

Received on (06-12-2017) Accepted on (06-05-2018)

## The State of the Date Palm (*Phoenix dactylifera*) in the Gaza Strip, Palestine: A Questionnaire-based Study

Abdel Fattah N. Abd Rabou <sup>1,\*</sup>

Eqbal S. Radwan <sup>1</sup>

<sup>1</sup> Department of Biology, Faculty of Science, Islamic University of Gaza, Gaza Strip, Palestine

Corresponding author:

e-mail address: [arabou@iugaza.edu.ps](mailto:arabou@iugaza.edu.ps)

### Abstract

The Mediterranean climate provides optimal conditions for growth and development of many cultivars of Date Palms (*Phoenix dactylifera*). Numerous uses have been associated with this holy tree in the Middle East countries including Palestine. The current study aims at documenting different aspects related to the state of the Date Palm sector in Deir El-Balah region in the middle of the Gaza Strip, Palestine. One hundred and fifty respondents (N=150) were selected randomly to fill a questionnaire especially designed for this purpose. The results pointed out that 71.4% of the respondents had 3 dunum or less cultivated with Date Palm. The groundwater was the main irrigation source of Date Palm as claimed by 61.3% of the respondents; the rest depends on either rain water or partially treated wastewater. The Hayani cultivar is the main cultivar grown by all respondents. The average production per Date Palm tree was stated by 62.0% of respondents to be from 70 to 200 kg per year. All respondents were aware of the popular uses and industries associated with Date Palm trees; 70.0% of them produced various household products. The Israeli military operations and the outbreak of the Red Palm Weevil – RPW (*Rhynchophorus ferrugineus*), along with many others, are crucial threats facing the Date Palm sector in the Gaza Strip. Moreover, 84.0% believed on advantages drawn by the Date Palm cultivation projects in the Gaza Strip. Finally, the study recommends the improvement of the processes of Date Palm cultivation, production and marketing to ensure a sustainable development of the Date Palm sector in the Gaza Strip.

### Keywords:

*Date Palm, cultivars, public uses, threats, Deir El-Balah, Gaza Strip.*

### 1. Introduction:

Date Palm (*Phoenix dactylifera* L.) is a diploid ( $2n = 2x = 36$ ), perennial, and monocotyledonous plant belonging to Palmaceae (Barrow, 1998). It is one of the oldest fruit crops grown in the arid regions of the Arabian Peninsula, North Africa, and the Middle East. The average economic life of a Date Palm tree is 40 to 50 years, but some are still productive up to 150 years or more (Chao and Krueger, 2007). It is a main income source and staple food for local populations in many countries in which they are cultivated. It has been cultivated since ancient times because of its environmental, socioeconomic and ornamental values (Chao and Krueger, 2007; Saafi et

al., 2008; El-Juhany, 2010). Today, the Date Palm prevails in both the old and the new worlds where dates are grown commercially in large quantities (Zabar and Borowy, 2012). From an environmental point of view, the Date Palm tree has a minimum water demand in addition to its tolerance to harsh weather and higher salinities. In fact, the plant is more salt tolerant than any other fruit crops (FAO, 1982; Alhammedi and Kurup, 2012). Many diseases and pests afflict Date Palms, with the Red Palm Weevil – RPW (*Rhynchophorus ferrugineus*), has recently become one of the major Date Palm pests

and causes severe losses to farmers (Vidyasagar and Aldosari, 2011).

Cultivated Date Palms have existed in Palestine for 5,000 years. The Mediterranean climate conditions provide optimal conditions for growth and development of many cultivars of Date Palms (Abu-Qaoud, 2015; Radwan, 2017). Locally, different uses have been attributed to Date Palm trees (Abd Rabou, 2005 and 2011; Abd Rabou et al., 2008; Abu-Qaoud, 2015; Radwan, 2017 and Abd Rabou and Radwan, 2017a). The plant has an ornamental value as it prevails in most gardens, parks and streets (Abbas, 2016). The problems facing the Date Palm cultivation and development in the Palestinian Territories include water shortage, Israeli incursions and dredging, high production costs, weak marketing facilities and limited support policies for Date Palm cultivation (Wafa, 2014), in addition to the infestation of the Date Palm with many pests; including the most destructive RPW (Radwan, 2017 and Abd Rabou and Radwan, 2017a and b).

Date Palm cultivation is mainly concentrated in the Middle and southern Governorates of the Gaza Strip (Figure 1). Deir El-Balah, which is a city lying in the Middle Governorate of the Gaza Strip, is well known for growing Date Palms as its name dictates (Figure 2). However, thousands of Date Palm trees have been uprooted or bulldozed by the Israeli Army during the last 20 – 30 years for claimed security reasons. In addition to being a local delicacy, date cultivation; particularly the "Hayani" cultivar, constitutes one of the principal sources of income for many of Deir El-Balah's residents (El Kichaoui et al., 2013; Abd Rabou and Radwan, 2017a). Other leading agricultural crops cultivated in Deir El-Balah include citrus, almonds and grapes. In spite of the great importance of the Date Palm sector to the Palestinians, a few studies have been carried out to investigate the status of the Date Palm in the Gaza Strip including its uses, threats and conservation. Hence, the current study aims at documenting the Gazans' awareness towards the state of the Date Palm sector and its uses in Deir El-Balah region in the middle of the Gaza Strip, Palestine.

about 365 km<sup>2</sup>. It constitutes 1.35% of the total area of Palestine (27,009 km<sup>2</sup>). The territory is 41 km long, and from 6 to 12 km wide (PCBS, 2016). The study area has a typical semi-arid Mediterranean climate; hot in summer and cold in winter. The average daily mean temperature ranges from 25°C in summer to 13°C in winter, with the average daily maximum temperature range from 29°C to 17°C and the minimum temperature range from 21°C to 9°C, in summer and winter respectively. The daily relative humidity fluctuates between 65% in daytime and 85% at night in summer and between 60% and 80% respectively in winter (UNEP, 2003).



Figure 1 The geographic location of the Gaza Strip

## 1. Methodology

### 2.1. Study Area

The Gaza Strip (Figure 1) is a very populated and overcrowded (about 2.0 million) with an area of



**Figure 2** Date Palm cultivation in the Middle Governorate of the Gaza Strip

## 2.2. The study design

A questionnaire was designed and applied in June and July 2016 in the Deir El-Balah region, which lies in the Middle Governorate of the Gaza Strip (Figure 1). The target group included agricultural farmers, workers and owners of Date Palm orchards. One hundred and fifty respondents (N=150) were selected randomly to fill a questionnaire especially designed to conduct the current study. The draft questionnaire was validated by experts in the fields of agricultural, plant and environmental sciences. The questionnaire was piloted and modified as necessary to capture the concerns raised by the respondents during the pre-test survey. All interviews were conducted face to face. During the survey, the interviewers explained to the respondents any questions that were not clear to them. The questionnaire included relevant information on personal profile of respondents, education, household and farmland size, production of Date Palm in addition to its general uses and industries, pests facing the trees and finally, development and management aspects related to the Date Palm in the Gaza Strip. Mix of yes/no; multiple choice and open-ended questions were included in the questionnaire. Field observations and discussions with stakeholders were carried out as well. This method permitted the surveyors to obtain endless information that enrich the study. It is worth mentioning that the respondents were cooperative during the succeeding stages of this study.

## 2.3. Photography and Data Analysis

Many photos concerning Date Palm orchards and cultivars were taken in the field for confirmatory purposes. The data collected throughout the course of the current study were computer analyzed by descriptive statistical methods using SPSS/PS (Statistical Package for the Social Sciences Inc, Chicago, Illinois) program version 22.

## 3. Results

### 3.1. Personal Profile of the Research Sample in Deir El-Balah Region

Table 1 illustrates the personal profile of the research sample or respondents (N=150) in the Deir El-Balah region. The sex showed that 95.33% of the respondents were males and 4.7% were females. The age frequency showed that 72.0% of the respondents were from 21 to 50 years, 26.0% were more than 50 years, and 2.0% were less than 20 years. For marital status, the majority of the respondents (84.0%) were married, while 13.3% were single and the rest 2.7% were widowed. In general, 82.0% of the interviewed people have children. The analysis of the educational level showed that 54.7% of the respondents had diploma, university or master degrees, 28.0% had finished secondary school and 17.3% had finished preparatory or primary school. With regard to the profession, 46.7% were employees, 25.3% were unemployed. The rest were workers.

**Table 1** The personal profile of the respondents (N=150)

Variable	Frequency	Percentage (%)
<b>1. Sex</b>		
Male	143	95.3%
Female	7	4.7%
<b>2. Age</b>		
Less than or equal 20 years	3	2.0%
From 21 to 30 years	35	23.3%
From 31 to 40 years	36	24.0%
From 41 to 50 years	37	24.7%
51 years and more	39	26.0%
<b>3. Educational level</b>		
preparatory and less	26	17.3%
Secondary	42	28.0%
Bachelor or diploma	79	52.7%
Master	3	2.0%

Variable	Frequency	Percentage (%)
<b>4. Profession</b>		
Employee	70	46.7%
Unemployed	38	25.3%
Worker	42	28.0%
<b>5. Marital status</b>		
Single	20	13.3%
Married	126	84.0%
Widowed	4	2.7%
<b>6. Number of children</b>		
From 1 to 5 children	63	42.0%
6 children and more	60	40.0%
Have no children	27	18.0%

### 3.2. Date Palm Orchards in Deir El-Balah Region

Table 2 showed that 71.4% of the respondents had 3 dunum or less, 11.3% had from 4 to 6 dunum, and 17.3% had more than 6 dunum. As far as the age of Date Palm trees is concerned, 46.0% of the respondents had Date Palm trees of ages from 11 to 30 years, 41.3% of less than or equal 10 years, and 12.7% of more than 30. The source of irrigation is groundwater as claimed by 61.3% of the respondents, 28.7% depends on rain water while the rest (8.0%) use reclaimed wastewater.

With regards to the number of Date Palm cultivars grown by the participants, 41.3% of the respondents reported that they had only one cultivar (especially the Hayani cultivar) (Figure 3), 26.7% had two cultivars, and 32% had three cultivars or more. The respondents stated that the diversity of Date Palm cultivars in farms serves as sites for conserving genetic resources along with fulfilling the primary aim of food production. It maximizes yield, revenue and income and finally it can help lower the risk of pest infestation. In addition, the results showed that 36.6% of the respondents sell their products (balah) directly to the markets or factories, 34.0% convert it to Ajwa or rutab, 18.7% sell balah in the field, and 10.7% keep it for home consumption or present it as a gift to relatives.

**Table 2** Date Palm orchards in the Deir El-Balah region (N=150)

Variable	Frequency	Percentage (%)
<b>1. Area of the Date Palm orchards</b>		
3 dunum or less	107	71.4%
From 4 to 6 dunum	17	11.3%
More than 6 dunum	26	17.3%

Variable	Frequency	Percentage (%)
<b>2. Age of Date Palm trees</b>		
Less than 10 years	62	41.3%
From 11 to 30 years	69	46.0%
From 31 to 60 years	12	8.0%
61 years and more	7	4.7%
<b>3. Source of irrigation water</b>		
Groundwater	95	63.3%
Rain water	43	28.7%
Reclaimed waste water	12	8.0%
<b>4. Number of Date Palm cultivars grown</b>		
One cultivar	62	41.3%
Two cultivars	40	26.7%
Three cultivars or more	22	32.0%
<b>5. Methods of selling the product</b>		
Directly to the markets or factories	55	36.6%
In the field	28	18.7%
Convert the product into rutab or Ajwa	51	34.0%
Others	16	10.7%



**Figure 3** The "Hayani" is the most common Date Palm cultivar in the Gaza Strip

### 3.3. Production of Date Palm in Deir El-Balah Region

In spite of the fact that the average production of the Date Palm tree equals 130kg per annum as acknowledged by most Gazans, table 3 showed that 62.0% of the respondents confirmed that the average production per tree was from 70 to 200kg per annum, 26.0% stated that it was less than 70kg, while 12.0% pointed out that it exceeded 200kg. With regard to the productivity of Date Palm trees,

table 3 also showed that the majority of the respondents (85.3%) believed that the production of Date Palm was good; few believed that the production was either excellent or poor. In the same context, two-thirds of the respondents (66.0%) believed that there is a reduction in the production of Date Palm in the Gaza Strip, while 34.0% did not believe.

**Table 3** Production of Date Palm trees in the Deir El-Balah region (N=150)

Variable	Frequency	Percentage (%)
<b>1. The average production of Date Palm per annum</b>		
Less than 70kg	39	26.0%
70-100kg	49	32.7%
101-200kg	44	29.3%
More than 200kg	18	12.0%
<b>2. Assessment of Date Palm production</b>		
Poor	15	10.0%
Good	128	85.3%
Excellent	7	4.7%
<b>3. Knowledge on the reduction in Date Palm production</b>		
Yes	99	66.0%
No	51	34.0%

### 3.4. Public Uses and Industries Relied on Date Palm

All respondents confirmed such popular and public uses of the Date Palm trees in the Gaza Strip. Table 4 illustrated that 70.7% of the respondents used to produce household products, such as picture frames, vases, chandelier, bibelots, mats, baskets, ropes, strings bowls, salvers, cans, bags, hats, pillow, tissues cans, broom, bird and fruit cages, pergola and ceilings. Many food industries have been stated by respondents to depend on Date Palm trees such the production of Balah jam, Ajwa, biscuits, pies, date cake, qatayif, pastries, and coffee from date seeds. A few stated that organic fertilizer and animal fodder are commonly produced from Date Palm residues such as fibers, seeds, fronds, etc.

However, the majority of the respondents (84.7%) confirmed that their products did not receive any encouragement or support from the local responsible authorities and agencies. The rest received some sort of encouragement and support from responsible authorities and associations such as the Ministry of Agriculture (MOA), Al-Ahlyah

Association for the Development of Date Palm (ASDPD) and the Palestinian Al-Nakheel Association for Progress and Development (PNAPD). Such an encouragement may include marketing of products, implementation of advertising campaign and promotion of consumers to purchase Date Palm products.

**Table 4** Household products based on the Date Palms (N=150)

Variable	Frequency	Percentage (%)
<b>1. Production of household products from Date Palm trees</b>		
Yes	106	70.7%
No	44	29.3%
<b>2. Encouragement and support of household products by local agencies</b>		
Yes	23	15.3%
No	127	84.7%

### 3.5. Threats Facing Date Palm Sector in the Gaza Strip

Table 5 shows that 90.0% of the respondents believed on the threats that face the cultivation of Date Palms in the Gaza Strip, 76.0% confirmed the infection of their Palms by several pests that caused considerable losses. The main pests mentioned included the RPW, fruit stalk borer and termites. The other threats included water shortage, electricity interruptions, fuel deficiency; high production costs, encroachment and building activities. Finally, 68.7% confirmed the capital role of the Israeli occupation and its military procedures in the deterioration of the Date Palm sector in the Gaza Strip. The procedures stated by both respondents and media included incursions, bombardments shoveling and bulldozing agricultural land in the Gaza Strip. Thousands of Date Palm trees were uprooted during the last era by the Israeli army. Moreover, the export of dates and import of chemicals, pesticides, and vaccines have declined to a minimum due to closure of the borders and blockades imposed on the Gaza Strip since 2007.

**Table 5** Threats facing Date Palm cultivation in the Gaza Strip (N=150)

Variable	Frequency	Percentage (%)
<b>1. Knowledge on the threats facing the cultivation of Date Palm</b>		
Yes	135	90.0%
No	15	10.0%
<b>2. Knowledge on the pests infecting Date Palm trees</b>		
Yes	Yes	Yes
No	No	No
<b>3. The role of the Israeli occupation in the deterioration of Date Palm sector</b>		
Yes	Yes	Yes
No	No	No

### 3.6. Infection of Date Palm Orchards by RPW

Table 6 shows that about three-quarters (74.7%) of the respondents ensured the infection of their Date Palm orchards by RPW since 2011. However, the majority of respondents (87.3%) considered the RPW as the most threat facing the Date Palm sector in the current years of the Gaza Strip. They claimed that the pest has a rapid reproduction rate and an ease transmission of infection to intact trees. Moreover, the RPW was said to cause economic losses to fruits, which become inappropriate for marketing or consumption. With regard to the losses caused by the RPW, 60.0% of the respondents considered the losses as great or severe, 32.0% moderate and 8.0% mild. Many control methods were adopted by the respondents to combat the RPW: Chemical pesticides, aggregation pheromone traps, injection devices, fumigation tablets, burning of old fronds and infected offshoots, and finally the covering of Date Palm roots with soil to a height of 20 cm in order to prevent insect attacks.

**Table 6** The infestation of Date Palms by RPW (N=150)

Variable	Frequency	Percentage (%)
<b>1. Infestation of Date Palms by RPW</b>		
Yes	112	74.7%
No	38	25.3%
<b>2. RPW as a main threat facing Date Palm cultivation</b>		
Yes	131	87.3%

Variable	Frequency	Percentage (%)
No	19	12.7%
<b>3. Assessment of losses caused by RPW</b>		
Severe	26	17.3%
Great	64	42.7%
Moderate	48	32.0%
Mild	12	8.0%

### 3.7. Development and Management of Date Palm Sector in the Gaza Strip

Table 7 illustrates that 89.3% of the respondents confirmed that they did not attend any training courses dealing with the various issues of Date Palms in the Gaza Strip. Some of them inherited experience from their parents and grandparents. The rest attended such courses carried out by governmental and/or non-governmental agencies. The Bayroha'a El-Nakheel is a significant project established since years in Khan Younis Governorate, southern Gaza Strip for Date Palm cultivation and development. The results showed that only 19.3% of the respondents heard about this project. Many of the respondents were not optimistic concerning the project because they claimed that it was established on sandy land which needs much water in times the Gaza Strip has a water shortage crisis. Many others were optimistic because the project will increase the number of the Date Palm trees, increase productivity, create jobs and raise income of workers.

As far as the benefits provided by Date Palm projects are concerned, 84.0% of the respondents ensured the economic benefits of the projects to include self-sufficiency, employment and food security. The projects preserve the Palestinian cultural and agricultural heritages as well. Environmentally, the respondents were aware on the role of Date Palm plantation in fixing the soil and preventing soil erosion. The Palms were thought to promote the biodiversity level of the urban environment by providing food, nesting and resting sites and shelter for many insects, birds and other wildlife categories. Moreover, 71.3% of the respondents confirmed the presence of numerous challenges and constrains facing the Date Palm projects in the Gaza Strip. The challenges stated by most of the respondents included the procedures adopted by the Israeli occupation, wide spread of RPW, water shortage

crisis, limited budgets and funds allocated for such projects, and shortage of qualified researchers and training staff.

**Table 7** Development and management of Date Palms (N=150)

Variable	Frequency	Percentage (%)
<b>1. Attendance of training courses in Date Palm sector</b>		
Yes	16	10.7%
No	134	89.3%
<b>2. Knowledge on the local projects of Date Palm cultivation</b>		
Yes	29	19.3%
No	121	80.7%
<b>3. Importance of the projects of Date Palm cultivation</b>		
Yes	126	84.0%
No	24	16.0%
<b>4. Challenges facing the projects of Date Palm cultivation</b>		
Yes	107	71.3%
No	43	28.7%

Finally, the interviewed population introduced such suggestions to improve the Date Palm sector in the Gaza Strip as follows:

- Introduction of new Date Palm cultivars which can withstand the environmental conditions of the Gaza Strip.
- Provision of good marketing facilities and manufacturing techniques throughout the year.
- Implementation of new technological methods in terms of fertilization, pest control, pruning ... etc. The application of integrated pest management techniques (IPM) was respected by many educated respondents.
- Improvement of the Date Palm production throughout agricultural research, tissue culture laboratories, extension programs and financial support. The enhancement of the scientific and training capacities can improve the Date Palm sector in Palestine.

#### 4. Discussion

The current questionnaire-based study discusses the Gazans' awareness toward the state and uses of the

Date Palm sector in Deir El-Balah region in the middle of the Gaza Strip, which is characterized by its intensive cultivation of Date Palm, as its name dictates. The respondents (N=150) showed good intention to participate in the questionnaire interview. The sex of the respondents showed that 95.33% were males and 4.7% were females. Distribution of this ratio was due to random selection of samples and does not mean that women's rights are robbed or prohibited from working in the agricultural sector, but there are a good proportion of them sharing their husbands and families in agricultural works including the Date Palm cultivation and harvest.

The study showed that 72.0% of the respondents were 21-50 years old. This means that the young category is the largest group in the community. The Palestinian society is productive in the sense that marriage often occurs at early ages and the fertility rate is great among the Palestinians to the extent that the average number of children per couple is greater than 7 (Abd Rabou, 2005) and this is consistent with findings of present study where 84.0% of the interviewed population were married and 82.0% of the married population have children.

The results showed that 54.7% of the respondents had a diploma, university, or master degree. This sort of education level of respondents is generally very good in the sense that it will enhance the level of awareness toward the related issues of Date Palms in the future. Such results are normally expected in the Palestinian society as a whole, since the majority of the Palestinians in the Gaza Strip are educated due to the political, social and economic pressures prevailing during the last 5-6 decades.

In spite of the diversity of Date Palm cultivars grown in the Deir El-Balah region, the Hayani was the most common cultivar and preferred by most respondents. This can be interpreted because of the Hayani cultivar's nutritional values favored by the Palestinian community and because of its tolerance to the unique political, socioeconomic, climatic and environmental circumstances prevailing in the Gaza Strip. The choice of one cultivar cultivation in Sudan was highlighted by Ezebilo et al. (2013) who showed that the Barakawi cultivar is more tolerant to some diseases in addition to its nutritional values. The cultivation of two or more Date Palm cultivars was shown by 58.7% of the respondents. Such

cultivation can help lower the risk of pest attacks to minimum levels (Ezebilo et al., 2013 and Abd Rabou and Radwan, 2017a and b).

The average production of Date Palm trees in the Gaza Strip was stated by Radwan (2017) as 130 kg per tree per year. The low production of Date Palm orchards in the Gaza Strip was attributed by most respondents to many reasons including the Israeli incursions and destruction of agricultural lands, high costs of production, infestation of pests and diseases, and marketing difficulties and constrains. More or less analogous reasons have been stated by many authors (El-Juhany, 2010; Jain 2012; Al-Bitar, 2013; Al-Agha, 2016). El-Juhany (2010) added that the susceptibility of Date Palm trees to degradation was due to extensive exploitation resulting from human over-population.

The valuable industrial products depending on the various parts of the Date Palm tree are mostly made by the Palestinian women who are good contributors to local incomes in times the whole Palestinian community are living under blockades imposed by the Israeli army on the Gaza Strip since 2007. Many local (Albanna and Eid, 2007; MOA, 2010 and Qofa, 2014) as well as regional studies (Marshall, 2003; Hasan et al., 2006, Al-Khalifah and Shanavaskhan, 2012; Al-Orf et al., 2012; Johnson, 2012 and Boufennara et al., 2016) confirmed such industrial products. The Date Palm fruits are of high nutritional value and are considered a good source of sugars, minerals and vitamins. The local industries and factories based on Date Palms, using modest equipment and tools, enhance the percentage of employment and income of poorer families.

The threats facing the cultivation, production and marketing of the Date Palm sector in the Gaza Strip are diverse as stated by the respondents. More or less threats facing Date Palms have been highlighted by many local as well as regional studies (El-Juhany, 2010; Jain 2012, Abu-Qaoud, 2016; Al-Agha, 2016 and Radwan, 2017). However, the threats imposed by Israeli occupation were highly considered by respondents. Thousands of thousands of various fruity trees, including Date Palms have been eradicated and destroyed by the Israeli Army since decades because of claimed security reasons and during incursions and wars. Blockade and the repeated closures prevent the export of products

and import of chemicals, pesticides and vaccines from abroad. ARIJ (2007) ensured the Israeli restrictions on the free movement, marketing and export of the Palestinians' goods including the Date Palm to both national and international markets. Moreover, the Israeli restrictions imposed on the water allocated for the Palestinians represent a significant obstacle to expanding Date Palm cultivation.

Globally, the RPW is considered one of the most destructive pests threatening the Date Palm sector. Locally, the RPW was discovered in late 2011. It caused severe losses as pointed out by many local studies (MOA, 2012; El-Hindi, 2017 and Abd Rabou and Radwan, 2017a and b). In spite of the means used locally to control the RPW, the use of integrated pest management (IPM) programs is highly recommended internationally. The IPM seeks to reduce the chemical inputs through the inclusion of a range of methods which are environmentally compatible. Many studies carried out by Murphy and Briscoe (1999), Vidyasagar and Aldosari (2011), Aleid et al. (2015), Dembilio and Jaques (2015), El Kichaoui et al. (2017) and El-Hindi (2017) suggested possible methods for RPW management. The methods suggested focused on IPM strategies which comprise surveillance, pheromone traps, cultural control, chemical treatments, biological control, etc. The benefits of the Bayroha'a El-Nakheel and the Bahja Gardens projects, which were established since years in the Gaza Strip to develop the Date Palm sector seemed to coincide with the benefits stated by Al-Marshudi (2002), Ali (2010) and Arias et al. (2016) in the sense that they minimize the dependency on dates imported from outside, and increase the availability of Date Palm products such as Ajwa and sweets in the local markets with low prices. The projects in question provided many job opportunities and improved the economic status and living standards of many poorer families in times the whole Gaza Strip is falling under political and military siege imposed by the Israeli occupation. Finally, the development of a national strategy with clear objectives to promote the sustainable Date Palm sector in the whole Palestinian Territories should be motivated and enhanced.



## Acknowledgment

We would like to acknowledge and extend our gratitude to the Gazan farmers, Date Palm orchards owners and normal people who spared no effort in supporting and enriching the current study with information needed throughout its succeeding stages.

## References

- Abbas, A. (2016). An ecological Survey and assessment of median trees and shrubs as an urban biodiversity component in Gaza city, Palestine. [M.Sc. Thesis]. Biology Department, Islamic University of Gaza, Palestine.
- Abd Rabou, A.N. (2005). An ecological survey and assessment of Wadi Gaza Nature Reserve, Gaza Strip–Palestine, with particular emphasis on wildlife. [Ph.D. Thesis], Al-Neelain University, Sudan.
- Abd Rabou, A.N. (2011): On the Ecology of Wadi Gaza, Gaza Strip: Survey and Assessment (Wildlife is Focused). LAP LAMBERT Academic Publishing, Germany.
- Abd Rabou, A.N., Baroud, N.S. & Yassin, M.M. (2002). Awareness of farmers towards pesticide use in the Gaza Strip. *The Egyptian Journal of Community Medicine*, 20(2), 59-71.
- Abd Rabou, A. N., Yassin, M. M., Al-Agha, M. R., Madi, M. I., Al-Wali, M. M., Ali, A. S., & Hamad, D. M. (2008). Notes on some common flora and its uses in Wadi Gaza, Gaza Strip. *The Islamic University Journal*, 16(1), 31-63.
- Abd Rabou, A. N. & Radwan, E. S. (2017a). The current status of the date palm (*Phoenix dactylifera*) and its uses in the Gaza Strip, Palestine. *Biodiversitas*, 18(3), 1047-1061.
- Abd Rabou, A. N. & Radwan, E. S. (2017b). Visual symptoms and control of the Red Palm Weevil (*Rhynchophorus ferrugineus*) in the Gaza Strip, Palestine. *Nusantara Bioscience*, 9(3), 322-329.
- Abu-Qaoud, H. (2015). Date Palm Status and Perspective in Palestine. In Al-Khayri, J. M., Jain, S. M. & Johnson, D. V. (Eds.), *Date palm genetic resources and utilization. Africa and the Americas*, 2:423-439, *Springer Science + Business Media Dordecht*. doi:10.1007/978-94-017-9707-8
- Al-Agha, B. A. (2016). *Palm cultivation in Gaza Governorates, A study in agricultural geography*. (Unpublished Master thesis), The Islamic University of Gaza, Palestine.
- Albanna, M., & Eid, A. (2007). *Date Palm of Palestine, Between Reality and the Possibilities, Analytical study of the remnants of palm for reuse in the Gaza Strip*, Deir El-Balah, Palestine.
- Al-Bitar, A. (2013). *Reality of Date palm cultivation in Palestine and the prospects for its development*. In Challenges facing agricultural development in the Palestinian territories Conference. Al-Quds Open University, Ramallah, Palestine.
- Al-Khalifa, N.S. & Shanavaskhan, A.E. (2012). *Micropropagation of date palms*. Asia-Pacific Consortium on Agricultural Biotechnology (APCoAB) and Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA). P. 54.
- Aleid, S. M., Al-Khayri, J. M., & Al-Bahrany, A. M. (2015). Date Palm Status and Perspective in Saudi Arabia. In Al-Khayri, J. M., Jain, S. M., & Johnson, D. V. (Eds.), *Date Palm Genetic Resources and Utilization, Springer Science + Business Media Dordecht*, 2,49-95. 7
- Alhammadi, M. S., & Kurup, S. S. (2012). Impact of Salinity Stress on Date Palm (*Phoenix Dactylifera L*)-A Review (P. Sharma & V. Abrol Eds.): *InTech Open Access Publisher*.
- Ali, H. G. (2010). Development of Date palm Cultivation and its Role in Sustainability of Agriculture in Oman. Paper presented at the Proceedings of the Fourth International Date Palm Conference, Abu Dhabi, United Arab Emirates, 15-17/3/2010, 54-59.
- Al-Marshudi, A. S. (2002). Oman traditional date palms: production and improvement of date palms in Oman. *Tropicultura*, 20(4), 203-209.
- Al-Orf, S. M., Ahmed, M. H., Al-Atwai, N., Al Zaidi, H., Dehwah, A., & Dehwah, S. (2012). Review: Nutritional properties and benefits of the date fruits (*Phoenix dactylifera L.*). *Bulletin of the National Nutrition Institute of the Arab Republic of Egypt*, 39, 98-129.
- Al-Shahib, W., & Marshall, R. J. (2003). The fruit of the date palm: its possible use as the best food for the future. *International journal of food sciences and nutrition*, 54(4), 247-259.
- Arias, E., Hodder, A. J., & Oihabi, A. (2016). FAO support to date palm development around the world: 70 years of activity. *Emirates Journal of Food and Agriculture*, 28(1), 1-11.
- ARIJ. (2007). *A review of the Palestinian agricultural sector*. The Applied Research Institute – Jerusalem (ARIJ), Bethlehem, Palestine.
- Asrat, S., Yesuf, M., Carlsson, F., & Wale, E. (2010). Farmers' preferences for crop variety traits: Lessons for on-farm conservation and technology adoption. *Ecological Economics*, 69(12), 2394-2401.

- Barrow, S. (1998). A monograph of *Phoenix* L. (Palmae: Coryphoideae). *Kew Bul.*, 53: 513–575
- Boufennara, S., Bouazza, L., de Vega, A., Fondevila, M., Amanzougarene, Z., & Lopez, S. (2016). In vitro assessment of nutritive value of date palm by-products as feed for ruminants. *Emirates Journal of Food and Agriculture*, 28(10), 695-703.
- Chao, C. T., & Krueger, R. R. (2007). The date palm (*Phoenix dactylifera* L.): overview of biology, uses, and cultivation. *HortScience*, 42(5), 1077-1082.
- Dembilio, Ó., & Jaques, J. A. (2015). Biology and Management of Red Palm Weevil. In W. Wakil, J. R. Faleiro, & T. A. Miller (Eds.), *Sustainable Pest Management in Date Palm: Current Status and Emerging Challenges* (pp.13-36): Springer Science+Business Media, Dordrecht.
- El-Juhany, L. I. (2010). Degradation of date palm trees and date production in Arab countries: causes and potential rehabilitation. *Australian Journal of Basic and Applied Sciences*, 4(8), 3998-4010.
- El-Hindi, M. W. (2017). Isolation, Molecular Identification and under Lab Evaluation of the Entomopathogenic Fungi *M. anisopliae* and *B. bassiana* against the Red Palm Weevil *R. ferrugineus* in Gaza Strip. [Thesis]. The Islamic University of Gaza, Palestine.
- El Kichaoui, A. Y., Abu Zayed, M., & Ayish, B. (2013). Genotyping and identification of six date palm (*Phoenix dactylifera* L.) cultivars of the Gaza Strip by random amplification of polymorphic DNA. *Emirates Journal of Food and Agriculture*, 25(11), 916-925.
- El Kichaoui, A.Y., Abu Asaker, B.A. and El-Hindi, M.W. (2017). Isolation, Molecular Identification and under Lab Evaluation of the Entomopathogenic Fungi *M. anisopliae* and *B. bassiana* against the Red Palm Weevil *R. ferrugineus* in Gaza Strip. *Advances in Microbiology*, 7, 109-124.
- Ezebilo, E. E., Elsafi, M., & Garkava-Gustavsson, L. (2013). On-farm diversity of date palm (*Phoenix dactylifera* L) in sudan: a potential genetic resources conservation strategy. *Sustainability*, 5(1), 338-356.
- FAO (Food and Agriculture Organization). (1982). *Plant Production and Protection*. Rome, Italy.
- Hasan, S., Baksh, K., Ahmad, Z., Maqbool, A. S. I. F., & Ahmed, W. (2006). Economics of growing date palm in Punjab, Pakistan. *International Journal of Agriculture and Biology*, 8, 1-5.
- Jain, S. M. (2012). Date palm biotechnology: Current status and prospective – an overview. *Emirates Journal of Food and Agriculture*, 24:386-399.
- Johnson, D. V. (2012). Enhancement of date palm as a source of multiple products: Examples from other industrialized palms. *Emir. J. Food Agric.*, 24 (5): 408-414.
- MOA (Ministry of Agriculture). (2010). *Sustainable Agricultural Development Strategy*. Gaza, Palestine.
- MOA (Ministry of Agriculture). (2012). *Red Palm Weevil, Agricultural media version, public administration agricultural plant protection and quarantine*. Gaza, Palestine.
- Murphy, S., & Briscoe, B. (1999). The red palm weevil as an alien invasive: biology and the prospects for biological control as a component of IPM. *Biocontrol news and information*, 20(1), 35-46.
- PCBS (Palestinian Central Bureau of Statistics Agricultural Statistical Data). (2016). Statistical Yearbook Of Palestine. Ramallah, Palestine. Retrieved from: <http://www.pcbs.gov.ps/> at 5/2/2017.
- Qofa, B. (2014). The industries based on Palm products in the Gaza Strip (Reality and Ambition). *IUG journal for economical and managerial studies*, 22(2), 75-100.
- Radwan E., S. (2017). The Current Status of the Date Palm Tree (*Phoenix dactylifera* L.) and its Uses in the Gaza Strip, Palestine. [M.Sc. Thesis]. Islamic University of Gaza, Palestine.
- Saafi, E. B., Trigui, M., Thabet, R., Hammami, M., & Achour, L. (2008). Common date palm in Tunisia: chemical composition of pulp and pits. *International journal of food science & technology*, 43(11), 2033-2037.
- Vidyasagar, P. S., & Aldosari, S. A. (2011). *IPM of Red Palm Weevil*. Chair of Date Palm Research (CDPR), Plant Protection Department, College of Food and Agricultural Sciences, King Saud University, Riyadh, Saudi Arabia. Retrieved from [http://datepalm-ksu.org/ at 13/8/2015](http://datepalm-ksu.org/at 13/8/2015).
- UNEP (United Nations Environment Program). (2003). *Desk study on the environment in the Occupied Palestinian Territories*. Nairobi, Kenya, 188 pp.
- Vidyasagar, P. S., & Aldosari, S. A. (2011). *IPM of Red Palm Weevil*. Chair of Date Palm Research (CDPR), Plant Protection Department, College of Food and Agricultural Sciences, King Saud University, Riyadh, Saudi Arabia. Retrieved from [http://datepalm-ksu.org/ at 13/8/2015](http://datepalm-ksu.org/at 13/8/2015).
- Wafa (Palestinian Information Center). (2014). *Palm cultivation in Palestine*. Available on: [WWW.wafainfor.ps](http://WWW.wafainfor.ps)
- Zabar, A., & Borowy, A. (2012). Cultivation of date palm in Iraq. *Annales Universitatis Mariae Curie-Skłodowska. Horticultura*, 22(1), 39-54.

## حالة نخيل البلح (*Phoenix dactylifera*) في قطاع غزة، فلسطين: دراسة استقصائية

### الملخص:

يوفر المناخ المتوسطي ظروفًا مثلى لنمو وتنمية العديد من أصناف أشجار النخيل (*Phoenix dactylifera*)، حيث ارتبطت العديد من الاستخدامات بهذه الشجرة المقدسة في دول الشرق الأوسط بما فيها فلسطين. تهدف الدراسة الحالية إلى توثيق جوانب مختلفة متعلقة بقطاع نخيل البلح في منطقة دير البلح - وسط قطاع غزة، فلسطين. تم اختيار 150 مستجيب (N=150) عشوائياً لتعبئة استبانة صممت خصيصاً لهذا الغرض. بينت نتائج المسح أن 71.4% من عينة الدراسة أو المستجيبين يمتلكون 3 دونمات أو أقل مزروعة بأشجار نخيل البلح. تعتبر المياه الجوفية المصدر الأساسي للري كما أوضح 61.3% من عينة الدراسة، أما الباقون فيعتمدون على مياه الأمطار أو المياه العادمة شبه المعالجة. بينت الدراسة أن صنف الحياني هو الصنف الأساس ويستزرعه كل المشاركين في الدراسة، كما أكد 62.0% أن معدل إنتاج شجرة نخيل البلح يتراوح من 70 إلى 200 كيلوجراماً في السنة. أظهرت النتائج أن كل المستجيبين في الدراسة على وعي تام بالاستخدامات والصناعات المرتكزة على أشجار نخيل البلح وأن 70.0% منهم ينتجون منتجات بيئية متنوعة. شكلت العمليات العسكرية للاحتلال الإسرائيلي وانتشار سوسة النخيل الحمراء (RPW) بالإضافة إلى عوامل أخرى أهم المهددات التي تواجه قطاع نخيل البلح في قطاع غزة. يعتد 84.0% من المستجيبين بالمزايا التي تجلبها مشروعات زراعة نخيل البلح في قطاع غزة. في الختام، توصي الدراسة بتحسين عمليات زراعة وإنتاج وتسويق نخيل البلح لضمان التنمية المستدامة لقطاع نخيل البلح في قطاع غزة.

الكلمات المفتاحية: نخيل البلح، الأصناف، الاستخدامات العامة، المهددات، دير البلح، قطاع غزة.