton and Barclay (1998)
	Motivation in Product development team members	Poolton and Barclay (1998)
	Risk in decision-making	Haverila(2012), Poolton and Barclay (1998)
Technical factors	Technical capabilities	Cooper (1999) Sun and Wing (2005), Poolton and Barclay (1998)
	Product Production in Appropriate Time and cost	Cooper (1999), Sun Lynn et al. (1999) and Wing (2005), Lester (1998)
	Clear definition of the functions of the product	Cooper (1999) Gupta and Wilemon (1990)
	Technically difficult to replace	Sun Lynn et al. (1999), Lester (1998)
Marketing factors	Appropriate Marketing strategy	Lester (1998), Haverila(2012), Ernst Holger (2002)
	Focus on the customer	Cooper (1999) Sun, Wing (2005), Haverila(2012), Ernst Holger (2002)
	A growing market	Poolton and Barclay (1998), Ernst Holger (2002) Sharma (2006)
	Clear definition of the target market	Lester (1998), Cooper (1999) Sun and Wing (2005), Ernst Holger (2002)
Organizational factors	Long-term vision	Cooper (1999) Sun and Wing (2005)
	Different levels of cooperation	Cooper (1999), Haverila(2012), Haverila(2012), Wing (2005)
	Entrepreneurial culture in the organization	Wing (2005), Poolton and Barclay (1998)
	The time of replacement	Sun Lynn et al. (1999), Lester (1998)
Commercialization	Appropriate timing for the project	Haverila(2012), Cooper (1999) Sun and Wing (2005)
	Product Scores than competitors	Sun Lynn et al. (1999), Sharma (2006)
	Resources to implement the project	Lester (1998), Cooper (1999) Sun and Wing (2005)
	product developed Scores than The old type	Sun Lynn et al. (1999)
Generating good ideas by Expert Groups	Wing (2005), Haverila(2012), Sun Lynn et al. (1999), Lester (1998)	

4. Data analysis

In this study the ANP method is used to Prioritization Effective Factors in New product development. In this section, an empirical study is presented to illustrate the application of the solution for Prioritization Effective Factors in New product development. The calculations of the supermatrix can be solved by using Microsoft Excel. The overall weights from the limit supermatrix are shown in Table 2. Also, final prioritization of criteria and sub-criteria is shown in table 3. In terms of criteria we have considered four items of the Technical factors, Management and Staff, Commercialization, Organizational factors and Marketing factors and the normalized weights of these factors are 0.269, 0.231, 0.197, 0.168 and 0.136 respectively. In other words, Technical factor is the most important factor, followed by Quality, Flexibility and Delivery time. As we discussed, this items includes 21 sub-criteria. The normalized weights of sub-criteria are shown in table 3. Technical capabilities is the most important sub-criteria with weight of 0.0879, followed by Motivation in Product development team members with weight of 0.0851, Resources to implement the project with weight of 0.0743 etc.

Table 2. The Limited Weighted Super-matrix

	A	B	C	D	E	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4	D5	E1	E2	E3	E4
A	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048
B	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056
C	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
D	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038
E	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
A1	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052
A2	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
A3	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
A4	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019
B1	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065
B2	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
B3	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021
B4	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032
C1	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017
C2	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
C3	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
C4	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
D1	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033
D2	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
D3	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038
D4	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
D5	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
E1	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
E2	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
E3	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
E4	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049

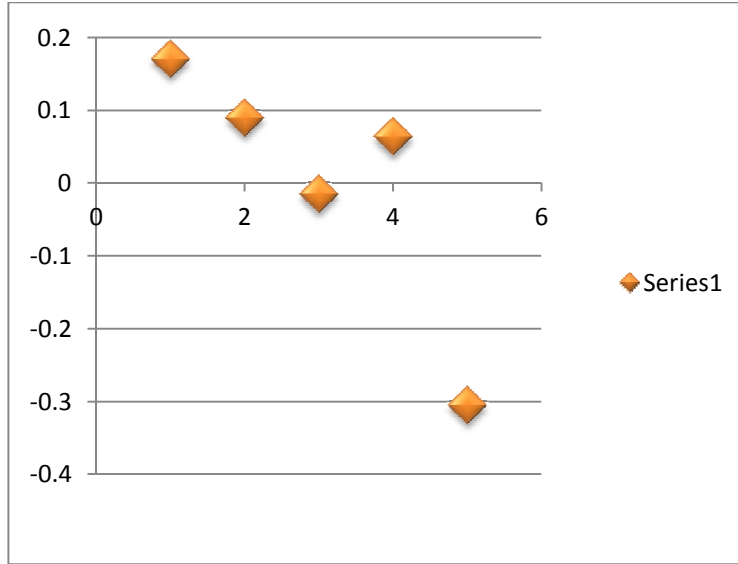
Table 3: Final Prioritization of Criteria and Sub-criteria

Criteria and Sub-criteria	Prioritization based on limited weighted super matrix	Prioritization of un-weighted	Priority
Management and Staff (A)	0.048	0.231	2
Technical factors (B)	0.056	0.269	1
Marketing factors (C)	0.028	0.136	5
Organizational factors (D)	0.035	0.168	4
Commercialization (E)	0.041	0.197	3
Senior management commitment (A1)	0.052	0.0714	4
Flexibility and responsiveness to change (A2)	0.041	0.0563	7
Motivation in Product development team members (A3)	0.062	0.0851	2
Risk in decision-making (A4)	0.019	0.0261	19
Technical capabilities (B1)	0.065	0.0879	1
Product Production in Appropriate Time and cost (B2)	0.024	0.0330	15
Clear definition of the functions of the product (B3)	0.021	0.0288	17
Technically difficult to replace (B4)	0.032	0.0439	11
Appropriate Marketing strategy (C1)	0.017	0.0235	20
Focus on the customer (C2)	0.045	0.0618	6
A growing market (C3)	0.015	0.0207	21
Clear definition of the target market (C4)	0.022	0.0302	16
Long-term vision (D1)	0.033	0.0454	10
Different levels of cooperation (D2)	0.030	0.0412	12
Entrepreneurial culture in the organization (D3)	0.038	0.0523	8
The time of replacement (D4)	0.020	0.0276	18
Appropriate timing for the project (D5)	0.025	0.0344	14
Product Scores than competitors (E1)	0.028	0.0386	13
Resources to implement the project (E2)	0.054	0.0743	3
product developed Scores than The old type (E3)	0.036	0.0495	9
Generating good ideas by Expert Groups (E4)	0.049	0.0673	5

Data collected from the experts was analyzed with the DEMATEL method. The degree of central role ($D_x + R_x$) in DEMATEL represents the strength of influences both dispatched and received. On the other hand, if ($D_x - R_x$) is positive, then the evaluation criterion x dispatches the influence to other evaluation criteria more than it receives. If ($D_x - R_x$) is negative, the evaluation criterion x receives the influence from other evaluation criteria more than it dispatched. Total relationships matrices are demonstrated in Tables 4 to Table 9. The results show Management and Staff has great impact on new product development among main aspects.

Table 4. The matrix X (I-X)⁻¹ for Main aspect.

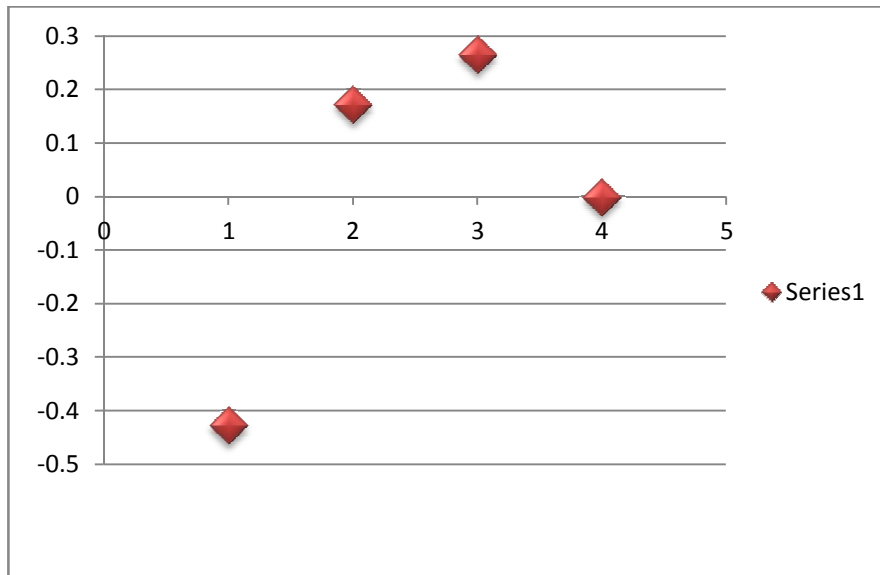
	Management and Staff	Technical factors	Marketing factors	Organizational factors	Commercialization	D	D+R	D-R
Management and Staff	0.247	0.524	0.325	0.451	0.298	1.845	3.52	0.17
Technical factors	0.406	0.269	0.287	0.320	0.365	1.647	3.205	0.089
Marketing factors	0.308	0.243	0.365	0.418	0.513	1.847	3.71	-0.016
Organizational factors	0.439	0.206	0.524	0.257	0.330	1.756	3.449	0.063
Commercialization	0.275	0.316	0.362	0.247	0.340	1.54	3.386	-0.306
R	1.675	1.558	1.863	1.693	1.846			



Among criteria of Management and Staff , Motivation in Product development team members has Great Influence on other criteria.

Table 5. The matrix $X(I-X)^{-1}$ for factor of Management and Staff

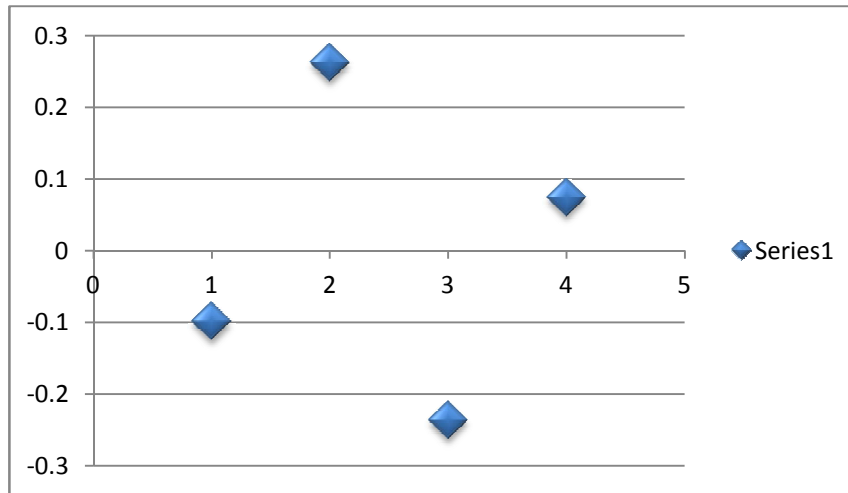
	Senior management commitment	Flexibility and responsiveness to change	Motivation in Product development team members	Risk in decision-making	D	D+R	D-R
Senior management commitment	0.246	0.365	0.285	0.325	1.221	2.872	-0.43
Flexibility and responsiveness to change	0.541	0.298	0.297	0.360	1.496	2.822	0.17
Motivation in Product development team members	0.448	0.305	0.357	0.425	1.535	2.807	0.263
Risk in decision-making	0.416	0.358	0.333	0.327	1.434	2.871	-0.003
R	1.651	1.326	1.272	1.437			



Among criteria of Technical factor , Product Production in Appropriate Time and cost has Great Influence on other criteria.

Table 6. The matrix $X(I-X)^{-1}$ for Technical factor.

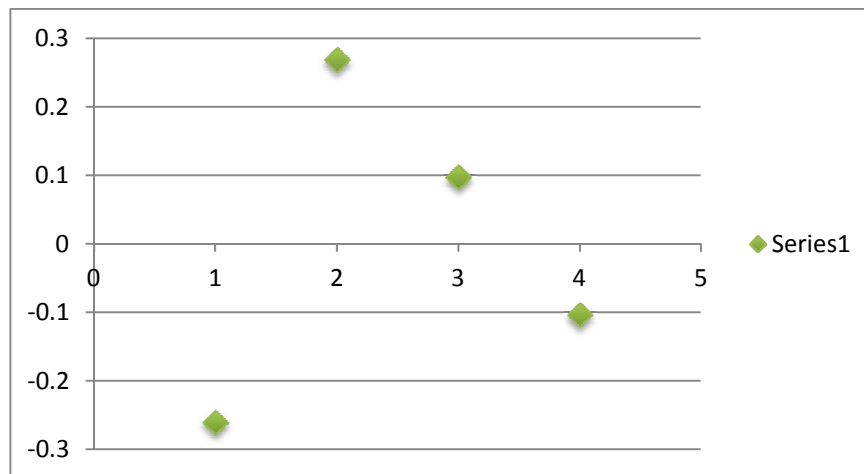
	Technical capabilities	Product Production in Appropriate Time and cost	Clear definition of the functions of the product	Technically difficult to replace	D	D+R	D-R
Technical capabilities	0.251	0.426	0.384	0.358	1.419	2.937	-0.099
Product Production in Appropriate Time and cost	0.517	0.385	0.447	0.416	1.765	3.268	0.262
Clear definition of the functions of the product	0.411	0.338	0.276	0.286	1.311	2.859	-0.237
Technically difficult to replace	0.339	0.354	0.441	0.420	1.554	3.034	0.074
R	1.518	1.503	1.548	1.48			



Among criteria of marketing factor , Focus on the customer has Great Influence on other criteria.

Table 7. The matrix $X(I-X)^{-1}$ for Marketing factor.

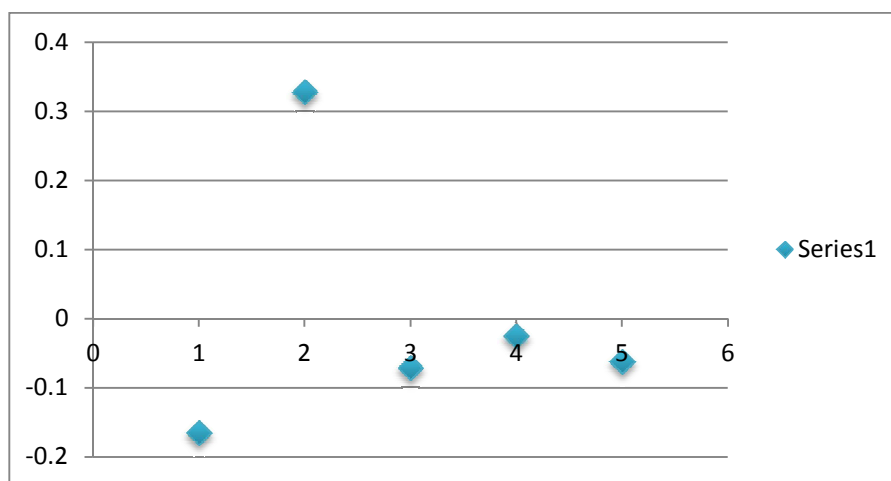
	Appropriate Marketing strategy	Focus on the customer	A growing market	Clear definition of the target market	D	D+R	D-R
Appropriate Marketing strategy	0.425	0.256	0.325	0.307	1.313	2.887	-0.261
Focus on the customer	0.415	0.222	0.259	0.412	1.308	2.348	0.268
A growing market	0.306	0.242	0.325	0.419	1.292	2.487	0.097
Clear definition of the target market	0.428	0.320	0.286	0.337	1.371	2.846	-0.104
R	1.574	1.04	1.195	1.475			



Among criteria of Organizational factor , Different levels of cooperation has Great Influence on other criteria.

Table 8. The matrix $X(I-X)^{-1}$ for Organizational factor.

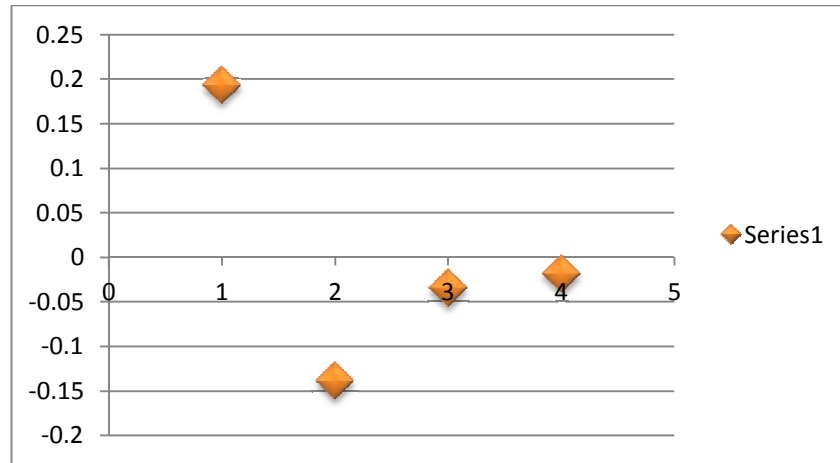
	Long-term vision	Different levels of cooperation	Entrepreneurial culture in the organization	The time of replacement	Appropriate timing for the project	D	D+R	D-R
Long-term vision	0.126	0.236	0.327	0.336	0.514	1.539	3.244	-0.166
Different levels of cooperation	0.426	0.357	0.417	0.367	0.264	1.831	3.335	0.327
Entrepreneurial culture in the organization	0.441	0.327	0.227	0.369	0.418	1.782	3.636	-0.072
The time of replacement	0.349	0.287	0.446	0.329	0.351	1.762	3.55	-0.026
Appropriate timing for the project	0.363	0.297	0.437	0.387	0.340	1.824	3.711	-0.063
R	1.705	1.504	1.854	1.788	1.887			



Among criteria of Commercialization , Product Scores than competitors has Great Influence on other criteria.

Table 9. The matrix $X(I-X)^{-1}$ for factor of Commercialization.

	Product Scores than competitors	Resources to implement the project	product developed Scores than The old type	Generating good ideas by Expert Groups	D	D+R	D-R
Product Scores than competitors	0.125	0.451	0.325	0.452	1.353	2.513	0.193
Resources to implement the project	0.415	0.236	0.225	0.339	1.215	2.569	-0.139
product developed Scores than The old type	0.367	0.259	0.254	0.308	1.188	2.411	-0.035
Generating good ideas by Expert Groups	0.253	0.408	0.419	0.337	1.417	2.853	-0.019
R	1.16	1.354	1.223	1.436			



6. Conclusion

In this study try to Identifying and Prioritization Effective Factors in New product development and the impact of these factors on each Using DEMATEL and ANP Methods. Results of the ANP method shows that Technological factors, Management and Staff factors, Commercialization, factors Organizational factors and Marketing factors are the most important factors in new product development. Results of the DEMATEL method show that Management and Staff have great impact on success of NPD implementation among main aspects. Among criteria of Management and Staff , Motivation in Product development team members has Great Influence on other criteria. Among criteria of Technological factor, Production in Time and cost Appropriate has Great Influence on other criteria.

Among criteria of marketing factor, Focus on the customer has Great Influence on other criteria. Among criteria of Organizational factors , cooperation of Different levels has Great Influence on other criteria. Also, among criteria of Commercialization factor , Product superior to competitors has Great Influence on other criteria.

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Antifungal agent from *Streptomyces* sp: Taxonomy, Fermentation, Purification and Biological Activities**Houssam M. Atta^{1*} and Ahmed M. Reyad²**¹ Botany and Microbiology Department, Faculty of Science (Boys), Al-Azhar University, Cairo, Egypt. The present address: Biotechnology Department, Faculty of Science and Education, Taif University, Al-Khurmah branch – KSA.² Botany Department, Faculty of Science, Beni-Suef University, Egypt. The present address: Department of Biology, Faculty of Sciences, Jazan University, KSA.*houssamatta@yahoo.com and houssamatta@hotmail.com; Tel: 00966506917966

ABSTRACT: An actinomycete culture was isolated from a soil sample collected from Al-Khurmah governorate, KSA. This actinomycete isolate, KSA-818 was found to be active against unicellular and filamentous fungi viz. *Saccharomyces cerevisiae*, ATCC 9763; *Candida albicans*, IMRU 3669; *Aspergillus niger*; *Aspergillus fumigatus*; *Aspergillus flavus*; *Aspergillus terreus*; *Fusarium solani*; *Fusarium oxysporum*; *Fusarium moniliforme*; *Alternaria alternate*; *Botrytis cinerea*; *Penicillium chrysogenum* and *Rhizoctonia solani*. The nucleotide sequence of the 16S rRNA gene (1.5 Kb) of the most potent strain evidenced a 90% similarity with *Streptomyces fimbriatus*. From the taxonomic features, the actinomycetes isolate KSA-818 matched with *Streptomyces fimbriatus* in the morphological, physiological and biochemical characters. Thus, it was given the suggested name *Streptomyces fimbriatus*, KSA-818. The active metabolite was extracted using n-butanol (1:1, v/v) at pH 7.0. The separation of the active ingredient and its purification was performed using both thin layer chromatography (TLC) and column chromatography (CC) techniques. The physico-chemical characteristics of the purified antifungal agent viz. color, melting point, solubility, elemental analysis and spectroscopic characteristics have been investigated. This analysis indicates a suggested empirical formula of C₂₆ H₃₆ O₉ N₂. The minimum inhibition concentrations "MICs" of the purified antifungal agent were also determined. In conclusion, the collected data emphasized the fact that the purified antifungal agent was suggestive of being belonging Blastmycin antibiotic produced *Streptomyces fimbriatus*, KSA-818.

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Keywords: Blastmycin antibiotic, *Streptomyces fimbriatus*, 16s rRNA, Production, Extraction, Purification, physico-chemical characteristics and Biological activities.

1. INTRODUCTION

Actinomycetes are the most economically and biotechnologically valuable prokaryotes able to produce wide range of bioactive secondary metabolites, such as antibiotics, antitumor agents, immunosuppressive agents and enzymes [Deepa *et al.*, 2013]. These metabolites are known to possess antibacterial, antifungal, anticancer, antialgal, antimalarial and anti-inflammatory activities [Ravikumar *et al.*, 2011]. Deepa *et al.*, 2013, says that the Actinomycete have the capacity to synthesize many different biologically active secondary metabolites such as cosmetics, vitamins, nutritional materials, herbicides, antibiotics, pesticides, anti-parasitic and enzymes like cellulose and xylanase used in waste treatment [Ogunmwonyi *et al.*, 2010]. They are free living, saprophytic bacteria, and a major source for production of antibiotics [Atta *et al.*, 2009].

The Blastmycin antibiotic consists of 9- membered dilactone ring which bears a long alkyl side chain and O-acyl group, linked via an amide bond to a 3-formamino-salicylic acid residue [Berdy, 1980]. Blastmycin producing *Streptomyces* sp e.g. *S. blastomyceticus*, *S. kitazawaensis*, *S. griseus* and *S. fimbriatus* are commonly recognized in the screening programs directed toward the isolation of antifungal

compounds other than polyenes. A wide variety of saprophytic and pathogenic fungi & yeast are highly sensitive to Blastmycin and used as antitumor [Umezawa, 1977; Berdy, 1980 and Jacobi, *et al* 2000].

In the present work we describe the isolation of an actinomycete strain from Al-Khurmah governorate, KSA, which generates an antifungal compound. The identification of this strain, based on the cultural, morphology, physiology and biochemical characteristics, as well as 16s rRNA methodology, is also reported. The primary bioactive substance was isolated, purified and biological activities were determined.

2. MATERIALS AND METHODS**2.1. Microorganism**

The actinomycete strain was isolated from soil sample collected from Al-Khurmah governorate, KSA. It was purified using the soil dilution plate technique described by [Williams and Davis, 1965].

2.2. Media Used**Growth media (g/L)**

Starch, 20.0; NaNO₃, 2.0; K₂HPO₄, 1.0; MgSO₄.7H₂O, 0.5; KCl, 0.5; FeSO₄ 0.01; Yeast extract 2.0 agar, 20.0 distilled water up to 1000 ml. The pH was

adjusted at 7.2 before sterilization.

2.3. Test organisms

2.3.1. Bacteria

2.3.1.1. Gram Positive

Micrococcus kristinae, ATCC 27570; *Staphylococcus aureus*, NCTC 7447; *Staphylococcus haemolyticus*, NCTC 29968; *Bacillus subtilis*, NCTC 1040, *Bacillus pumilus*, NCTC 8214 and *Sarcina maxima*, ATCC 33910.

2.3.1.2. Gram Negative

Escherichia coli, NCTC 10416; *Klebsiella pneumoniae*, NCIMB, 9111 and *Pseudomonas aeruginosa*, ATCC 10145.

2.3.2. Fungi

2.3.2.1. Unicellular fungi

Saccharomyces cerevisiae ATCC 9763 and *Candida albicans*, IMRU 3669.

2.3.2.2. Filamentous fungi

Aspergillus niger; *Aspergillus fumigatus*; *Aspergillus flavus*; *Aspergillus terreus*; *Fusarium solani*; *Fusarium oxysporum*, *Fusarium moniliforme*, *Alternaria alternata*, *Botrytis cinerea*, *Penicillium chrysogenum* and *Rhizoctonia solani*.

2.4. Identification of actinomycete isolate, KSA-818:

2.4.1. Morphological characteristics

Purified isolates of actinomycetes were identified using morphological and cultural characteristics by the methods as described in the International *Streptomyces* Project (ISP) [Shirling and Gottlieb, 1966]. The morphology of the spore bearing hyphae with the entire spore chain, the structure and arrangement of the spore chain with the substrate and aerial mycelium of the actinomycetes were examined using slide culture technique and identified [Williams *et al.*, 1989]. After growth, the slide cultures were examined under light microscope [Pridham, 1965].

2.4.2. Physiological and biochemical characteristics

Lecithinase was conducted on Egg-Yolk medium according to the method of [Nitsh and Kutzner, 1969]; Lipase [Elwan, *et al.*, 1977]; Protease [Ammar, *et al.*, 1991]; Pectinase [Ammar, *et al.*, 1995b]; α -amylase [Ammar, *et al.*, 1998] and Catalase Test [Jones, 1949]. Degradation of Esculin and xanthine has been done according to [Gordon, *et al.*, 1974]. Nitrate reduction was performed according to the methods of [Gordon, 1966]. Hydrogen sulphide production was carried out according to [Cowan, 1974]. The utilization of different carbon and nitrogen sources were carried out according to [Shirling and Gottlieb, 1966]. Determination of Diaminopimelic acid (DAP) and sugar pattern was carried out according to [Becker, *et al.*, 1964 and Lechevalier and Lechevaier, 1968].

2.4.3. Color characteristics

The ISCC-NBS color –Name Charts illustrated with centroid detection of the aerial, substrate mycelium and diffusible pigment [Kenneth and Deane, 1955] was

used.

2.5. Screening for antimicrobial activity

The anti-microbial activity was determined by cup method assay according to [Kavanagh, 1972].

2.6. Taxonomic studies of actinomycete isolate

Morphological characteristics of the most potent produce strain KSA-818 grown on starch nitrate agar medium at 30 °C for 5 days was examined under scanning electron microscopy (JEOL Technics Ltd.,).

2.7. DNA isolation and manipulation

The locally isolated actinomycete strain was grown for 5 days on a starch agar slant at 30°C. Two ml of a spore suspension were inoculated into the starch-nitrate broth and incubated for 5 days on a shaker incubator at 200 rpm and 30°C to form a pellet of vegetative cells (pre-sporulation). The preparation of total genomic DNA was conducted in accordance with the methods described by [Sambrook *et al.*, 1989].

2.8. Amplification and sequencing of the 16s rRNA gene

PCR amplification of the 16s rRNA gene of the local actinomycete strain was conducted using two primers, StrepF; 5.-ACGTGTGCAGCCCAAGACA-3. and Strep R; 5.ACAAGCCCTGGAACGGGGT-3., in accordance with the method described by [Edwards *et al.*, 1989]. The PCR mixture consisted of 30 pmol of each primer, 100 ng of chromosomal DNA, 200 μ M dNTPs, and 2.5 units of Taq polymerase, in 50 μ l of polymerase buffer. Amplification was conducted for 30 cycles of 1 min at 94°C, 1 min of annealing at 53°C, and 2 min of extension at 72°C. The PCR reaction mixture was then analyzed via agarose gel electrophoresis, and the remaining mixture was purified using QIA quick PCR purification reagents (Qiagen, USA). The 16s rRNA gene was sequenced on both strands via the dideoxy chain termination method, as described by [Sanger *et al.*, 1977]. The 16s rRNA gene (1.5 kb) sequence of the PCR product was acquired using a Terminator Cycle Sequencing kit (ABI Prism 310 Genetic Analyzer, Applied Biosystems, USA).

2.9. Sequence similarities and phylogenetic analysis

The BLAST program (www.ncbi.nlm.nih.gov/blst) was employed in order to assess the degree of DNA similarity. Multiple sequence alignment and molecular phylogeny were evaluating using BioEdit software [Hall, 1999]. The phylogenetic tree was displayed using the TREE VIEW program.

2.10. Fermentation

The *Streptomyces fimbriatus*, KSA-818 cultivated into a 500 ml flask containing 75 ml of liquid medium composed of Starch, 20.0; NaNO₃, 2.0; K₂HPO₄, 1.0; MgSO₄ .7H₂O, 0.5; KCl, 0.5; FeSO₄ 0.01; Yeast extract 2.0 agar, 20.0 distilled water up to 1000 ml. The pH was adjusted at 7.2 before sterilization. After incubation at 30 °C for 5 days, filtration was carried out through cotton wool and followed by centrifugation at 5000

r.p.m. for 20 minutes. The clear filtrates were tested against test organisms.

2.11. Extraction

The clear filtrate was adjusted at pH 7.0 and extraction process was carried out using different solvents to be added to fermentation broth at the level of 1:1 (v/v) respectively. The organic phase was concentrated to dryness under vacuum by using a rotary evaporator.

2.12. Precipitation

The precipitation process of the antifungal agent was carried out using petroleum ether. The compound precipitate was centrifuged at 5000 rpm for 15 min. The antibiotic powder was tested for its antifungal activity by using paper disk method.

2.13. Separation

Separation of the antifungal agent into its individual components has been tried by thin layer chromatography using a solvent system composed of chloroform and methanol (24: 1, v/v).

2.14. Purification

The purification of the antibiotic was carried out by using silica gel column chromatography. A column of 2.5 X 50 cm was used for this purpose. Chloroform and Methanol 8:2 (v/v), was used as an eluting solvent. The column was left for over night until the silica gel (BDH – 60- 120 mesh) was completely settled. One-ml crude extract to be fractionated was added on the silica column surface and the extract was adsorbed on top of silica gel. Fifty fractions were collected (each of 5 ml). Antifungal activities were performed for each separate fraction.

2.15. Physico-chemical properties of antifungal antibiotic

2.15.1. Elemental analysis

The elemental analysis C, H, O, N and S was carried out by the Microanalytical Center of Cairo University, Egypt.

2.15.2. Spectroscopic analysis

The IR, UV and Mass spectrum were determined at the Microanalytical Center of Cairo University, Egypt.

2.15.3. Reaction of the antifungal agent with certain chemical test

For this purpose the following reactions were carried out: Molish's, Fehling, Sakaguchi, Ninhydrin, Ehrlich, Nitroprusside, Ferric chloride, and Mayer reactions

2.16. Biological activity

The minimum inhibitory concentration (MIC) has been determined by cup method assay [Kavanagh, 1972].

2.17. Characterization of the antifungal antibiotic

The antibiotic produced by *Streptomyces fimbriatus*, KSA-818 was tried to be identified according to the recommended international references of [Umezawa, 1977 and Berdy, 1974, 1980 a, b & c].

3. RESULTS

3.1. Screening for the antimicrobial activities

The actinomycete isolate, KSA-818 exhibited various degrees of activities against unicellular and filamentous fungi: *Saccharomyces cerevisiae*, ATCC 9763; *Candida albicans*, IMRU 3669; *Aspergillus niger*; *Aspergillus fumigatus*; *Aspergillus flavus*; *Aspergillus terreus*; *Fusarium solani*; *Fusarium oxysporum*, *Fusarium moniliforme*, *Alternaria alternata*, *Botrytis cinerea*, *Penicillium chrysogenum* and *Rhizoctonia solani* (Table 1).

3.2. Identification of the actinomycete isolate

3.2.1. Morphological characteristics

The actinomycete isolate KSA-818, Spore chain are spiral, Spore surfaces are smooth and Spore mass is light gray, substrate mycelium is Light gray- yellowish brown (ISP 2, 4 & 5) and deep yellowish brown (ISP 6 & 7) while, diffusible pigment was produced on ISP-media Nos. 6 & 7 (plate 1). Neither both sclerotic granules and sporangia nor flagellated spores were observed.

3.2.2. Cell wall hydrolysate:

The cell wall hydrolysate contains LL-diaminopimelic acid (LL-DAP) and sugar pattern not detected.

3.2.3. Physiological and biochemical characteristics

Tests for protein, starch, lipid, and pectin are positive whereas and Egg-yolk (lecithin) and Catalase test are negative. Melanin pigment, production of H₂S and nitrate reduction are positive, and degradation of esculin, xanthine, utilization of citrate, and decomposition of urea are positive, whereas KCN test is negative.

The isolate KSA-818 utilizes, xylose, mannose, glucose, galactose, sucrose, mannitol, raffinose, *meso*-insoitol, arabinose, lactose, rhamnose, maltose, fructose, trehalose, ribose, L-phenylalanine, L-arginine, L-glutamic acid, L-cysteine L-valine and L-histidine. Good growth could be detected within a temperature range of 20 to 40 °C. Growth in the presence of NaCl up to 5% was recorded and growth at different pH values from 5 to 8 was also recorded and finally no growth in the presence of growth inhibitors Sodium azide, phenol and thallos acetate (Table 2).

3.2.4. Color and culture characteristics

For the purpose of investigating the cultural characteristics of KSA-818, the ISCC-NBS color- name charts illustrated centroid color detection of aerial and substrate mycelia and diffusible pigment was used for this purpose [Kenneth and Deane, 1955].

As shown in Table (3), the KSA-818 was allowed to grow on the ISP-media [Shiriling and Gottlieb, 1966], the isolate KSA-818 exhibited no growth on tryptone- yeast extracts broth (ISP-1). Moderate growth on yeast extract-malt extract agar medium (ISP-2), the aerial mycelium is light gray, substrate mycelium is

light gray yellowish brown and the diffusible pigment is moderate yellowish brown. Good growth was detected on oat-meal agar medium (ISP-3), aerial mycelium is light gray, substrate mycelium is moderate yellowish brown and diffusible pigment is pinkish white. Good growth was detected on inorganic salts-starch agar medium (ISP-4), aerial mycelium is light gray, substrate mycelium is light gray-yellowish brown and diffusible pigment is yellowish gray. Poor growth was detected on glycerol-asparagine agar medium (ISP-5), aerial mycelium is light gray, substrate mycelium light gray-yellowish brown and no diffusible pigment are produced. Moderate growth was detected on peptone yeast extract-iron agar medium (ISP-6), aerial mycelium is light gray, substrate mycelium is deep yellowish brown, and diffusible pigment brown black. Moderate growth was detected on tyrosine agar medium (ISP-7), aerial mycelium is light gray, substrate mycelium is deep yellowish brown, and diffusible pigment is moderate deep brown. Good growth on Starch-nitrate agar medium, aerial mycelium is light gray, substrate mycelium is moderate yellowish brown and the diffusible pigment is dark grayish yellowish brown (Table 3).

3.2.5. Taxonomy of actinomycete isolate

This was performed basically according to the recommended international Key's viz. [Buchanan and Gibsons, 1974; Williams *et al.*, 1989 and Hensyl, 1994]. On the basis of the previously collected data and in view of the comparative study of the recorded properties of KSA-818 in relation to the most closest reference strain, viz. *Streptomyces fimbriatus*, Table (4), it could be concluded that both isolates are identical on the basis of Spore chain spiral, spore mass light gray, spore surface smooth (Plate 1) and spore non-motile. Cell wall hydrolysate contains LL-diaminopimelic acid, and sugar pattern not detected. Melanin pigment is produced. Utilization of xylose, sucrose, *meso*-inositol, L-arabinose, D-fructose, D-galactose, D-glucose, D-mannitol, raffinose and L-rhamnose. In view of all the recorded characteristics of KSA-818, it could be stated that KSA-818 is suggestive of being belonging to *Streptomyces fimbriatus*, KSA-818.

3.2.6. Amplification of the 16S rRNA gene

The 16S rRNA gene was amplified by polymerase chain reaction (PCR) using the universal primers. The primers that was used to 16S rRNA sequencing were 16F357 of the sequence strepF; 5'-ACGTGTGCAGCCCAAGACA-3' and strpR; 5'-ACAAGCCCTGGAAACGGGGT-3', the product of the PCR was analyzed on 1.5% ethidium bromide gel.

3.2.7. Molecular phylogeny of the selected isolate

The 16S rRNA sequence of the local isolate was compared to the sequences of *Streptomyces* spp. In order to determine the relatedness of the local isolate to these *Streptomyces* strains. The phylogenetic tree (as

displayed by the Tree View program) revealed that the locally isolated strain is closely related to *Streptomyces* sp., rather related to *Streptomyces* sp., rather than to *Streptomyces fimbriatus* (Fig. 1). Multiple sequence alignment was conducted the similarly revealed that the 16S rRNA sequence was 90% identical *Streptomyces fimbriatus* (Fig. 1).

3.3. Fermentation, Extraction and Purification

The *Streptomyces fimbriatus*, KSA-818 was inoculated into a 500 ml flask containing 75 ml of liquid medium composed of Starch, 20.0; NaNO₃, 2.0; K₂HPO₄, 1.0; MgSO₄ .7H₂O, 0.5; KCl, 0.5; FeSO₄ 0.01; Yeast extract 2.0 distilled water up to 1000 ml. The pH was adjusted at 7.2 before sterilization. After incubation 30 °C for 5 days with 3 discs (protein content 0.036 mg. protein/ disc). The culture broth (18 liters) harvested at 5 days of fermentation. Filtration and centrifugation was performed at 5000 rpm for 20 min. Only clear filtrates (supernatant) were tested for their antimicrobial activity. The clear filtrate was adjusted at pH 7.0 then extraction process was carried out n-Butanol was added to fermentation broth at the level of 1:1 (v/v). The organic phase was collected, evaporated under reduced pressure using a rotary evaporator. The residual syrup was dissolved in least amount of DMSO and filtered. The filtrates were tested for their antimicrobial activity. Only one fraction was obtained with petroleum ether (b.p. 40-60°C) by centrifugation at 5000 rpm for 15 minute. Separation of the antifungal agent(s) into individual components has been carried out by thin layer chromatography (TLC). The obtained results revealed that there is one compound exhibited obvious inhibitory effects against the growth of the fungal organisms.

3.4. Physicochemical characteristics

The physical characteristics such as melting point are 173-175°C and soluble in chloroform, n-Butanol, carbon tetra chloride, ethanol, DMSO and methanol but insoluble in petroleum ether, hexane and benzene were investigated.

3.5. Elemental analysis

The elemental analytical data of the antifungal agent produced by *Streptomyces fimbriatus*, KSA-818 showed the following: C=60.0; H=6.9; N= 5.4; O= 27.7 and S= 0.0. This analysis indicates a suggested empirical formula of: C₂₆ H₃₆ O₉ N₂.

3.6. Spectroscopic characteristics

The ultraviolet (UV) absorption spectrum of the antifungal agent recorded a maximum absorption peak at 230 and 320 nm (Fig. 2). The infra red (IR) spectrum of the antifungal agent showed characteristic band corresponding to 28 peaks (Fig.3). The Mass spectrum of antifungal agent showed that the molecular weight at 520.6 (Fig.4).

3.7. Biochemical reaction of antifungal agent

The reactions revealed the detection of certain groups in the molecule investigated. The antifungal

agent showed positive result with Mayer reaction, and Molish's test and negative result with nitroprusside reaction, Ninhydrin test Fehling test, Sakaguchi reaction, Ferric chloride and Ehrlich reactions (Table 5).

3.8. Biological activities

Data of the antimicrobial spectrum of antibiotic indicated that the antibiotic is fairly active against unicellular and filamentous fungi (Table 6).

3.9. Identification of the antifungal agent

On the basis of the recommended keys for the identification of antibiotics and in view of the comparative study of the recorded properties of the antibiotics, it could be stated that the antifungal agent is suggestive of being belonging to dilactone (Blastmycin antibiotic) (Table 7).

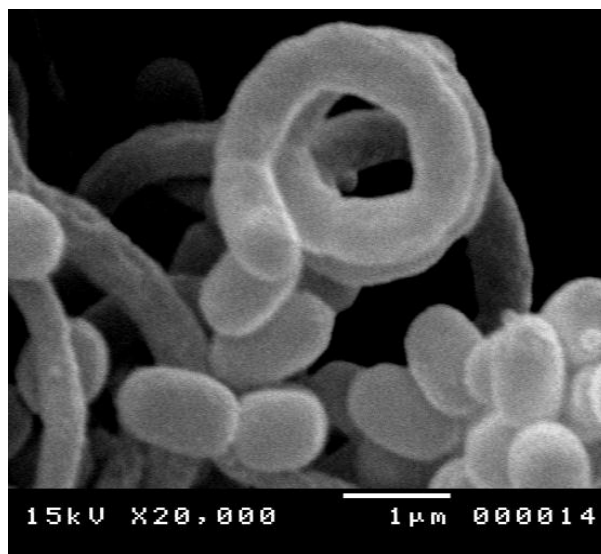


Plate 1. Scanning electron micrograph of the actinomycete isolate growing on starch nitrate agar medium showing spore chain spiral shape and spore surfaces smooth (X20,000).

Table 1. Mean diameters of inhibition zones (mm) caused by 100µl of the antimicrobial agent KSA-818 in the agar plate diffusion assay (The diameter of the used cup assay was 10 mm).

Test organism	Mean diameters of inhibition zone (mm)
A-Bacteria	
1-Gram Positive:	
<i>Micrococcus kristinae</i> , ATCC 27570	0.0
<i>Staphylococcus aureus</i> , NCTC 7447	0.0
<i>Staphylococcus haemolyticus</i> , NCTC 29968	0.0
<i>Bacillus subtilis</i> , NCTC 1040	0.0
<i>Bacillus pumilus</i> , NCTC 8214	0.0
<i>Sarcina maxima</i> , ATCC 33910	0.0
2-Gram Negative	
<i>Escherichia coli</i> , NCTC 10416	0.0
<i>Klebsiella pneumonia</i> , NCIMB 9111	0.0
<i>Pseudomonas aeruginosa</i> , ATCC 10145	0.0
B- Fungi:	
1-Unicellular fungi	
<i>Saccharomyces cerevisiae</i> , ATCC 9763	25.0
<i>Candida albicans</i> , IMRU 3669	25.0
2-Filamentous fungi	
<i>Aspergillus niger</i> , IMI 31276	24.0
<i>Aspergillus fumigatus</i> , ATCC 16424	21.0
<i>Aspergillus flavus</i> , IMI 111023	20.0
<i>Fusarium solani</i>	23.0
<i>Aspergillus terreus</i>	0.0
<i>Fusarium oxysporum</i>	22.0
<i>Botrytis cinerea</i>	21.0
<i>Botrytis fabae</i>	20.0
<i>Fusarium moniliforme</i>	21.0
<i>Alternaria alternata</i>	19.5
<i>Penicillium chrysogenum</i>	21.5
<i>Rhizoctonia solani</i>	22.0

Table 2. The morphological, physiological and biochemical characteristics of the actinomycete isolate KSA-818

Characteristic	Result
Morphological characteristics:	
Spore chains	spiral
Spore mass	light gray
Spore surface	Smooth
Color of substrate mycelium	moderate yellowish brown & Light gray- yellowish
Diffusible pigment	deep brown & brown black (ISP 6&7)
Motility	Non-motile
Cell wall hydrolysate:	
Diaminopimelic acid (DAP)	LL-DAP
Sugar Pattern	Not-detected
Physiological and biochemical properties:	
Hydrolysis of:	
Starch , Protein , Lipid & Pectin	+
Egg-yolk (lecithin)	-
Catalase test	-
Production of melanin pigment on:	
Peptone yeast- extract iron agar	+
Tyrosine agar medium	+
Tryptone – yeast extract broth	-
Degradation of:	
Xanthin	+
Esculin	+
H ₂ S Production	+
Nitrate reduction	+
Citrate utilization	+
Urea test	+
KCN test	-
Utilization of:	
D-Xylose	+
D- Mannose	++
D- Glucose	++
D- Galactose	++
Sucrose	+
L- Rhamnose	+
Raffinose	++
Mannitol	+++
L- Arabinose	++
meso-Inositol	++
Lactose	+
Maltose	+
Trehalose	++
D- Ribose	+
D-Fructose	++
L-Cysteine	+
L-Valine	+
L-Histidine	++
L-Phenylalanine	+
L-Arginine	+
L-Glutamic acid	+
Growth inhibitors:	
Sodium azide (0.01); Phenol (0.1) and Thallous acetate (0.001)	-
Growth at different temperature (°C):	
10	-
20-40	+
45	±
50	-
Growth at different pH values:	
3-4	-
5-8	+
8.5-12	-
Growth at different concentration of NaCl (%)	
1-5	+
7	-

+ = Positive , - = Negative and ± = doubtful results , ++ = moderate growth & +++ = good growth.

Table 3. Culture characteristics of the actinomycete isolate KSA-818.

Medium	Growth	Aerial mycelium	Substrate mycelium	Diffusible pigments
1-Starch nitrate agar medium	Good	264-1. gray light gray	77-m.ybr moderate yellowish brown	81-d.gy-ybr dark grayish yellowish brown
2-Tryptone yeast extract broth (ISP-1)	No growth	-	-	-
3-Yeast extract malt extract agar medium (ISP-2)	moderate	264-1. gray light gray	79-I-gy-.yBr Light gray- yellowish brown	77-m.ybr moderate yellowish brown
4-Oatmeal agar medium (ISP-3)	Good	264-1. gray light gray	77-m.ybr moderate yellowish brown	9-pk.White Pinkish white
5-Inorganic salts starch agar medium (ISP-4)	Good	264-1. gray light gray	79-I-gy-.yBr Light gray- yellowish brown	23-y. gray yellowish gray
6-Glycerol – asparagine agar medium (ISP-5)	Poor	264-1. gray light gray	79-I-gy-.yBr Light gray- yellowish brown	-
7-Peptone yeast extract iron agar medium (ISP-6)	moderate	264-1. gray light gray	78-dybr deep yellowish brown	65 -br-Black Brown black
8-Tyrosine agar medium (ISP-7)	moderate	264-1. gray light gray	78-dybr deep yellowish brown	59-d.br deep brown

*The color of the organism under investigation was consulted with the ISCC-NBS color –name charts illustrated with centroid color.

Table 4. A comparative study of the characteristics of actinomycete isolate, KSA-818 in relation to reference strain *Streptomyces fimbriatus*

Characteristics	KSA-818	Williams(1989) <i>Streptomyces fimbriatus</i>
Morphological characteristics:		
Color of aerial mycelium	Light gray	gray
Color of substrate mycelium	moderate yellowish brown, Light gray- yellowish brown	ND
Spore mass	light gray	gray
Spore chain	spiral	spiral
Spore surface	Smooth	Smooth
Cell wall hydrolysate:		
- Diaminopimelic acid (DAP)	LL-DAP	LL-DAP
- Sugar pattern	Not-detected	Not- detected
Melanin pigment	+	+
Hydrolysis of:		
lipid	+	ND
Gelatin	+	ND
Pectin	+	ND
Starch	+	ND
Egg-Yolk	-	ND
Motility	Non-Motile	Non-Motile
Utilization of:		
Sucrose	+	ND
D- Mannitol	+++	+
meso-Inositol	++	+
L- Rhamnose	+	+
Raffinose	++	+
L-Arabinose	++	+
D-Xylose	+	+
D-Fructose	++	+
D-Galactose	++	+
D-Glucose	++	+

+ =Positive, ND =No data

Table 5. Summarizes the response of the antifungal agent to certain biochemical reactions

Chemical test (reaction)	Result	Remark
Molish's reaction	+	Presence of sugar moiety
Fehling test	-	Absence of free aldehyde or keto sugar
Ninhydrin test	-	Absence of free-NH ₂ group
Sakaguchi reaction	-	Arginin is absent
Nitroprusside reaction	-	Absence of Sulfur
Ferric chloride reaction	+	Presence of Di-ketons group
Ehrlich reaction	-	Absence of indolic acid
Mayer reaction	+	Presence of nitro group

Table 6. Antifungal spectrum of the Purified antibiotic by applying the cup method assay.

Test organism	MIC (µg/ml) concentration
1-Unicellular:	
<i>Saccharomyces cerevisiae</i> ATCC 9763	15.6
<i>Candida albicans</i> IMRU 3669	15.6
2-Filamentous	
<i>Fusarium solani</i>	23.6
<i>Fusarium oxysporum</i>	23.6
<i>Rhizoctonia solani</i>	23.6
<i>Aspergillus niger</i> IMI 31276	15.6
<i>Aspergillus fumigatus</i> ATCC 16424	31.6
<i>Aspergillus flavus</i> IMI 111023	41.6
<i>Botrytis cinerea</i>	31.6
<i>Alternaria alternata</i>	41.6
<i>Penicillium chrysogenum</i>	31.6

Table 7. A comparative study of the characteristic properties of antifungal agent in relation to Reference antibiotic (Blastmycin).

Characteristic	Blastmycin	Purified antifungal agent
1- Melting point	174.5-175°C	173-175 °C
2- Molecular weight	520.56	520.6
3- Chemical analysis:		
C	59.99	60.0
H	6.97	6.9
N	5.38	5.4
O	27.66	27.7
S	ND	O.O
4- Ultra violet	228 & 328	230 & 320
5- Formula	C ₂₆ H ₃₆ O ₉ N ₂	C ₂₆ H ₃₆ O ₉ N ₂

ND=No Data

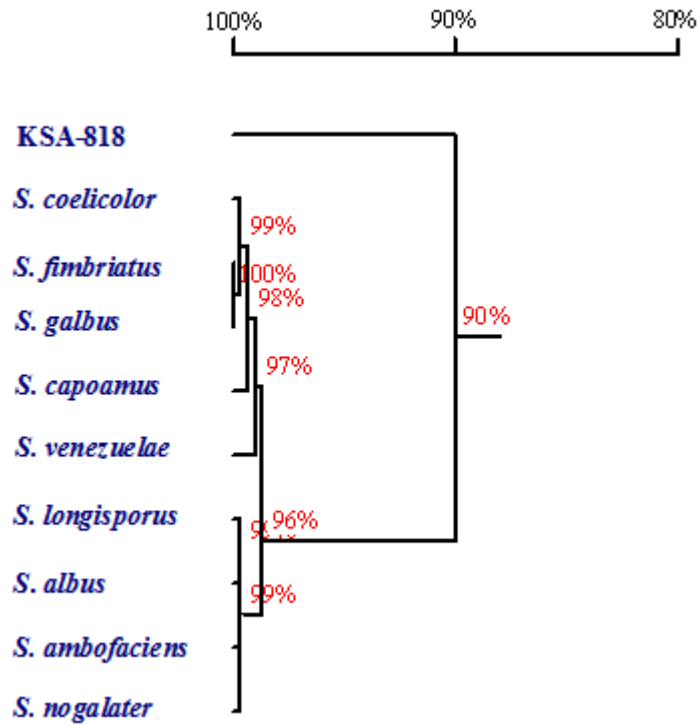


Fig. 1. The phylogenetic position of the local *Streptomyces* sp. strain among neighboring species. The phylogenetic tree was based on the pairwise comparisons of 16s rRNA sequences.

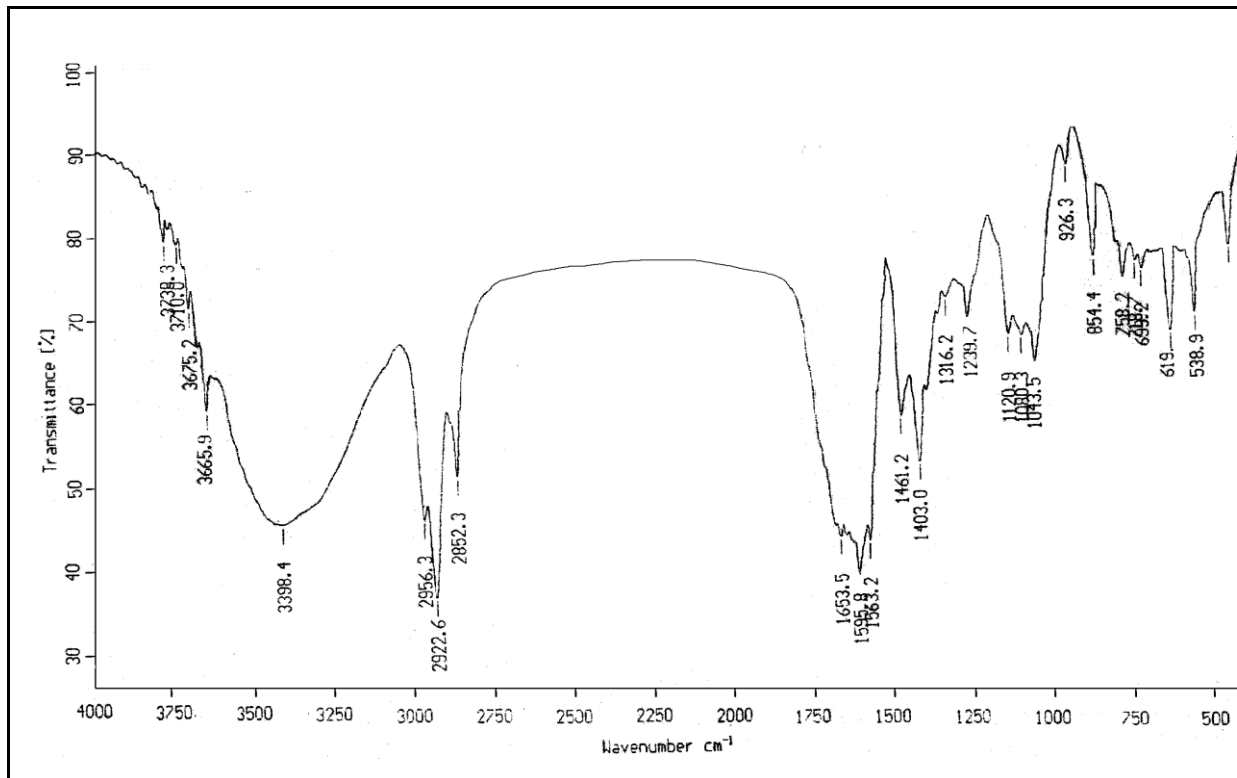


Fig. 2. IR spectrum of antifungal agent produced by *Streptomyces fimbriatus*, KSA-818.

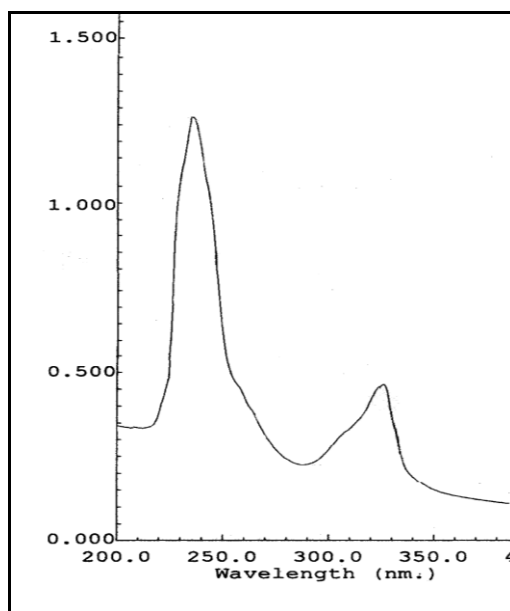


Fig. 3. Ultraviolet absorbance of antifungal agent produced by *Streptomyces fimbriatus*, KSA-818.

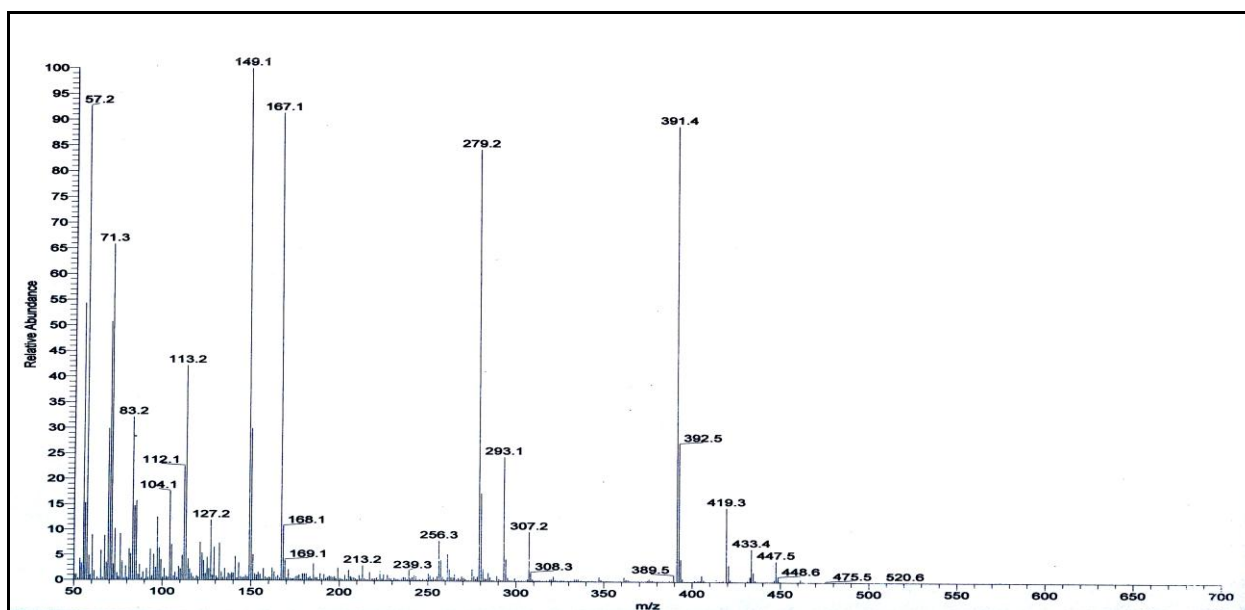


Fig. 4. Mass spectrum of antifungal agent produced by *Streptomyces fimbriatus*, KSA-818.

4. DISCUSSION

The *Streptomyces fimbriatus* was isolated from Al-Khurmah governorate, KSA. The isolate KSA-818 was growing on starch nitrate agar medium for investigating its potency to produce antimicrobial agents. The actinomycete isolate, exhibited a wide spectrum antifungal agent [Kavanagh, 1972]. Identification process has been carried out according to [Williams *et al.*, 1989, Hensyl, 1994 and Numerical taxonomy program, 1989]. For the purpose of

identification of actinomycete isolate, the morphological characteristics and microscopic examination emphasized that the spore chain is spiral. Spore surfaces are smooth and Spore mass is light gray, substrate mycelium is light gray- yellowish brown (ISP 2, 4 & 5) and deep yellowish brown (ISP 6 & 7) and diffusible pigment was produced on ISP-media Nos. 6 & 7. The results of physiological, biochemical characteristics and cell wall hydrolysate of actinomycetes isolate, exhibited that the cell wall

containing LL-diaminopimelic acid (DAP) and sugar pattern of cell wall hydrolysate could not detected. Moreover, spore non-motile, Melanin pigment is produced and utilization of xylose, sucrose, meso-inositol, L- arabinose, D- fructose, D- galactose, D- glucose, D- mannitol, raffinose and L-rhamnose. These results emphasized that the actinomycetes isolate related to a group of *Streptomyces*. In view of all the previously recorded data, the identification of actinomycete isolate was suggestive of being belonging to *Streptomyces fimbriatus*. The phylogenetic tree (diagram) revealed that the local isolate is closely related *Streptomyces fimbriatus*, similarity matrix is 90%.

The active metabolites were extracted by n-Butanol at pH 7.0 [Atta *et al.*, 2010].

The organic phase was collected and evaporated under reduced pressure using a rotary evaporator. The extract was concentrated and treated with petroleum ether (b.p. 40-60°C) for precipitation process where only one fraction was obtained in the form of yellowish ppt. and then tested for their antifungal activity. Separation of antifungal agent into individual components has been tried by thin-layer chromatography using a solvent system composed of chloroform and methanol (24:1, v/v) as developing solvent [Zhang *et al.*, 2007 and Atta *et al.*, 2009]. For the purpose of purification process, the antifungal agent were allowed to pass through a column chromatography packed with silica gel and eluting solvent was composed of chloroform and methanol (8:2 v/v), fifty fractions were collected and tested for their activities. The maximum activity was recorded at fraction No. 21. Similarly, many workers used a column chromatography packed with silica gel and eluting solvents composed of various ratios of chloroform and methanol [Criswell *et al.* 2006 and Sekiguchi, *et al.*, 2007]. The physico-chemical characteristics of the purified antibiotic revealed that, melting point is 173-175°C, soluble in chloroform, n-butanol, methanol, ethanol, DMSO, carbon tetra chloride, but insoluble in petroleum ether, hexane and benzene; similar results were recorded by [Lotfi *et al.*, 2003; El-Tayeb *et al.*, 2004c and Atta *et al.*, 2010].

A study of the elemental analysis of the antibiotic showed the following C=60.0; H=6.9; N= 5.4; O= 27.7 and S= 0.0. lead to an empirical formula of: C₂₆H₃₆N₂O₉. The spectroscopic characteristics of antibiotic revealed the presence of the maximum absorption peak in UV. at 230 and 320 nm, infra-red absorption spectrum represented by 28 peaks and Mass-spectrum showed that the molecular weight is 520.6. The biochemical tests of antibiotic gave positive reaction with Ferric chloride, Mayer and Molish's reactions [Yutaka *et al.*, 2001]. The MIC of antibiotic under study exhibited fairly active against unicellular

and filamentous fungi: *Saccharomyces cerevisiae*, ATCC 9763; *Candida albicans*, IMRU 3669; *Aspergillus niger*; *Aspergillus fumigatus*; *Aspergillus flavus*; *Aspergillus terreus*; *Fusarium solani*; *Fusarium oxysporum*, *Fusarium moniliform*, *Alternaria alternata*, *Botrytis cinerea*, *Penicillium chrysogenum* and *Rhizoctonia solani*. Similar investigations and results were attained by [Imnagaki *et al.*, 2006; Sekiguchi, *et al.*, 2007 and Atta, 2010]. Identification of antifungal agent according to recommended international keys indicated that the antibiotic is suggestive of being belonging to Dilactones (Blastmycin) antibiotic [Umezawa, 1967 and 1977 and Berdy, 1979 and 1980a, b & c].

5. CONCLUSION

The present study mainly involved in the isolation of Actinomycetes based on the cultural, morphology, physiology and biochemical characteristics, as well as 16s rRNA methodology. Further work should be focused in most potent *Streptomyces* isolate for production the antifungal activities against unicellular and filamentous Fungi. The bioactive substance was suggestive of being belonging to Blastmycin antibiotic.

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Controlling of Analog Capture Circuit and Digital Analog Converter for Spartan-3E FPGA Starter Kit

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Abstract: The analog capture circuit and Digital Analog Converter Controller (DAC) is very useful to apply and test the digital algorithms which are executed inside the Spartan-3E FPGA. A VHSIC Hardware Description Language (VHDL) code for controlling of Analog Capture Circuit and DAC of Spartan-3E FPGA Starter Kit board has been designed, implemented and tested. The code is based on finite state machine for each component. The VHDL code and its results are presented.

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Keywords: FPGA; Analog Capture Circuit; ADC; DAC; VHDL

1. Introduction

Nuclear measurements for nuclear safeguards applications using nuclear spectrometers with analog shaping are being replaced by digital systems that can provide higher throughput, better energy resolution and better stability. In the past, most spectroscopic systems used analog shaping, mostly Gaussian, to process detector signals. The peak of the shaped signal was digitized with an ADC and sorted into an energy spectrum using MCA. However, in the last years, systems with Digital Signal Processing (DSP) have started to replace the conventional analog systems to improve the performance and to build small handheld solutions [1]. The DSP algorithms could be executed inside a Field Programmable Gate Array (FPGA). The Analog to Digital Converters (ADCs), and their counterparts, Digital to Analog converters (DACs) are electronic components that mostly used in digital systems because digital signals cannot be used directly, as all the real world signals are more or less analog in nature; so that the analog signal first gets converted into digital one, then the processing is done on the digital signal, and finally the processed output is again converted into analog signal so that it can be used with other systems [2]. The analog capture circuit and DAC controller is very useful to apply and test the DSP algorithms which are executed inside the Spartan-3E FPGA. The Spartan-3E FPGA Starter Kit board includes two-channel analog capture circuits and an SPI-compatible, four-channel, serial 12-bit DAC. Each analog capture circuit channel consist a programmable scaling amplifier and 14-bit ADC. The amplifier, ADC and DAC are serially programmed or controlled by the FPGA [3]. Figure 1 shows the schematic diagram of amplifier, ADC and

DAC [4]. The maximum range of the ADC is ± 1.25 V which is centred on 1.65 V (reference voltage). The gain of each amplifier is programmable according the input voltage range [3]. Table (1) lists the interface signals between the FPGA and the amplifier, ADC and DAC. Istiyanto, J.E carried out and tested a VHDL design of a controller for the amplifier and ADC present on a Spartan-3E Starter Kit board [5]. D. Sillage developed Verilog modules for ADC, programmable scaling amplifier and DAC controlling [6].

2. Design and Implementation

The code is designed to control the amplifier, ADC and DAC on board the Spartan 3E FPGA. FPGA is programmed using VHDL. The VHDL code design based on Finite State Machine (FSM) is used to control the amplifier, ADC and DAC of Spartan 3E FPGA starter kit. FSM constitute a special modeling technique for sequential logic circuits. Such a model can be very helpful in the design of certain types of systems, particularly those whose tasks form a well-defined sequence [7]. State machines can usually be modelled using a case statement in a process. The state information is stored in a signal. The multiple branches of the case statement contain the behaviour for each state [8].

The amplifier, ADC and DAC are connected together through Spartan 3E FPGA using the signals in Table 1. The aim of this work is achieved through using these signals to control them and to pass the outputs through them. Figure 2 shows the block diagram of three components and their signal with Spartan 3E FPGA.

The initial state machine S0 is set pins and are shown in Figures 3, 4, 5 respectively.

timing signals for amplifier, ADC and DAC before the system is running in earnest. The state diagrams of FSMs for controlling the amplifier, ADC, DAC.

The design is then synthesised (“compiled”), placed, and routed on the FPGA using the ISE 9.2i software. The configured FPGA is tested and verified using an Electronic Explorer as shown in figure 6.

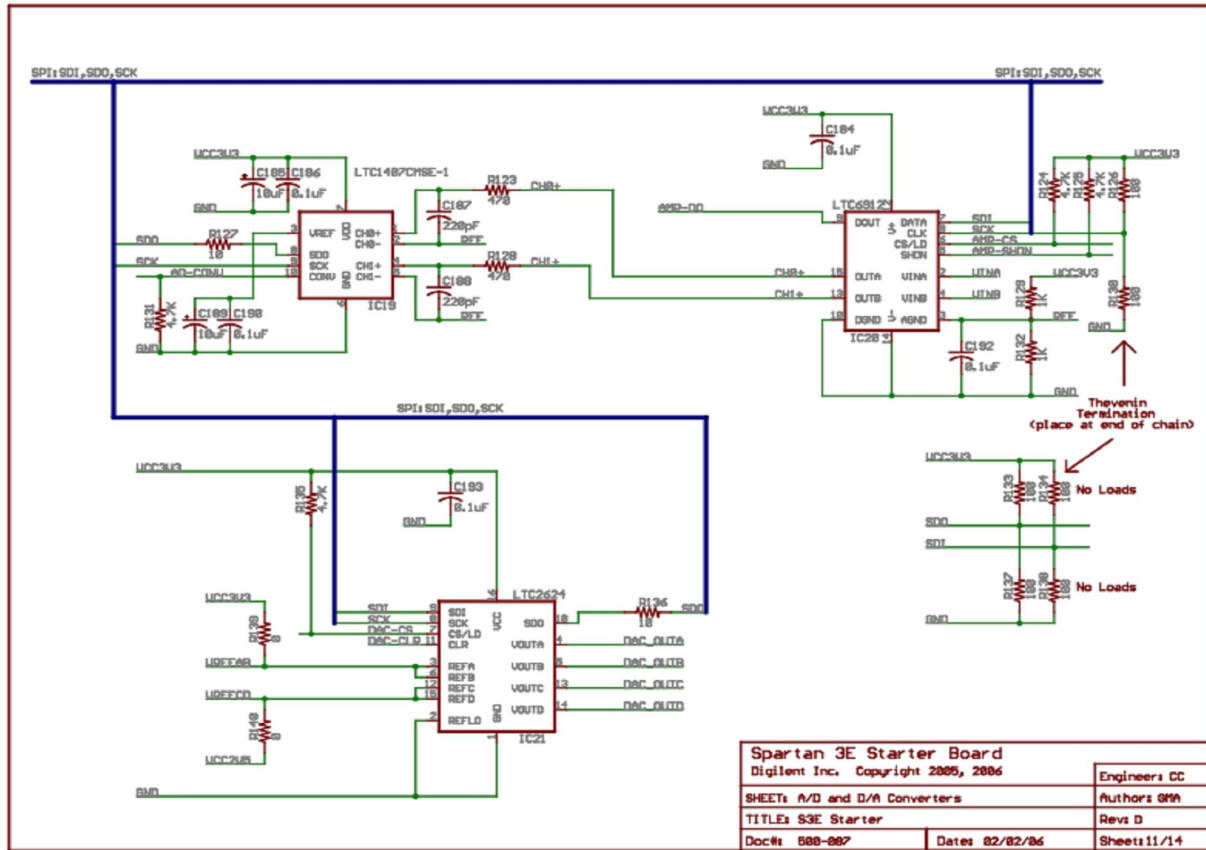


Figure 1. the schematic diagram of amplifier, ADC and DAC

Table 1. AMP, ADC and DAC INTERFACE SIGNAL [3]

Signal	FPGA Pin	Direction	Description
SPI_MOSI	T4	FPGA→AD FPGA→DAC	Serial data: Master Output, Slave Input.
AMP_CS	N7	FPGA→AMP	Active-Low chip-select. The amplifier gain is set when signal returns High
SPI_SCK	U16	FPGA→AMP FPGA→ADC FPGA→DAC	Clock
AMP_SHDN	P7	FPGA→AMP	Active-High shutdown, reset
AD_CONV	P11	FPGA→ADC	Active-High shutdown and reset.
SPI_MISO	N10	FPGA←ADC	Serial data: Master Input, Serial Output. Presents the digital representation of the sample analog values as two 14-bit two's complement binary values.
		FPGA←DAC	Serial data: Master Input, Slave Output
DAC_CS	N8	FPGA→DAC	Active-Low chip-select. Digital-to-analog conversion starts when signal returns High.
DAC_CLR	P8	FPGA→DAC	Asynchronous, active-Low reset input

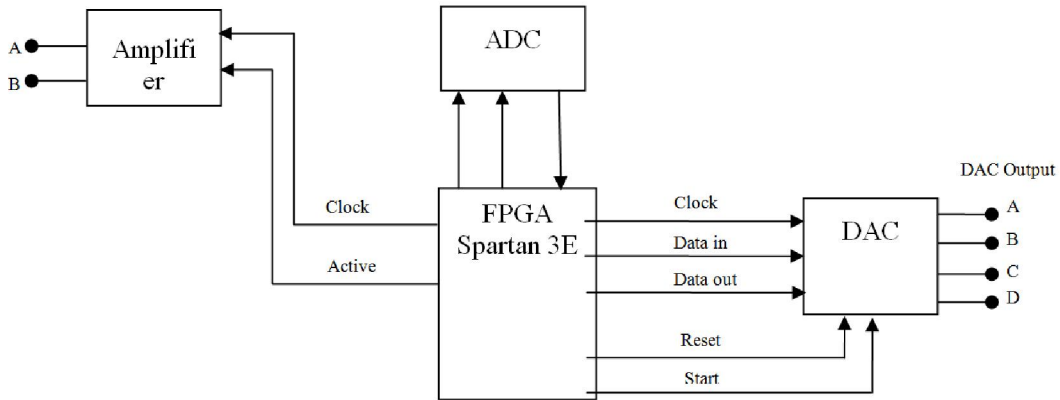


Figure 2. Block diagram of amplifier, ADC, DAC and its signals

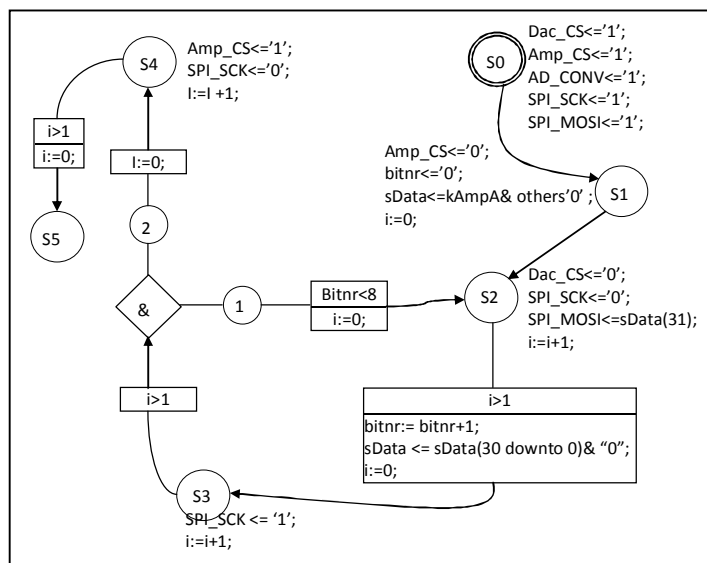


Figure 3. State diagram of FSM for controlling the amplifier on board Spartan 3E FPGA Starter kit

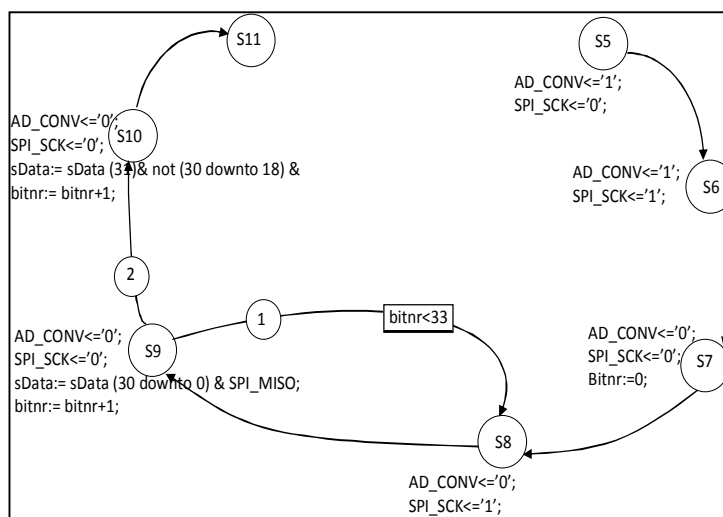


Figure 4. State diagram of FSM for controlling the ADC on board Spartan 3E FPGA Starter kit

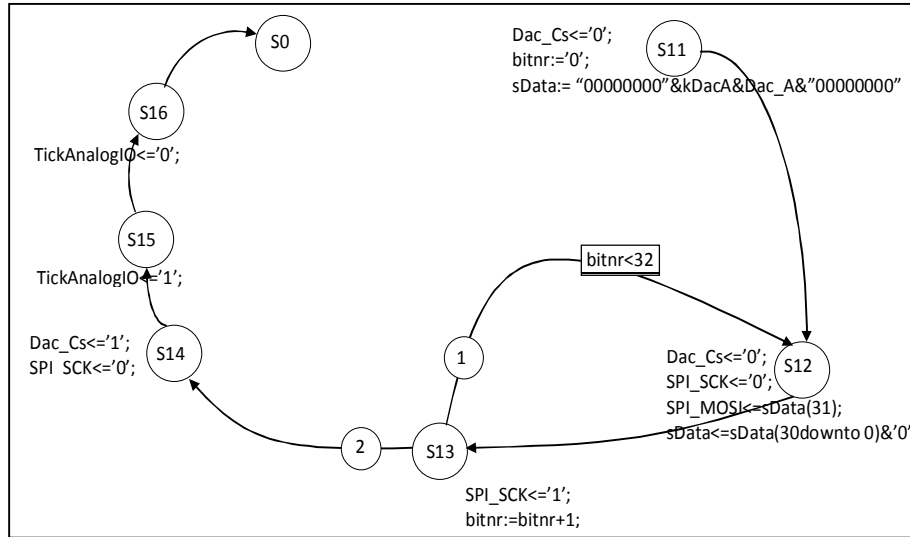


Figure 5. State diagram of FSM for controlling the DAC on board Spartan 3E FPGA Starter kit.

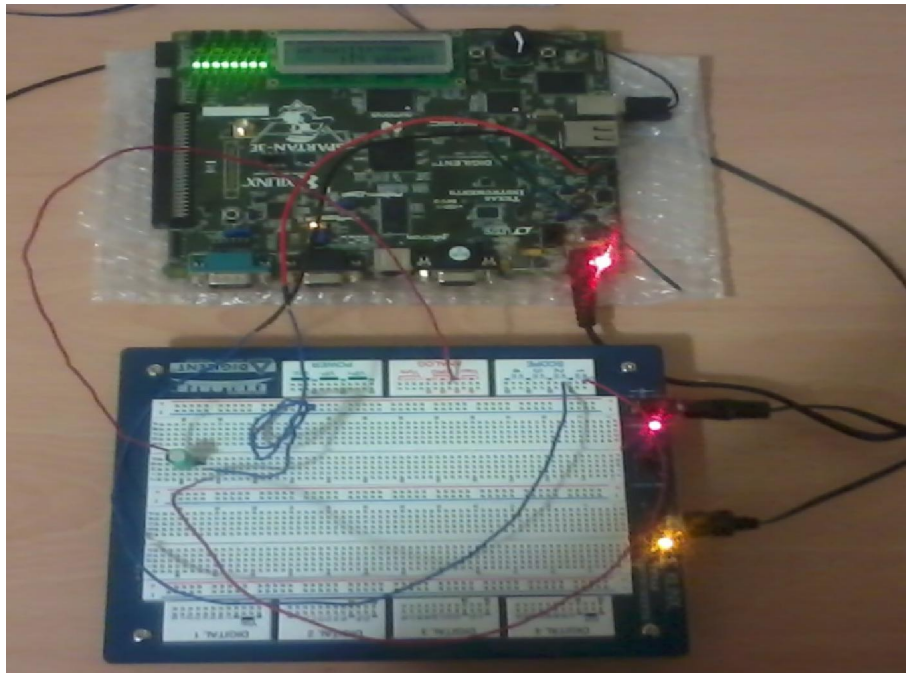


Figure 6. The used instruments for code testing and verification.

3. Verification and Results

The Electronic Explorer board (EE board) has many functions such as Wave-generator, Scope, Digitizer, Multi-meter, programmable-power. The EE board is powered by the free, PC-based WaveForms software that makes it easy to acquire, store, analyze, produce and reuse analog and digital signals. In this work; it was used as a wave generator and scope. The response of the configured FPGA is checked by applying well characterized signals to the input of the amplifier and recognizing their corresponding output signals of the DAC. Many signals from the wave

generator on the EE board with amplitudes ranging from 0 - 3.3 V were applied to the input of the amplifier. The applied signal was powered by Waveform software to select the signal type (sinusoidal) and its characteristics (amplitude, offset and frequency). The gain of the amplifier is set to -1 which is corresponding to voltage range of 0.4 - 2.9 V; it is chosen to allow wide voltage range that can be sampled. The offset of the signals was adjusted to 1.65 V (corresponding to the reference of the amplifier) and the amplitude of the signals was varied within ± 1.25 V. The input signal of the amplifier from the wave

generator and the output signal of DAC are fully characterized by Waveform software that supported to mean of a scope on EE board. Figure 7 illustrates the

obtained results of the amplifier input against DAC output for recommended value.

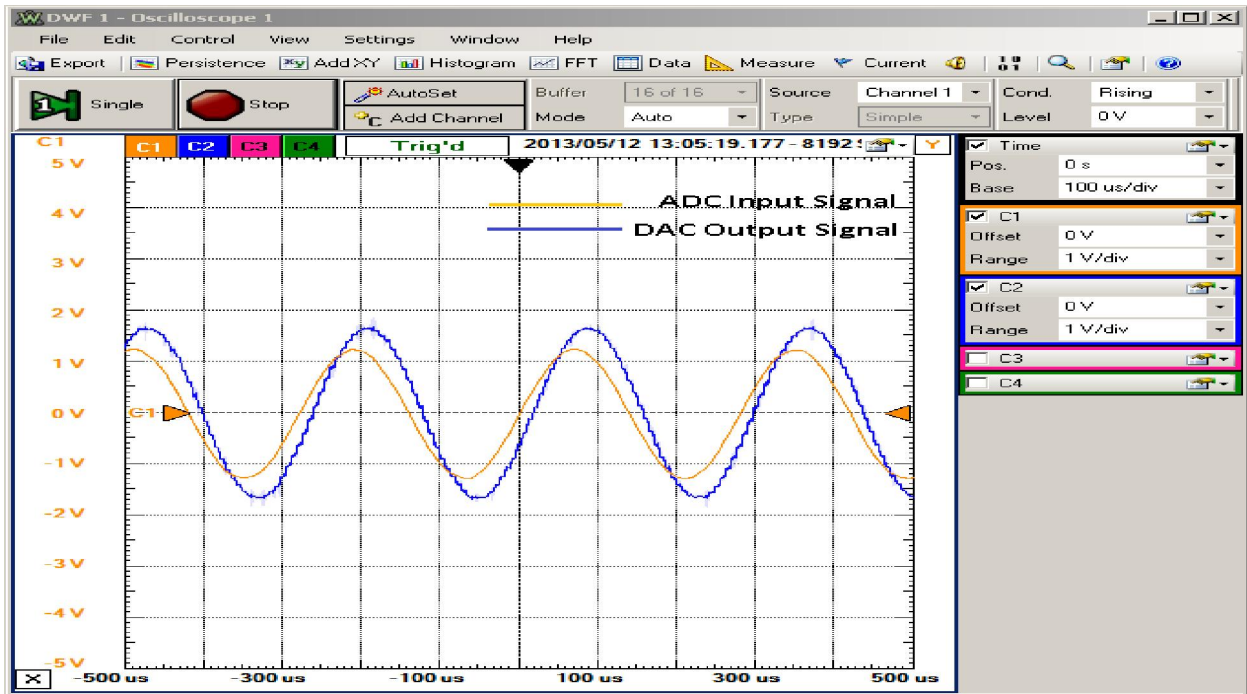


Figure 7. The obtained results of the amplifier input against DAC output for recommended value

As it was expected, the output signal of DAC was matched with the input signal of the amplifier, the amplitude and phase of output signal of the DAC were differ than its corresponding input signal to amplifier. The difference in amplitude is caused due to the differences in both the gain of amplifier and the number of bits of 14-bit ADC and 12-bit DAC as well as the capturing time of the input and output signal i.e. the output signal should be delayed than the input signal because it takes few micro seconds to be generated by DAC. The shape of DAC output was destroyed by changing the values of the offset and amplitude in order to be beyond the recommended values (offset=1.65V, amplitude = $\pm 1.25V$) as shown in Figures 8, 9, 10. These figures illustrate the obtained results of the amplifier input against DAC output when raising the amplitude to be (2.31V), raising the offset to be (2.88V) and decreasing the offset value to be (1.81V), respectively. The shape of DAC was not destroyed when using AC coupling capacitor to block DC. Using AC coupling capacitor solve the shape destroying results of the offset change but the

amplitude of signal is still limited by the maximum range of the ADC ($\pm 1.25V$) as shown in figure 11.

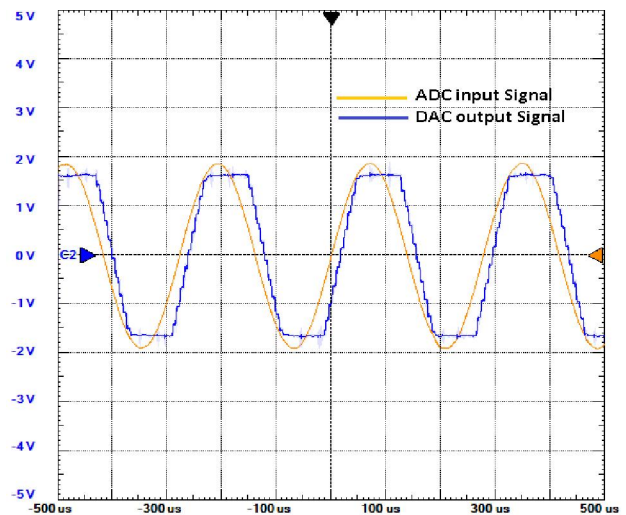


Figure 8. The obtained results of the amplifier input against DAC output when raise amplitude value

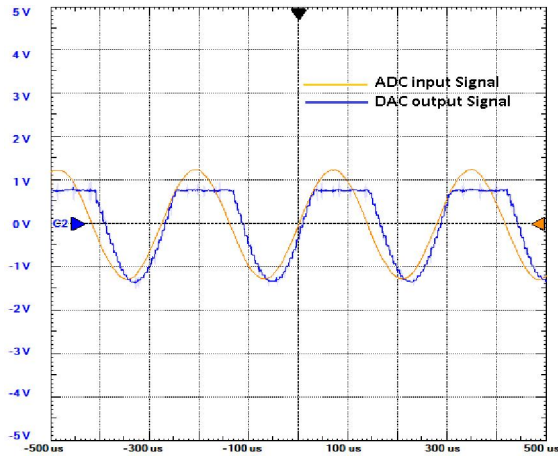


Figure 9. The obtained results of the amplifier input against DAC output when raise offset value

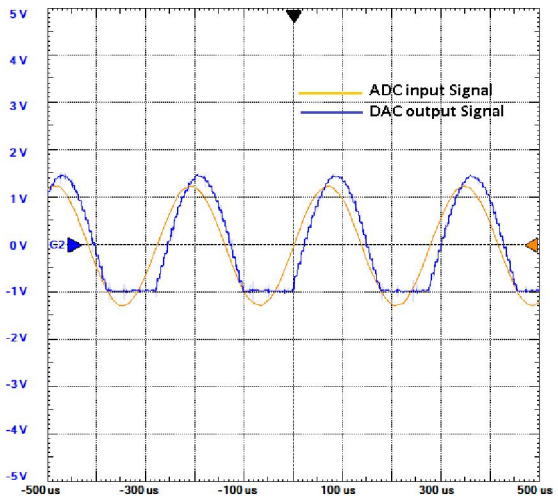


Figure 10. The obtained results of the amplifier input against DAC output when decrease offset value

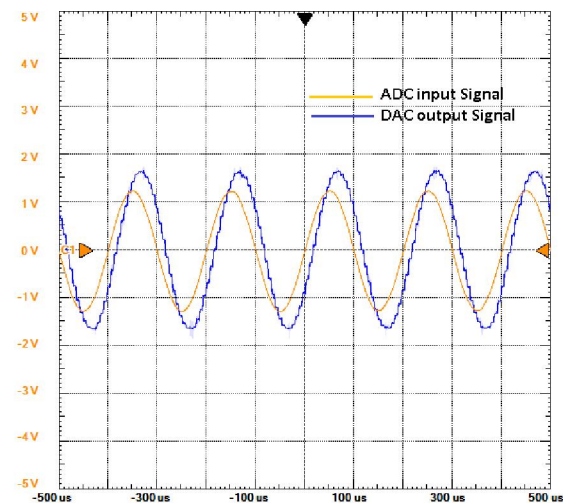


Figure 11. The obtained results of the amplifier input against DAC output using coupling capacitor

4. Conclusion

The controls of amplifier, ADC and DAC of Spartan-3E FPGA Starter Kit board have been applied. The FPGA code was performed through three stages; FSM was implemented for controlling in each component. The results of the implemented VHDL code tends to the on board ADC & DAC of the Spartan 3E FPGA Board were properly interfaced with real world signal.

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