

Degradation of Date Palm Trees and Date Production in Arab Countries: Causes and Potential Rehabilitation

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Abstract: The date palm (*Phoenix dactylifera* L.) is a major fruit crop in most Arab countries. It has historically been connected with sustaining human life and tradition of the people in the old world as a major agricultural crop. Arab countries possess 70% of the 120 million world's date palms and are responsible for 67% of the global date production. During the past 50 years, date palm groves were subjected to degradation due to extensive exploitation resulting from the increase in the human population and domestic animals. Like many other plants, some palms are in danger of dying out because of human activity. Date palm production faces serious problems such as low yields as well as marketing constraints. Over the last decade, productivity of date palm trees has declined in the traditional growing areas. As much as 30% of production can potentially be lost as a result of pests and disease. In the Gulf countries and Egypt, the Red Palm Weevil has recently become one of the major date palm pests, while Bayoud disease caused by a parasitic fungus is a common threat to date palms in North Africa. Technical and socio-economic factors contributed to date palm degradation. Also, date processing and marketing have affected the economic revenue from date production and its quality. Rehabilitation of date palm trees in the Arab countries is crucial and needs collaborative efforts and a dedicated budget. Recommendations for stopping the degradation in the date palm sector and strengthening this industry particularly for cultivation, harvesting, date processing and marketing in the Arab countries have been proposed.

Key words: Date palm, degradation, Date production, Arab countries, Rehabilitation

INTRODUCTION

The date palm (*Phoenix dactylifera* L.) is considered a symbol of life in the desert, because it tolerates high temperatures, drought and salinity more than many other fruit crop plant species. It is one of the oldest trees from which man has derived benefit, and it has been cultivated since ancient times. It is the only indigenous wild desert plant definitely domesticated in its native harsh environments appears to be the date palm (Zohary and Hopf, 2000).

The heavenly religions honored the date palm and showed concern for its cultivation and care. But no other religion has stressed the regard for dates and the date palm as much as Islam. The Holy Koran mentions dates and the date palm in many suras (chapters) and verses. Prophet Muhammad (peace be upon him) is reported to have said that the best property is the date palm, that dates cure many disorders, and he urged Muslims to eat dates and tend the date palm (Zaid and de Wet, 1999).

The date palm is considered a renewable natural resource because it can be replaced in a relatively short period of time or used through conservation efforts without depletion (University of Delaware, 2004). The exact origin or gene centre of the date palm has been lost in history, but evidence of date palm cultivation goes as far back as 4000 B.C. in what is now southern Iraq. References to date palms have also been found in Ancient Egypt (Barreveld, 1993). Remains of dates have been found on a number of Neolithic sites, particularly in Syria and Egypt. This means that they were being eaten by man as much as 7,000 to 8,000 years ago (Lunde, 1978).

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The date palm retains its value for cultivators as it gives a wide range of products and services, including many necessities of life. The date, the primary product of the palm, is rich in protein, vitamins, and mineral salts. That is why it represents an essential element of diet for the cultivator himself and his animals. All secondary products of the palm result from annual pruning and have essential uses for the cultivator. Unfortunately, the date palms grown in the Arab region are under threat from diseases, pests, environmental changes and socio-economic factors. Of the estimated 120 million date palms in the world, over two-thirds are in Arab countries (FAO, 1982).

The present work aims at shedding light on the importance, current status, degradation trends, constraints, and potential rehabilitation of the date palm and its production in the Arab countries (members of the League of Arab States).

Importance of Date Palm:

The date palm is a major agricultural crop in the Near East and North Africa, and it has historically been connected with sustaining human life in many of the hot and barren parts of the old world and has become an integral part of the culture and tradition of the people of these regions (Sawaya, 2000).

Date palms grow from Morocco in the west across the lower-altitude expanses of the Arab countries up to the foothills of the Himalayas. It is also found in pockets elsewhere in the world, notably in the American Southwest where date cultivation was first introduced by Spanish missionaries and where early in the 1900's offshoots imported from Algeria and Iraq were planted for commercial purposes (Saudi Aramco World, 1962).

The date palm needs a climate with plentiful sun, minimal rain, yet good access to water, which to a large extent is only provided by oases. They are very cold tolerant, salt tolerant; they can also take extreme heat, dry and wet conditions (Saudi Aramco World, 1962). Within the climatological limits of where the palms are now grown, the upper range of temperature tolerance is of little importance to the palm. Maximum temperatures of around 50°C as they occur do not harm the palm (Barreveld, 1993). In Arab countries, the date palm is considered one of the main fruit crops. The number of date palms, as well as date production and consumption, vary from one country to another due to prevailing environmental conditions, the intention paid to this crop and social conventions. The major producers of dates in the world are situated in the Arabia Gulf and North Africa. Kader and Hussein (2009) reported that in 2006, world production of dates was about 7 million tones and the top 10 producing countries were Egypt, Saudi Arabia, Iran, United Arab Emirates, Pakistan, Algeria, Sudan, Oman, Libya, and Tunisia. There are thousands of date palm cultivars, including those with soft, semi-dry, and dry fruits (depending on their water and type of sugar content at harvest when fully-ripe), grown in these countries (Kader and Hussein, 2009). This is true as the Arab countries possess the majority of world's date palms and produce the majority of the world's total date crop (FAOSTAT, 2009).

The date palm not only provides a concentrated energy food, it also creates a more amenable habitat for the people to live in by providing shade and protection from the desert winds. In addition, the date palm yields a variety of products for use in agricultural production and for domestic utensils.

Modern technological developments have made it possible to look at the palm as a raw material source for industrial purposes. Practically all parts of the date palm, except perhaps the roots, are used for a purpose best suited to them.

The fruit of the date is a drupe and has one seed, which can vary in size, shape, color and quality of flesh. The date itself is a high energy food item for both people and livestock. Since ancient times, the date palm has been a source of food for the inhabitants of the Arab countries. Dates have proved to be the best resource to ensure food security during food shortages and crises.

The date palm is a crop capable of establishing a sustainable system in subsistence agricultural areas and thus plays an important social role in reinforcing the subsistence base of a large population group by helping them to settle in rural areas versus migration to urban centers (Sawaya, 2000). The tree is a spectacular palm for landscaping large areas. It provides shade and protection from wind. It also prevents soil degradation and desertification, thus protecting the environment. In fact, the date palm represented an eloquent example of integrated sustainable use of renewable material resources (EI-Mously, 1998). The most commonly used parts of the date palm are its fruits, bark and leaves and they have the many commercial and medicinal applications. Date, the primary product of the palm, is rich in protein, vitamins, and mineral salts. So that it represents an essential element of diet for the cultivator himself and his animals (EI-Mously, 1998). In recent times, there has been a renewed interest in the date as a food source, not necessarily as a staple food, but rather as a component in food preparations like sweets, confectionery, baking products, institutional feeding and health foods (Barreveld, 1993).

All non-fruit components of the date palm (frond bases, midrib, leaflets, spikelets, fruit stalks, spathes) have a certain but limited value for ruminant feeding (in natural environments with no or limited alternatives it should be used). Leaves are very often used to construct fences providing wind protection and creating favourable micro-climates for horticulture and/or in nurseries. Also, date palms are providing construction material for different purposes (roofs, fences, baskets, cranes, textiles etc.) (Naturland, 2002). Secondary products of the palm result from annual pruning and have essential uses for the community, thus, no waste results from the growing of palms (EI-Mously, 1998). Date palm has provided many pharmaceutical uses from the ancient times till now. Medically, dates were recommended in mouth washes (an application most likely frowned upon by a present-day dentist); as a purgative or in gynaecologically related interventions (Darby *et al.* 1977). They added that dates formed part of various ointments, bandages and ophthalmic prescriptions and Plinius reports: "dates are applied with quinces, wax and saffran to the stomach, bladder, belly and intestines. The sap of leaves is a remedy for nervousness, kidney trouble and putrid wounds and calms the effervescence of the blood. Burnt seeds are made in an ointment for ulcers or a collyrium that produce long eyelashes.

The fruit, because of its tannin content, is used medicinally as a deterrent and astringent in intestinal troubles. In the form of an infusion, decoction, sirup or paste, is administered as a treatment for sore throat, colds, bronchial catarrh. It is taken to relieve fever, cystitis, gonorrhoea, edema, liver and abdominal troubles. And it is said to counteract alcohol intoxication. The seed powder is an ingredient in a paste given to relieve ague. A gum that exudes from the wounded trunk is employed in India for treating diarrhea and genito-urinary ailments. It is diuretic and demulcent. The roots are used against toothache (Morton, 1987). This sampling of medicinal use of date palm products could not end without reference to the invigorating power bestowed on man when consuming male flowers and male spathe (Popenoe, 1973).

The Present Status of Date Palms and Date Production in Some Arab Countries:

The world date palm cultivation is concentrated mostly in the Near East and North Africa, favoured by the suitable dry sub-tropical and high temperature climate prevailing in these regions (Sawaya, 2000). According to the report of FAO (FAOSTAT, 2009) about 75% of the world production of dates is in Arab countries for 2008; half of these is in Gulf area (including Iraq and Yemen) and the other half is in North Africa countries (including Sudan) (FAOSTAT, 2009) (Fig. 1). Production of dates in Arab countries stood at 5,096.99 tones produced from 82,346.08 date palm trees (AOAD, 2008) (Table 1). This clearly indicates that most of the world's date production is concentrated in a few countries in the same region. Date production of Egypt alone represents about 20% of the total World production, while Tunisia, Algeria and Saudi Arabia are among the five leading date-exporting countries (Zaid, 2001). North Africa is the second most important growing area for date palms in the world with approximately 30% of the world's total number of date palms; its production is about 1,500,000 tones of dates (Oihabi, 2001). In addition to the Arab countries, Pakistan and Iran are considered of the main date producers, with production accounted for 14.20% and 9.65% of the total World date production, respectively, for 2008 (Fig. 1).

Jaradat and Zaid (2004) reported that the red palm weevil [(*Rhynchophorus ferrugineus* (Olivier))] is threatening the Arab region's date palm trees. On the other hand, drought, due to a lengthy rainless period and drying up of many water wells, and as a consequence, increased water and soil salinity, are two serious threats to the expanding date palm plantations in most parts of the Arabian Peninsula. Due to economic and social factors, the diversity of date palm groves in most countries in the Arabian Peninsula and North Africa is declining and the composition of these groves as to the number of cultivars witnessed a sharp decline in recent years.

It is worth mentioning that accurate statistics on the number of date palms are not always available and not easy to collect (Zaid, 2001). The number of date palms presented in publications could be deceptive sometimes, as one can not know whether the trees are mature producing trees or young palms. The following describes the present status for date production in the main date-growing counties of the Arab countries.

Iraq:

Historically, it is said that Iraq is the tree's birthplace. The date palm has an important status in Iraq as it was the first country in the world when it comes to the number of date palms. Jaradat (2003) reported that more than 30 million date palms existed in the early 1960s. In terms of date production, Iraq used to be a major producer of dates but in recent years the amount of dates produced and exported has decreased. In the 1980s and mid-1990s, Iraq was consistently among the top five date-producing countries in the world and often ranked number one in terms of production by volume (Walsborn, 2008). In the early 1980s, an estimated 30 million date palm trees were growing in Iraq, but the number has declined dramatically since then (Rahif *et*

al., 1988). The devastation of the Shatt al Arab area during the Iran-Iraq War hastened the destruction of date palm groves, and in 1985 the government estimated the number of date palms at fewer than 13 million (Jaradat, 2003). In 2006, Iraq produced 432,000 tones of dates from 7,878,000 trees (AOAD, 2008), while produced 440,000 tones in 2007 and exported 37063 tones for USD 9532000 (FAOSTAT, 2009).

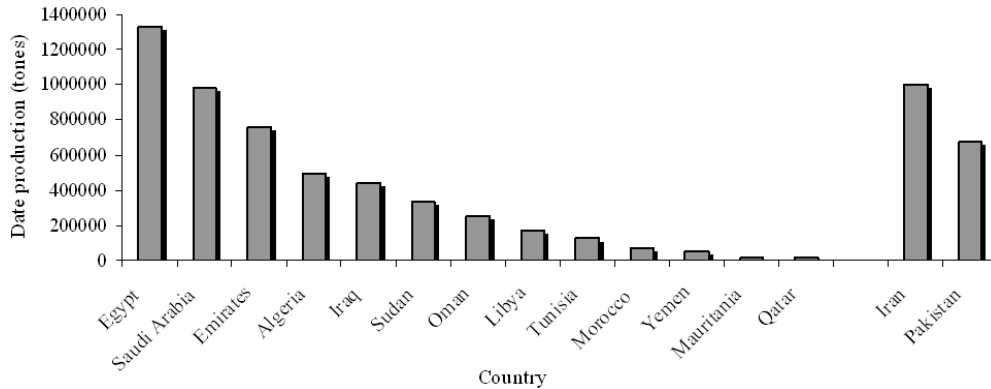


Fig. 1: Date production (tonnes) in the Arab countries for 2008 (Country with production less than 20,000 tones do not included); Iran and Pakistan were added for comparison (FAOSTAT, 2009).

Table 1: Number of productive date palms and area in the Arab countries for 2007 (AOAD, 2008)

Country	No. productive trees (× 1000 trees)	Area (× 1000 ha)
Jordan	104.38	0.66
United Arab Emirates	16342.19	219.30
Bahrain	379.98	1.52
Tunisia	3335.80	46.00
Algeria	10926.00	159.87
Saudi Arabia	12000.00	155.70
Sudan	2646.00	35.28
Syria	72.60	0.13
Iraq	8024.00	101.50
Oman	2457.00	32.76
Palestine Territories	301.20	0.30
Qatar	335.30	1.44
Kuwait	312.21	1.45
Libya	2100.00	28.00
Egypt	12039.42	36.45
Morocco	5760.00	42.00
Mauritania	600.00	8.00
Yemen	4610.00	10.40
Total	82346.08	880.76

Date palm in Iraq was subjected to many agricultural pests and biotic and abiotic factors such as negligence, salinity and overharvesting in addition to the overall economic factors that have passed the country as a result of the wars and the economic embargo. These factors have caused deterioration of the date palm productivity and resulted in revert in scientific research in this field for a period of more than twenty years (1980-2000) (Al-Jboory, 2007). Greiner (1998) defined the constraints to date palm production in Iraq as drought, high salinity, aged trees, diseases, and genetic erosion. Despite the damage suffered to date palm plantations during the wars, dates continue to be the most important agricultural product. Recently, the Iraqi government has established the General Authority for Horticulture and Forestry. The mission of this authority is to develop and extend the planting of date palms into the various regions of the country using modern techniques, as well as to improve existing orchards. Fortunately many of the Iraqi date gardens remain and can be rehabilitated by a series of interventions that will provide appropriate farming, post-harvest and processing, and marketing technology, facilities, and skills to the industry (Walsborn, 2008). Marshlands Restoration Program led by the Iraqi Ministry of Water Resources in cooperation with United States Agency for International Development (USAID) and other donors launched in 2004 and aims to improve the ecosystem of marchland in the southern part of the country. This will assist restoring the largest date palm orchard in the

world. Development of a date palm cultivation programme was another project funded by (FAO) and United Nations Industrial Development Organization (UNIDO) for rehabilitation of the date palm sector in Iraq started 2007. Recently, the Iraqi government has established the General Authority for Horticulture and Forestry. The mission of this authority is to develop and extend the planting of date palms into the various regions of the country using modern techniques, as well as to improve existing orchards. It is also working towards the development of harvesting methods and the identification of local and international markets for the yield.

Saudi Arabia:

The date palm is one of the most important cash crops in Saudi Arabia. After the modern Kingdom of Saudi Arabia was founded in 1932, the date palm was incorporated in its national emblem, as representative of "vitality and growth". Saudi's groves feature more than 20 million trees and more than 320 varieties of the fruit (Yang 2009).

The date palm plantations occupying 150,744 ha where 23 million trees produce 970,488 tones of dates annually (Alhudaib *et al.*, 2007). Earlier, Al Abdulhadi *et al.* (2004) reported that the estimated number of date palm trees in the Kingdom is 18 million and its annual production of dates estimated at 700,000 tons. In 2006, the Kingdom became the world's second largest producer of dates, supplying 17.6% of the world market. Production increased from 712,000 MT in 1999 to 870,000 MT in 2003 to 977,000 MT in 2006 (AOAD, 2008). FAOSTAT (2009) estimated the production of 2008 as 982546 tones representing 13.94% of the total World date production. The production of dates exceeds local consumption requirements. The rate of date consumption inside the country has decreased due to the existence of other fresh fruits and sweets in addition to changes in family size and food traditions. The country also donates a large amount of dates to hunger-stricken countries through the United Nation's World Food Program (World Food Programme, 2009).

The main problems of date production in Saudi Arabia are pests, diseases and a lack of marketing studies to identify promising markets. Saudi dates are facing competition in the international markets, in particular from Tunisia and Iran. Furthermore, insufficient efforts are being undertaken to adopt new technologies and modern machines to enhance the productivity of the date industry for exporting purposes. Scarcity of water contributes vigorously to reducing date palm productivity and even to the death of the trees. Date palms are accused of consuming a lot of water. In 2004, a Saudi hydrological expert claimed that date palm is water consuming and suggested to stop planting it and consequently stop monetary aid for date farmers. He advised them to plant other crops such as citrus (Al-Habib, 2004). However, researchers at the Department of Water Guidance of the Irrigation and Drainage Authority in Al-Ahsaa Governorate carried out a study for three years and found that the amount of water given to date palms in Saudi Arabia surpasses the actual requirements of the tree at a rate of 100%. This study showed that the appropriate amount of water to be given to the date palm is 63 cubic meters per year at a rate of 150 and 200 liters per day in winter and summer, respectively. It also showed that using drip irrigation is better than irrigation with bubblers, as the former increases the efficiency of water use with minimal losses (Saudi Press Agency, 2009).

Although the cultivation of date palms has developed considerably and great attention has been given to date production in Saudi Arabia, nonetheless, the level of date productivity is considered low compared with other date producing countries (Al-Obaid, 1996). The main causes for this decrease in date productivity are the increase in the number of the overage trees, the existence of many low quality and undesirable varieties of dates, lack of sufficient offshoots to establish new orchards or even renew the old ones, and the increase in price of new offshoots of good quality varieties (Al-Ma'ary, 1995; Bashah, 1999; Al-Sakran and Muneer, 2006).

The most important pests and diseases that infest date palm in Saudi Arabia are mainly red palm weevil (RPW) and Al Wijam disease. Phytoplasma pathogen was suspected to cause Al-Wijam; its main symptoms are leaf stunting, yellow streaking and a marked reduction in fruit and stalk size, which leads to failure in fruit production at harvest (Alhudaib *et al.*, 2007). Lack of efficient integrated pest management (IPM) has resulted in the spread of pests and diseases in different regions of the country.

United Arab Emirates:

The United Arab Emirates (UAE) has the largest number of date palms for any single country in the world. It was reported to have 40 million date palm trees and a minimum of 200 cultivars, 68 of which are the most important commercially (Jaradat and Zaid, 2004). Abboudi (2000) reported that the UAE has become 100% self-sufficient in its date consumption. In 2006, the UAE had 16,342,190 productive date palms producing 757,600 tones of dates (AOAD, 2008). Recently, The UAE has been officially recognized as the world's leading cultivator of date palms with 42 million trees, as was announced on 15 March 2009.

However, there are some problems facing the issue of date palms and their production in UAE. These include shortage of qualified and trained staff in various date palm activities, lack of adequate pests and disease research studies, narrow list of good quality varieties, poor harvesting, processing and packing techniques and poor water management as the overuse of the limited groundwater extensively (UNDP, 2004). As in the other neighbouring countries the Red Palm Weevil (RPW) is considered a major pest of the date palm in UAE. It has been a big menace to the date palm during the last twenty years costing a lot of money and a lot of effort to control. It was discovered in UAE in 1985 and its importance lies in being a fast killer to the palm (Gassouma, 2004). During a period of 5 years, the RPW infected trees in the UAE jumped from 1,3000 in 1990 to 44,000 date palms in 1995.

Egypt:

Cultivation of date palms in Egypt goes back to thousands of years. In Egypt, agricultural operations on date palm, like pollination, are known at least since 2500 BC proved by ancient texts. In Egypt, date palm is cultivated and grown everywhere (Taeckholm, 1974). Nowadays date palm plantations are spread out all over Egypt, wherever water is available (Riad, 1996) and date industry supports over one million people (Bazza, 2008). Before more than a century, Egypt was exporting date palms where potted offshoots from Egypt reached California in 1890 and 'Hayany'—the cultivar most extensively planted in Egypt introduced into California in 1901 (Morton 1987). Egypt has been the world's largest producer of dates since 1974 (FAOSTAT, 2009) and reports very high average yield compared to other countries. This is said to be due to good access to water by palms growing along the Nile valley (Bazza, 2008). Cultivation of new date palms is continuous, in particular in the new reclaimed land in the desert and in saline-affected areas. In 2006, productive date palms were estimated at 11,888,020 million trees and produced 1,328,720 tones of dates (AOAD, 2008). Date palms, however, are facing a devastating threat in the form of the Red Palm Weevil.

This pest was first discovered in Egypt at the end of November 1992 in El-Hussinia region in Al-Sharquiya, northeastern governorate (Cox, 1993). In Egypt itself, the introduction of the red palm weevil was caused by an importation of offshoots from the United Arab Emirates (Ferry, 2002). In 2005, 70,000 of Egypt's 13 million palms are infected by weevils. In the two provinces where the pest was first recorded, the insects continue to infect and kill new date palms year after year, despite all the techniques developed to combat it (Roic, 2005).

The fact is this problem still persists 16 years later, with no method of complete eradication. Research on ways to control the weevil is being carried out, but, because the fruit from date palms is harvested for human consumption, options for this species are limited. So far, no country has been able to eliminate the weevils completely. Unfortunately, the use of insecticides has led to the development of strains that are resistant to some of the chemicals used (Williams, 2008).

The date palm sector in Egypt does not have a national marketing authority to be in charge of designing a clear strategic policy for exporting dates, in addition to the lack of care in categorizing dates for export or grading them in terms of quality and pricing. Furthermore, FAO (2004) reported that the Egyptian dates face a strong competition in the markets from those of Saudi Arabia, Iran, Tunisia and United Arab Emirates. Also, Egypt has insufficient capacity in its factories to process and cure large numbers of dates (Riad, 1996).

Tunisia:

In Tunisia, date palms occur in the southern part of the country (North latitude 34°25'), where the conditions are most favorable for the production and ripening of such valuable "dessert date" varieties as Deglet Nour. This variety accounts for 60% of the total production (Triki *et al.*, 2003). Tunisia is the world-leading producer of Deglet Nour (FAO, 2003).

Although Tunisia represents only about 2% of the world's production, it is the leader in terms of value of exports with 30% of the world's export total and it provides Europe with more than half of its Deglet Nour dates. Tunisian date palm plantations are characterized by the prevalence of this variety in spite of their large genetic diversity. It occupies approximately 60% of the Tunisian palm plantations and continues to be multiplied (Bouguedoura *et al.*, 2008). In 2006, Tunisia's fruiting date palms were estimated at 3,335,800 and produced 125,000 tones of dates (AOAD, 2008(AOAD, 2008)). The date palm sector in Tunisia comes in third place at its domestic farm product exports, after olive oil and seafood products. Tunisian dates are placed third in the world's ranking in terms of quantities exported for 2007 after Iran and Pakistan (FAOSTAT, 2009). The date producers aim mainly to improve the quality and marketing methods to face the competition of other countries, like Algeria and Morocco.

In Tunisia, Bayoud disease has not been reported. However, some other diseases are found, as those associated with the presence of some fungi, insects and nematode species (Hammadi *et al.*, 2009). Old age of the palm groves is a considerable constraint as a proportion of 45% of the palm trees in Tunisia has more than 50 years (Baaziz *et al.*, 2000).

Algeria:

Date palm culture remains the pivot of the desert ecosystem which occupies almost 80% of the whole surface of Algeria (Touzi, 2007). Algeria ranks fifth in the list of producer countries with 0.52 M tons in 2005 from some 10.4 million trees (Bachir *et al.*, 2008). The Algerian palm groves currently have 45% of the cultivar Deglet Nour (Bouguedoura *et al.*, 2008) and it is the world second largest producer of this variety (1 million trees) (FAO, 2003). Tunisia and Algeria have focused on the high value confectionary market in Europe (Bachir *et al.*, 2008). In 2006, Algeria had 10,475,150 date palms producing 492,190 tones of dates (AOAD, 2008). In 2008, Algeria produced 500,000 tones of date palm represented 7.09% of the total World date production (FAOSTAT, 2009).

Date palm sector in Algeria has suffering problems such as potentialities, technical and environmental constraints and socio-economic preoccupations. Many palm groves were hence fully destroyed, ever buried under sand dunes, or under the influence of drought, and seriously damaged by Bayoud disease (Touzi, 2007). Bayoud destroyed the half of date palms in Western Algeria oases (Bouguedoura *et al.*, 2008). Poor marketing on a national and international scale is also a problem because of a lack of adequate organizations. Like in Tunisia, old age palm trees in Algeria that the exceeded the production age account 30% of the total country date trees (Baaziz *et al.*, 2000). Moreover, the absence of rapid means for transporting dates from farms to markets contributes to deterioration of the dates. This problem seems to be either solved or reduced as the Algerian government has set up a "green corridor" for exporting dates in September 2006 through arrangements will ensure maximum flow for export operations, allowing the rapid transport of dates to ports of entry.

Morocco:

Date palm is grown mainly in eleven provinces in Morocco, situated in the southern and northeastern parts of the country (Larbi, 1989). Its cultivation constitutes the basis of oasis agriculture in these regions. Baaziz *et al.* (2000) mentioned that in Morocco there are 4.8 million trees but only 2.1 million are considered to be productive. However, good quality dates represent only around 25% of total production. This situation contrasts strongly with that prior to the 20th century when Morocco was renowned for dates of superior quality and production levels were much higher (Greiner, 1995). The date palm in Morocco is in clear decline and suffers from a lack of maintenance and interest (de Haas and El Ghanjou, 2000) as a result of emigration of skilled labour to work in the cities, in addition to the decrease in water resources. The status of date production continues to worsen as a result of a combination of factors including prolonged drought, disease and infestation, and sanding up (Greiner, 1995). While date palm is affected by many diseases, Bayoud remains the most serious one.

In 2006, Morocco had 3,880,700 productive trees producing 45,500 tones of dates. It was the least figure reported comparing with 120,000 tones in 1990; the greatest one. FAOSTAT (2009) reported that date production of Morocco in 2008 was 72,700 tones, represented only 1.03% of the World date production. Date production in Morocco varies greatly due to variation in rainfall (Baaziz *et al.*, 2000).

Degradation of Date Palm Trees in the Arab Countries: Indicators and Causes:

Like many other plants, some palms are in danger of dying out because of human activity. Although date palm cultivation in the date growing regions of the world has a long history, yet the efforts expended for the development of this important crop, although significant, yet still insufficient and fall below expectations. In general, the product quality is still low, the field and post-harvest losses are quite high and the date products and byproducts can no doubt be improved and the product mix more diversified (Sawaya, 2000).

Date palm production is facing serious problems, such as low yields due to the lack of research, the spread of pests, as well as marketing constraints. Over the last decade, productivity has declined in the traditional growing areas. Pests and diseases have caused significant effects upon date production in the Arab countries. *Rhynchophorus ferrugineus* Olivier known as Red Palm Weevil is the most important pest of the date palm in the world. It is native and has been detected in many countries of southern Asia. Since the 1980s it has rapidly expanded its geographical range westwards and reached many countries in the Middle East and Europe. It is present in Egypt, Jordan, Iraq, Palestinian Authority Territories, Kuwait, Bahrain, Oman, Qatar, Saudi Arabia, United Arab Emirates, Spain France, Italy, Greece and Turkey (Malumphy and Moran, 2009).

Bayoud disease which is caused by fungus threatens the date palms in North Africa except Tunisia. It has affected nearly all Moroccan palm groves as well as those of western and central Algerian Sahara; it has killed more than 12 million in Morocco and 3 million in Algeria and has accelerated desertification (Djerbi, 1998). Unfortunately, pests and diseases spread increasingly with the expansion of trade and travel in the globalizing world system (UN Press Release, 2004). In North Africa, date palm cultivation and production are suffering from different problems but, the main problem is Bayoud disease (*Fusarium oxysporum* f.sp. *albedinis*), which killed in less than a century more than 13 million trees in Morocco and Algeria. In addition, abiotic stresses, such as drought and salt and traditional cultural techniques are common problems to the regions (Oihabi, 2001). Tafilalet Oases, which includes one of the largest palm groves in Morocco, is one of the regions where the water problem has arisen with the greatest magnitude. This resulted from the development of irrigated acreage in the entire zone that sharply increased water withdrawals and affected the quantity and quality of groundwater and surface water, added to the phenomena of drought. Consequently, the number of date palms has decreased (Babakhouya and Abaouz, 2005).

Unfortunately, the cultivation of date palms, which was considered the main agricultural activity in Kateef Oasis in Saudi Arabia (as an example), had lost this status at present. This is because of the shortage of labour; since many of the locals have moved from the area to work in companies and engage in other commercial activities that pay better salaries (Al-Nimer 2004). Consequently, the costs of date production have surpassed revenues. At the same time, the export of dates has declined to a minimum. Decrease in the productive capacity of date palms and the degradation of the quality of production itself are the main indicators of degradation. Similarly, the possibility to earn an income outside the oasis, have provoked mass migration to the urban centers of northern Morocco and to Europe. As the majority of these temporary migrants are young men between the age of 20 and 40, necessary agricultural activities such as soil preparation, selection and planting out of palm offshoots are hardly executed by many households. The maintenance of date palms is generally minimized. The result of this neglect is the running wild of the palm-groves, densely grown with date palms, reducing harvests and, consequently (de Haas, 1998).

In spite of the importance and broad culture areas of conventional date palm cultivation, field and post-harvest losses are high, and methods for measuring product quality and the use of date products and byproducts need improvement (Mahmoudi *et al.*, 2008). The export of dates from Algeria is subjected to problems such as disorganization of the export trade and lack of speed in transferring the dates which is considered a rapid damage commodity. Therefore, Algeria exports more natural dates than processed dates, as there is a lack of processing capacity (FAO, 2003).

During the last 50 years, date palm groves have been subjected to degradation due to extensive exploitation resulting from the increase in both the human population and the number of domestic animals. In addition, the increased ability of the majority of the population to benefit from opportunities presented by modern technology has led them to abandon their date palms. Natural factors have also contributed to the degradation of date palms, such as drought, soil salinity, pests, environmental change, and a decline in the quality of ground water. In specific cases, wars have brought about tremendous degradation in date palm orchards. For instance, Iraq used to be a major producer of dates, but in recent years production and exports have been curtailed.

The main common causes of date palm degradation in the Arab countries are losses of vegetation cover in some areas due to overgrazing and over-harvesting of wood for fuel, resulting in soil erosion, increased wind velocity and storm frequency resulting in an increase in the levels of suspended dust in the air, decreased infiltration of water into soil due to the increase in runoff and floods and decreased water table levels in some areas, in addition to decline of the quality of ground water resulting in increased soil salinity and loss of fertility. Increased sand drift and the development of new dune fields in some areas also is a considerable cause of date palm degradation. Acute shortage of skilled labour with increased wage demands, resulting in the neglect of many agricultural processes required for proper production. There is a noticeable weakness of government services for the extension and protection of agricultural activity. Increased infestation of pests and diseases resulting in a significant decline in the productivity of trees and have contributed significantly in degradation of date palm in the Arab countries.

The improvement of the current status of date palm cultivation in the date producing countries of the region and the enhancement of the quality of date products have become critical need that can't be overemphasized (Sawaya, 2000).

Although each of the date palm growing country has its list of pests and diseases, however, many of those are common to all countries. Some of the main insects and fungal diseases which attack date palms and dates are presented in Table 2 and Table 3.

Rehabilitation needed:

Having discussed the degradation of date palm in the aforementioned sections, suggesting rehabilitation of this sector has to be addressed as the following: solve the salinity of water and soil using right management, establish gene banks for date palm trees, mechanize the cultivation processes, organize training programmes and workshops for the workers and farmers in all cultivation processes of date palm trees, establish exemplary date palm orchards, establish databases for date cultivation, marketing and manufacturing, replace overage trees with new good quality ones and increase the distance between trees.

Table 2: Some of the main insects recorded on date palm in different Arab countries

Common name	Casual insect	Country
White scale	<i>Parlatoria blanchardi</i> Targ.	Mauritania, Morocco, Algeria, Tunisia, Libya, Egypt, Sudan Kuwait, Iraq, Oman, Saudi Arabia
Red scale	<i>Phoenicococcus marlatti</i> Cockerell	Morocco, Algeria, Tunisia, Egypt, Palestine Territories, Jordan, GCC countries
Boufaroua	<i>Oligonychus afrasiaticus</i> McGregor, <i>O. pratensis</i> Banks.	Tunisia, Algeria, Morocco, Egypt, GCC countries
Carob moth	<i>Ectomyelois ceratoniae</i> Zeller	Morocco, Algeria, Tunisia, Libya, Egypt, Iraq, Saudi Arabia
Rhinoceros beetle	<i>Oryctes rhinoceros</i> L.	Tunisia, Egypt, Yemen, Iraq, Qatar, Oman, Bahrain, UAE
Red palm weevil	<i>Rhynchophorus ferrugineus</i> Olivier	Egypt, GCC countries, Iraq, Syria
Dubas bug	<i>Ommatissus lybicus</i> Bergevin	Morocco, Algeria, Tunisia, Libya, Egypt, Sudan, Iraq, Saudi Arabia
Lesser date moth	<i>Batrachedra amydraula</i> Meyrick	Libya, Egypt, Palestine Territories, Kuwait, Iraq, UAE, Bahrain, Saudi Arabia

Table 3: Some of the main fungal diseases recorded on date palm in different Arab countries

Common name	Casual fungi	Country
Bayoud	<i>Fusarium oxysporum</i> f. sp. <i>albedinis</i> , (FOA)	Mauritania, Morocco, Algeria
Black scorch	<i>Ceratocystis paradoxa</i> (Dade) C. Moreau, <i>Thielaviopsis paradoxa</i> (De Seynes) Höhn	Mauritania, Algeria, Tunisia, Egypt, Saudi Arabia, Iraq
Brown leaf spot	<i>Mycosphaerella tassiana</i> (de Not.) Johanson	Morocco, Algeria, Tunisia, Egypt, UAE, Oman, Iraq
Diplodia	<i>Diplodia phoenicum</i> (Sacc) Fawc. & Klotz	Morocco, Tunisia, Egypt, Libya, Sudan, Yemen, Iraq, UAE, Oman, Kuwait, Saudi Arabia
Graphiola leaf spot	<i>Graphiola phoenicis</i> (Moug.) Poit.	Mauritania, Morocco, Tunisia, Libya, Egypt, Yemen, Sudan, Iraq, Oman, Kuwait, Saudi Arabia,
Khamedj or Inflorescence rot	<i>Mauginiella scattae</i> Cav.	Mauritania, Morocco, Algeria, Tunisia, Libya, Egypt, Iraq, Bahrain, Kuwait, Saudi Arabia
Omphalia root rot	<i>Omphalia tralucida</i> . Bliss, <i>O. pigmentata</i> Bliss	Mauritania
Belâat	<i>Phytophthora</i> sp. similar to <i>P. palmivora</i>	Morocco, Algeria, Tunisia, Iraq, UAE
Fruit rot	<i>Aspergillus niger</i> , <i>Pencellium</i> sp., <i>Alternaria</i> sp., <i>Fusarium</i> sp.	Algeria, Philistine Territories, UAE,

Constraints to rehabilitation:

As the date sectors of all date-producing Arab countries face similar problems, so that constraints to the rehabilitation of these sectors must also be similar (Ibrahim, 2004) and can be summarized as follows: (1) High cost of production due to employing manual labour, (2) Insufficient replacement of low-quality varieties with those of good quality, (3) Weakness of marketing services, (4) Neglect of farmers from achieving post-harvest processes, (5) Lack of cold stores, (6) An increase in the number of the low quality date varieties, (7) Decrease in the export volume of dates, (8) Neglect of benefit from accumulative local practical experience in the date sector, (9) Lack of interest in applied research related to manufacturing dates and their products, (10) An increase in the costs of storing dates in general and fresh dates in particular due to their need for low temperature transport means and specialized handling appliances, (11) Reliance of local date manufactures on governmental authorities for research and development efforts in the manufacturing sector, (12) Increased supply of dates due to expansion in the cultivation of date palms without any concomitant increase in demand for the production, (13) Increased losses in dates due to increased infestation of pests and diseases, improper transporting, handling, and storage that result in increase costs and (14) Neglect of most date producers and marketers of the marketing opportunities provided by international exhibitions due to the high costs of such events.

Recommendations:

The following points are suggestions and can be considered as a guideline to work towards strengthening the date palm industry in the Arab countries and to stop the degradation in their productivity sooner not later. There is a necessity to establish a database for the cultivation, marketing and manufacture of dates and date products. Improve the main processes to date cultivation such as propagation, planting of offshoots, irrigation, fertilization, integrated pest control, pruning, pollination, fruit thinning and harvesting techniques. These required, in addition to other requirements, enhancing the technical capacity of date palm workers and increase the research capacity in the field of date palm cultivation.

Regarding the date quality, subsidies should be paid only for good quality varieties of dates, applying comprehensive quality programmes and establish standard specifications for dates in both local and international markets in order to improve the economic revenue from production and its quality. There is a need to support date manufacturing and marketing through establish new date factories and develop existing ones, open new marketing channels for dates and use the low quality dates in conversion industries. Handling, storage, packing, transport of dates should be crucially improved. Establishment of cooperative societies for meeting the demands of post-harvest, preparation, processing and marketing is of a great importance to date palm sector. Finally, it is necessary to adopt advertising campaigns to promote dates, date products, and their benefits through different media, including the internet, schools, commercial centers, etc.

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