Chapter 13
Date Palm Status and Perspective in Palestine

Hassan Abu-Qaoud

Abstract Cultivated date palms (*Phoenix dactylifera* L.) have existed in Palestine for 5,000 years. The Mediterranean climate conditions dominant in the area provide optimal conditions for growth and development of date palm. Date palm cultivation in the Palestinian territories exists in the regions of Jericho and the Jordan Valley in the West Bank and in the Gaza Strip. This chapter reviews studies and research achievements on date palm in Palestine and addresses the importance of this sector: the status, production, and developmental constraints. After 1967, considerable areas of the Jordan Valley were cultivated by Israeli farmers with new high-quality date palm cultivars including Medjool. The adaptability of the new cultivars and the use of advanced techniques for propagation and cultivation of dates produced crop of excellent quality and yield to supply local and international markets. The total harvested area of dates in both the West Bank and Gaza was 725 ha in 2012. In the West Bank, there were 85,000 date palms spread over 600 ha, with a production capacity of 2,300 mt in 2012. However, the total date fruit production in Gaza was about 1,300 mt, with Hayany as a major cultivar in Gaza and Medjool in the West Bank. The average annual per capita consumption of dates in Palestine is 0.6 kg. Israel still remains a major supplier of dates to the Palestinian market. Several constraints face date cultivation and development, including high investment costs, poor marketing, and inequitable competition with Israeli products, limited water, pests, and diseases. However, there is a trend by formal governmental agencies as well as by national NGOs to support the cultivation of date palms in Palestine. The Palestinian Ministry of Agriculture has initiated several programs to support date palm cultivation in the Jordan Valley since 2000 with local NGO participation. Expansion of the knowledge about date palm will result in improving the productivity of this crop in Palestine.

Keywords Cultivar • Date palm • Gaza Strip • Jericho • Medjool • Palestine • West Bank

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13.1 Introduction

Date palm (*Phoenix dactylifera* L.) cultivation is a worldwide agricultural industry producing about 7.3 million mt of fruit in 2011 (FAOSTAT 2012). Date fruit is produced largely in hot arid regions. The climatic conditions that prevail in certain Palestinian areas during spring and summer provide optimal conditions for growth and development of date palm and fruit maturation. Date palm cultivation has been known in Palestine for thousands of years. Recently, date cultivation has rapidly increased in Palestine, the area cultivated in the West Bank has doubled several times from 2000 to 2012, and the production has also increased to a projected quantity of 5,000 mt in 2015. The objective of this chapter is to provide current information on the status of date palm cultivation in Palestine, which will help to improve the productivity of this important crop.

13.1.1 Historical and Current Agriculture

The Palestinian territories (West Bank and Gaza Strip) cover 602,351 ha, distributed between the West Bank (566,082 ha, 94 % of the total area) and Gaza Strip (36,269 ha, 6 % of the total area) (PCBS 2011). In 2005, the Palestinian population was 3.8 million, with 63 % in the West Bank and 37 % in the Gaza Strip (ARIJ 2007; PCBS 2006). The total area of cultivated agricultural land currently used by Palestinians covers 30.5 % (97,517 ha) of the Palestinian land area and 54.4 % of the total land suitable for cultivation, of which 92.1 % is in the West Bank and 7.9 % is in Gaza (PCBS 2010). Rainfed agriculture is practiced in 87.0 % of the total cultivated area, while only 13.0 % is irrigated agriculture. The total cultivated area in fruit trees, vegetables, and field crops is 91,155 ha (82,630 ha in the West Bank and 8,525 ha in Gaza).

The Mediterranean climate of long, hot, and dry summers, and a rainy winter, enables the Palestinian territories to grow many crops at different time periods throughout the year. Agriculture is distributed among eight ecological zones. Five are in the West Bank: Southern (Bethlehem, Hebron Governorate, and East Jerusalem), Jordan Valley (Jericho and eastern parts of Tubas), Central (Ramallah, Nablus, and Salfit), Northeast (Jenin and Tubas), and Northwest (Tulkarm and Qalqiliya). There are three zones in the Gaza Strip: Northern, Middle, and Southern (Fig. 13.1).

13.1.2 Palestinian Agriculture

The value of the major agricultural commodities in Palestine is shown in Fig. 13.2; vegetables are the highest, followed by olives and grapes. Even though date fruit production is relatively low, its value is higher than that of oranges and almonds, indicating a rapid shift to date cultivation in recent years, mainly in the West Bank.

Fig. 13.1 West Bank and Gaza, Palestine

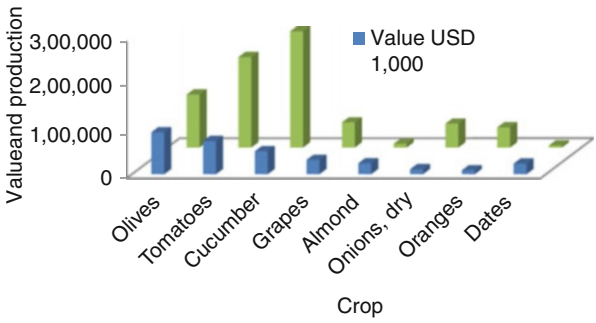

Fig. 13.2 Value and production of the main plant commodities in Palestine (PCBS 2011)

13.1.3 Production Statistics and Economics

Date palm cultivation has been known in Palestine for thousands of years. The Jordan Valley has been cultivated by Palestinian farmers for 5,000 years, especially surrounding the city of Jericho, which is considered the oldest city in the world.

Date palm cultivation has been practiced through the ages in the Jordan Valley, Gaza Strip, and Sinai since ancient times (Zaid and Wet 2002). Greeks and Romans named the northern part of Palestine the *Land of the Date* (Goor 1967). It is known that the historic city of Jericho was dubbed *Palm City*; Arab travelers from Jericho stated that the basic problem which faced the Arab cavalry was traversing date palm forests, which covered the region. Most of the date cultivation in the West Bank is now concentrated in Jericho and along the banks of the Jordan River. The extremely high temperatures and low relative humidity that prevail in those areas during spring and summer provide optimal conditions for growth and development of date palm and fruit maturation (Table 13.1). Being a tree of great economic, nutritional, and religious value and with its ability to grow in various climatic conditions, including saline soils, date palm is of great interest for Palestinian farmers (Kalbouneh 2011). Nowadays, the cultivation of date palm is located in regions of Jericho and the Jordan Valley in the West Bank and the Gaza Strip, especially near the cities of Deir al-Balah and Khan Younis.

After 1967, considerable areas of the Jordan Valley were cultivated by Israeli farmers, and new high-quality date palm cultivars, mainly Medjool, were introduced (Daiq 2007). Date fruit production by Israeli farmers in the Jordan Valley is reported in Israel's agricultural statistics. The adaptability of the new cultivars and the use of advanced techniques for propagation and cultivation produced fruits of excellent quality and yield to supply both local and international markets (EQA 2006a).

The cultivated area of date palms in the West Bank increased from 76 ha in 1993/1994 to 130 ha in 2001/2002, with an increase in production from 880 to 1,700 mt. Production also increased rapidly between 2006 and 2012. There are 85,000 date palms of good varieties spread over 600 ha. By 2012 the production capacity had increased rapidly to 2,300 mt, from only 60 mt in 2000. It is expected that this number will double by 2015 with a projected production level of 5,000 mt.

The total harvested area of dates in both the West Bank and Gaza was 725 ha in 2011, representing only 0.06 % of to the total harvested area in the world (FAOSTAT 2012). In comparison with Middle Eastern countries, this is a very small contribution (Table 13.2). However, there has been a significant increase in the harvested area of dates in the West Bank and Gaza in the last 10 years. Compared with olives, the oldest fruit grown in Palestine (Fig. 13.3), the cultivated area of date palm has increased rapidly from 2000 to 2011 (Fig. 13.4), and consequently the total production has notably increased (Fig. 13.4).

In the Gaza Strip, date palm production is relatively stable. Production reached about 2,000–3,000 mt during the 1970–1980 decade; this amount increased to 5,000–6,000 mt in the period 1995–2002 and declined to about 1,300 mt in the 2003–2008 period. The climatic conditions in Gaza (Table 13.3) are more suitable for producing soft dates. Therefore, 90 % of the date palms are cultivated for rutab stage fruits (Abu-Qaoud 1996). The production percentage of dates to overall fruit tree production in Gaza declined rapidly in recent years. In the period 1969–1984, the contribution was 25 %, decreased to 12.2 % between 1985 and 1993, fell to 8.6 % during the 1994–2002 period, and finally dropped to 4.4 % during in the

Table 13.1 Climatic data for Jericho district

	Month											
Element	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mean max temp, °C	19.1	20.9	24.3	29.3	33.7	36.7	37.8	37.6	36.1	32.2	26.4	20.4
Mean min temp, °C	7.4	8.3	10.5	14.2	17.6	20.4	22.1	22.4	21.2	17.9	12.9	9
Absolute max temp, °C	25	27.6	33.8	41.4	46.4	45	44	45.6	43.4	40.6	34.8	28.8
Absolute min temp, °C	0.2	0.4	2.8	2.4	10.4	15.4	18	19	13.2	11.4	4.3	2.1
Mean temp, °C	13.2	14.6	17.4	21.7	25.6	28.5	29.9	30	28.6	25.1	19.6	14.7
Mean sunshine, h/day	5.5	5.9	7.7	9.3	9.4	11.8	11.7	11.6	10.5	8.7	6.5	5.6
Mean RH, %	70	65	57	45	38	38	40	44	47	51	60	70
Total rainfall, mm	36	31	25	10	2	0	0	0	0	7	22	33
Evaporation, mm	78	76	128	189	261	289	298	276	227	135	94	59

Source: Palestinian Meteorological Department (2013)

Table 13.2 Date cultivation in selected Middle East countries

Country	Harvested area (ha)	Percentage of world total	Production (mt)	Production Values (USD1,000)
Saudi Arabia	172,297	14.4	1,122,820	573,429
Iran	154,274	12.9	1,016,610	519,187
Iraq	123,230	10.3	619,182	261,573
Egypt	41,652	3.5	1,373,570	701,488
Israel	5,500	0.45	37,008	18,900
Palestine	873	0.07	4,688	2,394
World	1,200,006		7,504,984	3,832,825

Source: FAOSTAT (2012)

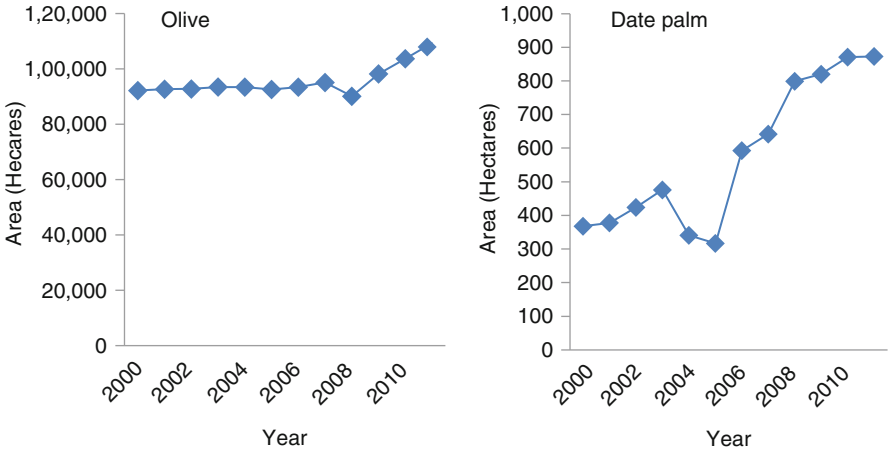

Fig. 13.3 Comparison between the harvested area (ha) of olives and date palms in Palestine

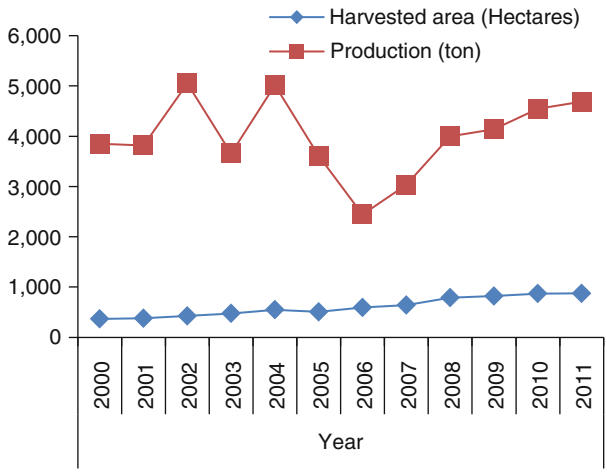

Fig. 13.4 Total harvested area (ha) and production (mt) of dates in Palestine (West Bank and Gaza)

Table 13.3 Climatic data of the Gaza Strip

	Month											
Element	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mean max temp, °C	17.5	17.5	19.5	23	24.5	27	29	29.5	27.5	26.5	23	19
Mean min temp, °C	9.4	10	11.7	14.5	16.9	19.7	21.8	22.2	21.2	19.4	14.5	11.3
Absolute max temp, °C	31.2	34.4	34.8	41.2	43.5	40	36	32.8	38.8	37.4	35.4	31.6
Absolute min temp, °C	2	2.6	3.6	7.4	11.4	14.8	18.5	19.2	16.2	12.2	7.5	3.4
Mean temp, °C	13.4	13.7	15.6	18.7	20.7	23.3	25.4	25.8	24.3	22.9	18.7	15.1
Mean sunshine, h/day	5.2	5.9	7.3	8.2	8.9	9.7	10.5	10.4	9.3	8.9	6.5	5.1
Mean RH, %	67	67	70	70	73	75	76	75	73	69	67	68
Total rainfall, mm	105	88	37	9	1	0	0	0	0	36	71	99
Evaporation, mm	68	76	115	142	162	190	193	183	165	132	87	69

Source: Palestinian Meteorological Department (2013)

period 2002–2009. The reduction in local demand, weak postharvest infrastructure, marketing difficulties, and a shift to other cash crops were the main reasons for the change (PCBS 1993–2009).

13.2 Cultivar Descriptions

13.2.1 Nutritional Aspects

Date fruits are among the most nourishing natural foods available to humankind and are known to have numerous health benefits. Rich in several vitamins and minerals, the date fruit is a good source of high nutritional value food. In general, there are three types of date fruits: soft, semidry, or dry. The semidry dates are the most popular; they are less sweet but more aromatic and distinctive than the others. Soft dates have higher moisture content, a mild flavor, and relatively low sugar. Dry dates are indeed dry, extremely hard, and intensely sweet.

13.2.2 Important Cultivars

Medjool This is one of the finest dates produced in Palestine, regionally and globally. Because it is grown in areas below sea level, there is an increase in the proportion of oxygen available to the palm which aids respiration and that in turn adds flavor and a distinctive color; the fruit is consumed at the tamar stage (Fig. 13.5a). The Palestinian Ghor region (the Palestinian area of the Jordan Valley) possesses a comparative advantage for growing Medjools. The climate in the Ghor region, where temperatures range from 12 °C in March up to 50 °C between July and October, is considered ideal for Medjool date production, which requires hot and dry weather. In fact, Medjool dates are produced in only certain other select areas of the world: the Maghreb region of North Africa, Southern California and Arizona in the USA, Namibia, and South Africa. However, the entry of Palestinian Medjools into European markets depends not only on the growing capacity but the ability to compete with other countries, especially Israel. Medjool market prices are significantly higher than for any other date cultivar (El-Jafari and Lafi 2004) (Table 13.4).

The Medjool trunk is medium in size, leaves are short with average curvature and of medium width, and the number of spines on each leaf ranges between 30 and 38. Fruit size varies from small to large; shape is mostly oval, ranging between orange and yellow, topped with fine reddish-to-brown stripes that develop during the khalal stage. The fruit becomes reddish brown in color when fully mature and has a waxy coat and a light skin; the shrunken mesocarp is wrinkled and rough and has a flesh thickness of 0.5–0.7 cm, a soft texture, little fiber, and a delicious taste; and the palm is early bearing. The palm produces 70–90 kg per tree per year.

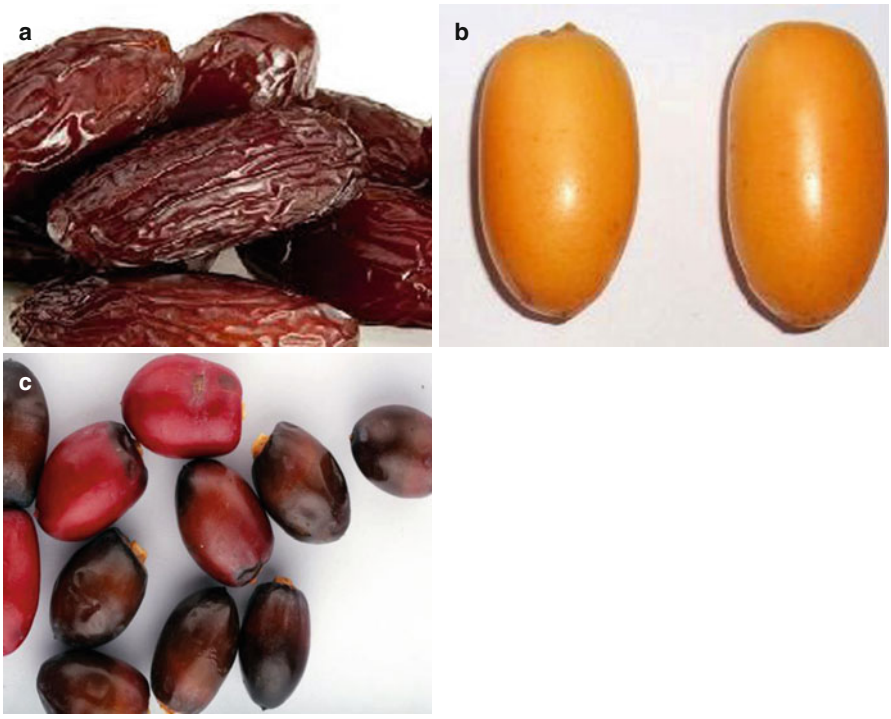

Fig. 13.5 Fruits of the three major date cultivars in Palestine. (**a**) Medjool consumed as tamar, (**b**) Barhi consumed mainly as khalal, **c** Hayani consumed mainly as rutab

Table 13.4 Farm gate prices for export quality dates in Israel in 1996

Cultivar	Export price at farm (USD/kg)
Medjool	3.5
Deglet Noor	2.5
Barhi	1.5
Hayany	0.6
Iraqi varieties	0.7

Source: Botes and Zaid (2002)

Barhi One of the most famous date cultivars, Barhi is characterized by its sweet taste and high per tree productivity, making its cultivation highly attractive. It is mainly consumed as khalal when still crisp in texture (Fig. 13.5b). The palm has a spreading crown, green leaves, and an aesthetically pleasing shape. The fruit has lower calories than other cultivars, making it ideal food for diabetics. The tree produces a low number of offshoots which is attributed to the cultivar itself.

Hayani This cultivar is mainly cultivated for rutab consumption in the Gaza Strip. Hayani, the most commonly grown cultivar, performs best over the three regions with an average fruit set of 87.6 %. It was concluded that the common climatic conditions in the

Gaza Strip are suitable for planting new cultivars along with Hayani, the traditional variety. Also, semidry cultivars could be introduced. The possibility of success for the dry cultivars under the conditions of the middle and south districts would depend on specific treatment (Al-Bana 2007). Hayani is a large palm with large leaves of average curvature, long thorns, medium-sized fruit, a length of 4–5 cm, and a diameter of 2.5–3 cm. The color is dark red at the completion of growth. Shape is cylindrical with a conical end. The fruit turns black at rutab (Fig. 13.5c). In this phase the exocarp easily separates from the mesocarp; annual production of this cultivar is about 90–120 kg per tree.

13.2.3 Economics of Date Palm Cultivation in Palestine

The successful cultivation of the date palm has a positive impact on Palestinian agriculture, especially in the Jordan Valley and the Gaza Strip. It has great importance in creating job opportunities for farmers and needy families, finding an alternative for the products of Israeli settlements, and providing food security to poor families, especially during political crises, border closures, and curfews related to the Israeli occupation.

Several studies have been conducted on the feasibility of date palm cultivation in Palestine (Al-Assi et al. 2003; Daiq 2003, 2007). These studies aimed at shedding light on the economics of date palm in Palestine and the creation of appropriate conditions for its cultivation. Dates are a basic food and are capable of being stored and therefore an important strategic commodity in the life of Palestinians, due to constant disruptions of their food supplies.

The date palm requires 4–5 years to become established and begin fruit production. It continues to produce fruits for 20 years over a productive life span of the tree of approximately 25 years.

The estimated cost and revenue of a Medjool palm tree are shown in Table 13.5. The total cost of establishment of an offshoot is about USD100 with production beginning after 4 years, with a revenue of USD50 from both fruit and offshoots. The amount increases afterwards until the tenth year when revenue will be USD140 per tree. The date palm is planted at a spacing of 9 × 8 m, which is equivalent to 14 seedlings in a given *dunum* (=1 decare); thus, the revenue of planting one dunum of Medjool date after 10 years will be 140 × 14 = USD1,960. This is considered as one of the highest revenue rates as compared to other agricultural crops.

13.3 Date Production and Marketing

13.3.1 Production and Demand

The local demand for dates in Palestine is relatively stable. During the late twentieth century, the average per capita consumption was 0.6 kg, which is close to the average domestic consumption globally of 0.9 kg per capita per year but much lower

Table 13.5 Estimated cost and revenue of one tree of cv. Medjool date palm in Palestine

	Tree expenses		Tree production				
Year	Item	Value (USD)	Dates (kg)	Dates value (USD)	Number offshoots	Offshoots value (USD)	Net per tree (USD)
First	Seedling price	55					
	Planting	15					
Second–Third	Water, labor, fertilizers, pesticides	30					
	Total 1st–3rd year	100	0	0	0	0	−100
Fourth	Running cost	30	20	40	1	40	50
Fifth	Running cost	50	30	60	1	40	50
Sixth	Running cost	60	40	80	1	40	60
Seventh	Running cost	60	50	100	1	40	80
Eight	Running cost	60	60	120	1	40	100
Nine	Running cost	60	70	140	1	40	120
Tenth	Running cost	60	80	160	1	40	140

Source: Daiq (2003, 2007)

than that of Saudi Arabia (38 kg) (El-Jafari and Lafi 2004). The total amount consumed in 1994 was 1,466 mt; this amount increased in 2000 by 28.4 %. Moreover, in 2010, this amount increased to 3,019 mt. The projected amount consumed in 2020 is 4,258 mt (El-Jafari and Lafi 2004; PCBS 2011). About 85 % of the Palestinian date palm production goes to the domestic market (approximately 4,000 mt), and only 15 % of production is exported (PCBS 2011). The date fruit consumption of a Palestinian family is no more than 0.17 % of the total food consumption. This low percentage is mainly due to the consumption habit, the high price of dates, and the presence of several alternative fruits. The development of the local date market requires a change in consumption habit, developing processes to promote this product, emphasizing health and nutritional benefits, and providing adequate marketing infrastructure (Daiq 2007).

13.3.2 Current Imports and Exports

Israel still remains the major supplier of dates to Palestinian markets, including in some cases low-quality fruit. The majority of the locally consumed dates are during the month of Ramadan. From 2002 to 2008, Ramadan coincided with the local production period; therefore, the amount of dates consumed was partially covered by local production. However, as the lunar calendar shifts backwards 11 days a year and Ramadan approaches in the months of May to July in the years 2011–2020, the required amount will be covered from Israeli dates from the previous year. Israeli storage management policy depends largely on the Palestinian market to absorb

Table 13.6 Production and consumption cycle of dates in the West Bank

	Month		
Condition	May–July	August	September–October
Status and maturation	Israel's stored dates from last years	Maturation of Israeli dates	Maturation of Palestinian dates
Consumption	Peak of dates consumption (Ramadan 2011–2020)	–	Low local consumption
Export	–	–	Exporting market

Fig. 13.6 Washing, sorting, and packing in a new modern date factory in Jericho (MADICO)

low-quality dates. Generally speaking, Israel depletes its inventories of dates 2 months ahead of the harvest season. In fact, the optimal length of time to store dates does not exceed 10 months. Israeli dates usually mature in August (1 month before the maturation of the Palestinian dates), thus the Israeli producers market stored dates before the maturation of the new crop. Since there is a lack of storage facilities in Palestine, the only other market for Palestinian dates is through exportation. The European market, which imports 50 % of total world exports of dates, has great potential for Palestinian Medjool dates. They are marketed as a high-quality product and supplied at high prices similar to those exported from Israel and the USA to Europe (Table 13.6).

13.3.3 Postharvest Operations

Exporting Palestinian dates to Europe requires taking into account several marketing functions to compete. These include washing, cleaning, drying, sorting, packaging, labeling, and storing in addition to production functions such as fertilizing, decreasing cluster weights, and packaging clusters (El-Jafari and Lafi 2004). In 2010, a modern processing facility, with the most up-to-date technologies for washing, drying, grading, sorting, packaging, and storing dates, was established in Jericho by the private company MADICO (Fig. 13.6). The production capacity of

the factory is 1 mt per hour with an electronic grading system monitored by cameras. The production line is able to sort up to ten different sizes. The facility meets the requirements of the BRC Global Standards, Global Gap, ISO 22000, and the Palestinian Certificate for Excellence. The Palestinian Dates Center practices equal employment opportunities and diversity, with a specific focus on providing employment opportunities for women from rural areas in the Jordan Valley. The center offers services to all Palestinian date farmers in the Jordan Valley and provides them with the opportunity to process, package, and store dates. This provides local farmers with an opportunity to utilize resources otherwise unavailable. It also strengthens the local farmers' market position and allows higher quality production and greater time flexibility (MADICO 2011).

13.4 Constraints Facing Date Palm Development in Palestine

Several constraints face the cultivation and production of date palm in Arab countries, among them: poor farm management, pest and disease control, harvesting, processing, and marketing, shortage of qualified and trained national staff and laborers, and insufficient research and development (Erskine et al. 2011). However, for Palestine, the following are the major obstacles facing date palm cultivation:

(a) Lack of water resources is the most significant obstacle to expanding date palm cultivation. Although the date palm is able to survive under arid conditions, they require sufficient water of acceptable quality to reach their potential yield; water requirements in such climates are higher when the water quality is low. Saline soils are a problem in this area because of insufficient annual rainfall to flush accumulated salts from the crop root zone. The high evapotranspiration rates of date palm calculated in the Jordan Valley emphasize the high water requirements (Table 13.7). The figures are based on the use of drip irrigation with an efficiency of 90 % (Kalbouneh 2011). Therefore, date farming in the Jordan Valley was found to be the best option for farmers in that region. Date palm production requires only one-third of the water needed to produce bananas or oranges, so when Medjools are substituted for banana plants and orange trees, two-thirds of irrigation water formerly required can be applied to other crops. In addition, dates can be produced in association with other cash crops. The hot and dry weather in the Jordan Valley is the optimum climate for date farming (El-Jafari and Lafi 2004); as a result there is high expansion in date cultivation.

(b) High production costs: date production is labor intensive and requires workers with sufficient experience in this area; therefore, operating costs are relatively high. In addition to the high cost prices of lifts used in cultivation and harvest, which range between USD15,000–20,000, limitations of availability of tissue-cultured seedlings of good quality and the high cost of local offshoots add to the production cost. The cost of an offshoot may reach USD50–60.

Table 13.7 Calculated evapotranspiration and irrigation demand for date palm in the Jordan Valley

Month	ET^0 (mm)	Crop coeff. (kc)	Evapotranspiration (mm)	Irrigation req. (mm)
January	52.4	0.77	40.4	0.0
February	65.5	0.87	57.1	17.5
March	109.4	0.81	88.2	53.4
April	128.4	0.98	126.0	108.7
May	171.4	0.94	161.2	160.9
June	189.0	1.01	191.1	191.1
July	234.1	0.85	198.2	198.2
August	213.6	0.86	183.1	183.1
September	165.0	0.92	151.5	151.5
October	102.9	1.08	111.4	110.9
November	64.8	1.13	73.0	52.8
December	42.5	1.21	51.5	6.9
Total	1,539.0		1,432.6	1,235.0

Source: Kalbouneh (2011)

(c) High shipping and transportation costs: generally the cost of shipping and transportation for exports and imports in Palestine is more than 30 % above the norms; for instance, this is equivalent to four times that of Jordan and more than 50 % above the transportation cost of Israeli goods.

13.4.1 Pest and Disease Challenges

Over the last decade, productivity of date palms has declined in many areas. As much as 30 % of production can potentially be lost as a result of pests and diseases. Different pests and diseases attack date palm, and many of the pests are common in producing countries, mainly in the Mediterranean region. The red palm weevil (*Rhynchophorus ferrugineus*) has recently become one of the major date palm pests (El-Juhany 2010). Human activity is the culprit of the high rate of the pest spread, mainly by transporting infested date trees and offshoots from contaminated to uninfected areas. Usually the damage caused by the red palm weevil larvae is detectable only long after infection occurs. No safe and effective technique for early detection of the pest yet has been devised (Ferry and Gomez 2002). This insect was first detected in the Jordan Valley and especially in the Jericho area and the Gaza Strip in 1999 (Al-Jaghoub et al. 2000). Different measures have been reported to be effective to control this dangerous insect, including chemical, biological, and other methods. Ayedh and Rasool (2010) used gamma radiation to sterilize red date palm weevil males; they reported that egg hatchability was significantly reduced using gamma radiation; the results indicated that 15 Gy is the optimum dose for sterilizing the red palm weevil.

Another important pest is the dubas date bug (*Ommatissus binotatus* Fieber). This insect has been recorded in the Jordan Valley and Jericho; other insects reported in Palestine include the white palm cortical insect, red date scale, Parlatoria date scale insect, mealy bug, frond borer, lesser date moth, greater date moth, and date seed beetle.

A survey of insect pests attacking date palm trees at Al-Arish region, northern Sinai, Egypt, which borders Gaza (Al-Arish city), identified eleven insect pests belonging to nine families from the orders Isoptera, Homoptera, Lepidoptera, and Coleoptera as causing damage and occurring frequently in the area. The most dominant and economically important pests were two scale insects (*Parlatoria blanchardii* and *Phoenicococcus marlatti*), a mealy bug (*Dysmicoccus brevipes*), the lesser date moth (*Batrachedra amydraula*), and the termite, *Psammotermes hypostoma.* Attacks of desert locust (*Schistocerca gregaria*) were of rare occurrence especially on offshoots (EI-Sherif et al. 2000). Other pests reported by Blumberg (2008), who wrote a review on the date palm arthropod pests and their management in Israel, included the sap beetle, date stone beetle, red scale, Parlatoria scale, and green scale.

Regarding diseases, several diseases were reported including Graphiola leaf spot, Diplodia leaf base rot, inflorescence rot, black scorch or terminal bud rot, leaf spot, fruit rot, and bending head (Lahaam 2005).

13.5 Conclusions and Recommendations

In spite of the feasibility of date palm production, cultivation in the Palestine is still below expectations. Several constraints impede progress, including high investment costs and underdeveloped marketing structures. Palestinian agricultural products, in particular those from the date palm, suffer from weak and inadequate marketing and processing services. This is mainly attributable to the absence of specialized firms. Marketing mainly depends on individual assessments and not on a thorough analysis of the local and international markets. Regarding date production, the following factors are major obstacles facing marketing and production: (a) weak competition in the domestic market and the absence of any control of the flow of date imports to the Palestinian market; (b) despite the high quality of Palestinian dates, Medjools in particular, the process of marketing to Europe still encounters many difficulties; (c) weakness and lack of modern marketing procedures and the adoption of standardized methods of washing, sorting, packaging, and drying; (d) farmers' lack of knowledge about exports and the requirements of global markets and consumer patterns; (e) lack of commitment by farmers and exporters to specifications and quality standards in terms of production and postharvest operations; (f) poor agricultural extension services at all stages of production; and (g) limited policies to support date palm cultivation.

The absence of official support for this sector is one of the important factors which have led to the weakening of the competitiveness of Palestinian agricultural products, including dates. The lack of support is reflected in production cost and subsequently the ability to enter foreign markets, as well as the continuity of overall agricultural practices.

El-Jaffary and Lafi (2004) proposed several points to overcome marketing problems of the Medjool date, some of which have been implemented. Their recommendations were:

(a) Stimulate and encourage investment to establish marketing infrastructure and facilities. Since the expansion in production takes a certain time period (up to 8 years) between planting the palm trees and the first harvest, investment in marketing facilities could be implemented gradually to absorb the annual increases in date production.
(b) Invest in cold storage facilities to maintain the postharvest quality of dates and to control the supply of date products to both local and export markets.
(c) Medjool palm growers should comply with international standards and requirements to be able to market their product through export channels. To accomplish that, training and rejuvenation programs should be provided to Medjool date producers and exporters to integrate them efficiently with local and export markets. Marketing surveys and research should be carried out on retail consumers through the export market chains.
(d) Concerning the efficiency of marketing Medjool dates in local markets, the following two steps should be applied: Firstly, protect Palestinian markets through appropriate laws and regulations; this will enable producers, wholesalers, and retailers to market local production efficiently in the domestic market. Secondly, wholesalers should design appropriate marketing packages to promote local consumption of date products as healthy food, not only during the Ramadan season but throughout the year.

Regardless of these difficulties, a trend by formal governmental agencies, as well as by national NGOs, to support the cultivation of date palms in the Jordan Valley has been initiated (EQA 2006a; LRC 2004). The Palestine Ministry of Agriculture has initiated three programs to support date palm cultivation in the Jordan Valley since 2000 with local participation of NGOs (EQA 2006b). Most of the seedlings distributed to farmers were Medjool and Deglet Noor cultivars. Regardless of constraints, the cultivated area of dates is increasing, and the projected production will exceed consumption; additionally, the production in the coming years will not coincide with the local high-demand period of Ramadan, and therefore dates should be exported to foreign markets. Several measures need to be taken for exporting dates, including washing, cleaning, drying, sorting, packaging, labeling, and storing and packaging clusters. Therefore, investment in postharvest infrastructure should be supported; other difficulties facing the production process include pollination, fertilization, pest management, and postharvest problems; research should be initiated and supported in these fields.

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