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The Date Palm in Palestine

By

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The Date-Palm in Palestine*)
By ASAPH GRASOVSKY and JOSEPH WAITZ.

The Home of the Date-Palm and its Uses in Ancient Times

The home of the date-palm is in the sub-tropics. The exact locality is not known, but it is supposed to be Iraq whence it spread to Arabia, Palestine, Egypt and North Africa. It has been known in the said countries for four thousand years and has played an important part in the lives of their inhabitants, since its fruit forms their chief article of food, its leaves are used to cover their houses, and other parts of the tree are similarly utilised.

In ancient Palestine the date-palm was also highly considered, and when the Israelites conquered the country they recognised its value and appreciated its importance. The Talmud tells us of "the date-palm which produces no waste-matter, its fruit forming a food, its leaves being used for ' lulavim' and for roofing, its fibre for cord and the stalks of its fruit for making sieves...". How high the date-palm stood in the affection of the people is seen from the fact that it was used as an ornament in the decorations of the Temple and was also represented on the national coins. It was, furthermore, the subject of countless popular sayings, such as: "Why shall the righteous be compared to a palm-tree and not to any other tree? Other trees when seen from a distance cannot be identified, but the date-palm stands out for what it is for miles. So it is with the righteous".

The date-palm grows mainly in valleys and lowlands. The old learned men used therefore to say "a date palm indicates a valley". Of the valleys the most renowned for its palms was the Valley of the Jordan from Jericho

*) A paper read at the Horticultural Committee.
northwards. Here the country abounded with date-palms of fine quality, so much so that Jericho was known as the “City of Dates”. The Greek and Roman historians tell us that the plantations around the city stretched for a distance of seventeen kilometres; and Josephus says of the Jericho palms that “...they are different in taste and name, and the soft varieties are pressed and honey produced therefrom which is not inferior in flavour to the honey of the bees which abound in this country.” Besides these lowland palms, there were also palms which grew in the uplands. The fruit of these latter, however, were of poor quality, and this fact gave rise to the expression “mountain date-palm” for a witless creature.

The date-palm has always had a prominent place in the affections of the desert-dwelling Arab. He looks for it on his wanderings, for its leaves provide him with a tent to sleep in and its fruits are his regular diet the whole year through.

Fig. 1. Date-palm plantation at Deir-el-Balah.

Even the prophet Mohammed sanctified the date-palm saying: “Honour the date-palm for it is the brother of your father. For it sprang from the soil which was left
over after the creation of Man. The date-palm resembles Man: It is erect and tall and is known to have two sexes. If its head is lopped off it will die, if its heart is injured, it will wither. When its leaves are pruned they do not grow afresh. It is covered with a down similar to human hair...” Further, an Arab legend identifies the date-palm with the tree of Paradise: “...Adam cut his hair and pared his nails and buried them in the soil of the Garden. Immediately there sprouted in the place a date-palm bearing fruit. Adam, full of fear, fell on his face. The Angel Gabriel appeared before him, pointed to the palm and said: “This tree was created from the same matter as that from which you were formed, and it will provide you with sustenance”.

Distribution of the Date-palm in Palestine
at the Present Time.

Despite the fame enjoyed by the date-palm in Palestine in ancient times, to-day the tree is only to be found here in small numbers. Only a part of the trees planted south of Gaza in Deir-el-Balah can be considered as of economic value.

The varieties of any value number only three to four and only 2100 out of the total of 6000 trees in the district are of good quality. The balance are palms grown from seed called in Arabic “Majhal” or “Navah” i.e. trees raised from seeds and producing inferior fruit. These trees are gradually being uprooted and better varieties planted in their place.

In the vicinity of Jericho there are to be found some fifty palms the fruit of which is suitable for the market. The remainder are seedling trees bearing fruit of poor quality.

In Beisan the number of palms is even less; and those at Tiberias can be counted on the fingers of both hands, and even these are young palms brought recently from Egypt and elsewhere only now commencing to bear fruit. There are a few scattered palms also at lenin.

The scores of palms found in the neighbourhood
of the towns of Jaffa, Haifa and Acre are mostly of inferior quality having grown from seeds not sown intentionally but left there, a hundred years ago by the soldiers of Ibrahim Pasha—so the old people recount—in the vicinity of their camping grounds.

One of the reasons for the small number of plantations of the date palm in this country is without a doubt connected with the difficulty of propagating the species which depends primarily on offshoots. In the country itself there are only few good varieties suitable for propagation, and offshoots have therefore to be imported. This brings with it countless difficulties as we shall see later, the chief of which is the prohibition by Egypt, Tunis and Algeria of the export of date offshoots from their countries.

**Yields**

Palm propagated from offshoots ordinarily come into bearing in the sixth year after planting. It sometimes occurs, that a tree will commence bearing in its fourth year. This depends on the size of the offshoots when planted, on the variety, on the care and attention given to the plant, and more especially on the number of offshoots which are allowed to grow. This last factor has an influence also on the quality of the fruit on young palms, for a multiplicity of offshoots reduces the quality and quantity of the fruit.

From the sixth year onwards the yield increases annually until the tenth year when the norm is reached. The maximum yield, however, is only attained by the tree in its fortieth year.

The varieties most prevalent here are the “Hayani”, and “Bint-Aisha”. Their yield differs: the former produces 8-14 bunches per tree annually or 100-125 kilograms; the latter 4-5 bunches or 60-70 kilograms. The varieties newly introduced into the country such as “Zaghlool”, “Samani”, “Hilwani”, “Amri” and “Khadrawi” have only now come into bearing and it is therefore impossible to determine their yielding capacities at this stage. In Egypt their average yield is reckoned to be in well cultivated
plantations 80-100 kilograms per tree, and occasionally, if pollination has been exceptionally successful and irrigation water is plentiful, the yield will reach 200 kilograms, especially with the “Zaghloul”.

Fig. 2. Varieties: Hayani (right) Bint Aisha (left).

Marketing

Owing to the small number of palms in the country their produce from the marketing standpoint is rather small. “Hayani” dates of Gaza sub-district which ripen at the same time as the dates imported from Sinai fetch 10-20 mils per rottel (3-6 mils per kilogram); against this, “Bint Aisha” dates which ripen a month later and are used principally for jam manufacture, fetch 40-50 mils per rottel (12-16 mils per kilogram).

It is clear that the crop from these palms is insufficient to meet the local demand, and there is no question of exporting. On the contrary, all fresh dates consumed in this country are brought from abroad, and the public is therefore sending away each year huge sums in payment therefor. Why should we have to import fresh and dried dates when we have the opportunity of developing our plantations so as to supply at least the local demand? The following table shows the quantities of dates imported into Palestine in the last four years together with their value.
<table>
<thead>
<tr>
<th></th>
<th>1928</th>
<th>1929</th>
<th>1930</th>
<th>1931</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kilos</td>
<td>L.P.</td>
<td>Kilos</td>
<td>L.P.</td>
</tr>
<tr>
<td><strong>Fresh dates</strong></td>
<td>313,829</td>
<td>2,496</td>
<td>365,481</td>
<td>2,570</td>
</tr>
<tr>
<td><strong>Preserved dates</strong></td>
<td>2,062,087</td>
<td>22,536</td>
<td>1,343,508</td>
<td>17,742</td>
</tr>
</tbody>
</table>

Table B

Quantity of dates imported into Palestine in 1928-1931
The fresh dates come mainly from Egypt and Sinai; the preserved dates from Egypt and Iraq. It should be added that the figures for fresh dates (about 500,000 kilos per annum) only indicate the quantity which entered the country through the Custom houses; they do not include the quantities smuggled in from Sinai.

**Climate**

In order to produce high quality fruit the date-palm being a native of sunny lands, requires a high temperature and dry atmosphere. However, palms which are grown purely for ornamental purposes are grown on a much wider area. The regions suitable for commercial cultivation of the palm as a fruit tree are extremely limited and experts therefore say that countries suitable for the growth of the date-palm are those where the summer is long, the nights and the days warm, where the winter is short and mild; and where the rain does not fall in the spring (when the fruit is setting) nor in the autumn (when the fruit ripens). The only parts of Palestine which answer to these requirements are the Jordan Valley from Jericho northwards and to some extent the Maritime Plain.

A number of date experts in neighbouring countries specialising in the cultivation of the date-palm have investigated the influence exerted by climate on the growth of the date-palm, and paid particular attention to the minimum temperature required for the ripening of its fruit. They determined that a number of "heat units" are required by the different varieties of palm for the proper ripening of their fruit.

Two factors serve as basis for calculating these "heat units": (1) The time elapsing from flowering to ripening (during the months of May to October) a period of 183 days and (2) 18° C as the minimum degree below which fruiting cannot be expected. Every degree higher than this minimum temperature is considered as a "heat unit" and is multiplied by the number of days in each of the six months of the season, producing the total number of heat units required during the entire season.
Thus, the experts calculated and found that 1166 heat units are required in order to ripen the soft date varieties while the dry varieties required 2000-2611 units. For example, the varieties “Hilwani”, “Khadrawi” and “Berhi” in Basra require 2419 units and the variety “Deglet Nur” which grows in Algeria required 1944-2000 units. Where the number of heat units is highest there the best preserving varieties will grow. Soft dates have been found to grow and produce fruit only in areas where the mean temperature in the shade rises above 26.6° C for at least one month in summer and that the mean temperature for the period of May-Oct. is not less than 21.1° C. Further the experts determined that for packing varieties the mean temperature for the said period should not fall below 23.9 degrees Cent. and late packing dates will bear only if the temperature in the months of June, July and August is not less than 32.2° C. These heat units teach us something important also with regard to the introduction of trees from country to country and from region to region within the same country: Varieties which require a certain number of heat units if planted in regions where the number of units is less than the requirement will not bear fruit, or if they do the fruit will be of poor quality.

If we study the temperature prevailing in summer in different regions of Palestine and calculate the heat units of each we shall find, as per the tables below, that in 1930 Jericho had 2036.4 units, Tiberias 2000 units, Daganiah 2169.9 (1929), Beisan 1789.9 units, Gaza 1458.5 units, Jaffa 1326.8 units and Acre 1167.5 units. From these figures we conclude that the soft varieties such as Hayani, Bint-Aisha, Zaghloul, Samani and the dry types such as Amri, and Amhat can grow successfully in most of the districts mentioned, while the Hilwani and the Khadrawi can only grow in Jericho and the Deglet-Nur is limited to Jericho and possibly to Tiberias and Beisan. The Maritime Plain can also be included in the Date-Palm Belt; but where too close to the sea the damp sea-breezes often cause shedding of the fruit. This can be overcome by covering the fruit with canvas sacks.
<table>
<thead>
<tr>
<th>Months of the Season</th>
<th>Jericho</th>
<th>Tiberias</th>
<th>Beisan</th>
<th>Gaza</th>
<th>Jaffa</th>
<th>Acre</th>
<th>Dagania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month</td>
<td>Days</td>
<td>Temp. above 18°</td>
<td>Total Heat Units</td>
<td>Temp. above 18°</td>
<td>Total Heat Units</td>
<td>Temp. above 18°</td>
<td>Total Heat Units</td>
</tr>
<tr>
<td>May</td>
<td>31</td>
<td>7.8</td>
<td>241.0</td>
<td>7.1</td>
<td>220.1</td>
<td>6.0</td>
<td>186.0</td>
</tr>
<tr>
<td>June</td>
<td>30</td>
<td>11.4</td>
<td>342.0</td>
<td>10.4</td>
<td>312.0</td>
<td>9.9</td>
<td>297.0</td>
</tr>
<tr>
<td>July</td>
<td>31</td>
<td>12.9</td>
<td>399.9</td>
<td>10.5</td>
<td>387.5</td>
<td>11.3</td>
<td>350.0</td>
</tr>
<tr>
<td>August</td>
<td>31</td>
<td>13.9</td>
<td>450.9</td>
<td>12.9</td>
<td>399.9</td>
<td>12.8</td>
<td>396.8</td>
</tr>
<tr>
<td>September</td>
<td>30</td>
<td>11.7</td>
<td>351.0</td>
<td>10.7</td>
<td>321.0</td>
<td>10.6</td>
<td>318.0</td>
</tr>
<tr>
<td>October</td>
<td>31</td>
<td>8.6</td>
<td>266.6</td>
<td>8.4</td>
<td>260.4</td>
<td>7.8</td>
<td>241.8</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2031.4</td>
<td>2000.9</td>
<td>1789.9</td>
<td>1458.5</td>
<td>1526.8</td>
<td>1167.5</td>
</tr>
</tbody>
</table>
Soils

The best soil for the date-palm is a sandy loam, rich and well drained; it will however grow well in other soils. The date-palm can grow and bear fruit however when grown on soils containing alkali provided the quantity is not more than 3% ; it also is unaffected by alkaline irrigation water if the water does not contain more than 6 parts per thousand. Of course, the fruit of trees growing under such conditions cannot compare both in quality and quantity with the fruit of trees growing in alkali-free soil.

Propagation.

The date-palm is propagated either from seeds or offshoots. The former method is an easy and rapid one but it is not suitable for the purpose. Palms raised from seed do not inherit the qualities of the female palm from which the seeds are taken, and even if the seeds are carefully selected first-class plants will never be obtained; many of them will be male plants which do not bear fruit, and the rest will be female palms capable of bearing fruit and even those will be of poor quality. Despite this it sometimes happens that a palm bred from seed will produce remarkable fruit.

Until quite recently the majority of the palms growing in the country were raised from seed. Whether this was intentional or not is not known. The fruit of these palms is therefore poor. An examination of the fruit of these palms has indicated the possibility of discovering some palms the quality of whose fruit makes it worth while taking offshoots from them for propagation.

Propagation by means of offshoots ensures that the daughters are identical with their parents, since the offshoot which sprouts from the root of the palm or from its trunk inherits the qualities of its parent and carries same with it on its removal. This method however is the more difficult since the rooting of the offshoots presents many obstacles so much so that a 100% "take" is never certain. Where offshoots were planted in
this country the “take” was only 10—20 per cent. This uncertainty in propagation is the main impediment to the development of date-palm culture in Palestine, for the palms suitable for propagation are very few and the offshoots taken therefrom are consequently highly priced (the lowest price being 200 mils each). In the case of offshoots brought from the neighbouring countries, the value of same at the plantation is sometimes as much as 750 mils, while there are cases where for exceptionally high quality offshoots as much as L.P. 2 each was paid.

It is possible that the lack of knowledge and experience of handling nursery plants which is one of the defects of our agriculturists is the cause of the low state of date-palm culture in this country. The only growers possessing such knowledge are those of Egyptian origin living in the village of Deir-el-Belah, and a few of Algerian ancestry scattered here and there in the country. The Colonisation Department of the Jewish Agency, which about nine years ago commenced to cultivate the date-palm from offshoots imported from Egypt, soon dropped the task without achieving any definite results. Of late years efforts have been made by the Department of Agriculture of the Government at its Experiment Stations at Jericho and Beisan to investigate problems connected with the propagation of the palm by means of offshoots, such as: The nature of the soil required for the rooting of the offshoots; the type of pruning required before rooting; the best time for planting, etc. It may be hoped that, with the help of these investigations and systematic experiments a better method will in the course of time be discovered. From the results attained already at the two stations mentioned and similar experiments carried out in the country within recent years by various institutions and individuals, the suggestions for propagation of offshoots may be summarised as follows:

1. A woody offshoot is preferable, one with plenty of space around it (not growing closely with others), and
whose development was slow. Such an offshoot is better than a large and tender one. For this reason offshoots from palms used to little water are preferable to offshoots taken from palms used to having plenty of water. The size of the offshoot should be from 1.5—2 metres in height, its weight 20—50 kilograms and its age between two and four years.

![Date-palm offshoot](image)

**Fig 3. Date-palm offshoot.**

2. Offshoot should be separated from the trunk of the parent-palm by means of a sharp cutting instrument (it is essential that the edge of the instrument be very sharp in order to prevent wounding the offshoots or the mother plant). Care should be taken that the cut is made precisely at the junction of the offshoot with the trunk. After the separation the bottom of the offshoot is cleaned and smoothed over, any side-shoots present are pruned off, and it is placed in a shady spot for a few days in order that its moisture should evaporate somewhat (about $12\% - 15\%$). This operation prevents fermentation which is liable to occur if the offshoot is planted soon after
it was separated from its parent. The offshoot should not, however, be allowed to remain so too long or else it is liable to dry up. The length of time in which the offshoot should be allowed to dry depends on its length and the size of its base: in the case of large offshoots the period is longer than in the case of small ones.

3. The offshoot is then planted permanently in the place chosen or in a nursery bed.

The above applies to an offshoot without roots. Of recent years new methods of getting the offshoot to produce roots before planting have been tried. There are three ways:

(a) The offshoot is not wholly separated from its parent, a small portion of its base being left intact. Earth to which fertilizer has been previously added is then heaped at the base to induce the offshoot to produce roots. When it has rooted the operation is completed and the offshoot separated and planted out.

(b) A good nursery soil is heaped around the offshoot while it is still joined to the trunk of its parent. It is then watered from time to time in order to maintain constant moisture, and eventually the offshoots start to grow. In the case of an offshoot situated high above ground, the earth is applied in a box which is tied to the tree and forms a nursery bed. When the offshoot has rooted it is severed and planted out in the open.

(c) The offshoots are planted in nursery beds heated by hot water pipes. The heat so applied induces rapid rooting.

Planting.

Date growers usually plant date-palms at two seasons of the year, viz. in the Spring and Autumn. The best time, however, is the Spring, preferably in March. The offshoots, whether they are rooted or not, are planted in pits measuring about 50 x 50 cm. The shoots are not planted deep in the soil, with two-thirds of the crown in the ground and the remainder above the ground. This is to prevent water penetrating the heart and giving rise to
its decay. As an additional precaution, a mound of earth is heaped around the shoots, and thus when the tree is irrigated, water does not come into direct contact with the plant.

Once planted, the offshoots are wrapped in a net, sack, light cloth or in straw to protect them from the rays of the sun. This covering is left on the shoot until it strikes roots and the offshoot sprouts and grows. If the shoots are planted in alkali soil, it is advisable to dig larger pits to be filled with good soil in order to let the plant root well. Once the offshoots have developed they will be able to resist the alkali soil.

There are no fixed distances for planting in this country; with the sole exception of the groves in Deir el-Balah, all the palms here are planted at varying distances. At the said place, which is South of Gaza, a few well-planned groves are to be found with regular, parallel rows and the fixed distance of 8 m. between the trees. In Egypt, it is usual to allow a space of 6-7 metres between the trees if the spaces between are not interplanted, and 10-12 metres if vegetables or bananas are grown between.

Naturally, too close planting is not good, for the trees bear poor crops. The Arabs have two sayings bearing on this point. One runs: "Keep away from me and you will be able to take from me"; the other: "Keep your shade away from me, and I will bear fruit for you and me". It is generally believed that the proper distance is 8-10 metres.

After planting the shoots are regularly watered, and this is continued at frequent intervals during the first few months until it is certain that the plant has taken roots. During the whole period the soil around the plant must be kept moist, but not damp.

Along the sand dunes of the coast in the southern part of the country, where the water table is low, the date growers plant their palms in the following manner: Large trenches or holes of large dimensions or sometime even entire excavations, which means the removal of thousands of cubic metres of soil, are dug in order to
reach about half or one meter from the water table. At this depth the large date offshoots are planted and then watered for a number of seasons. Once the roots have developed and have reached the underground water table the date-palms start to live on their own and do not require any further attendance. With the gradual growing up of the date-palm the large excavation holes are filled in and after a number of years the date-palm is found to have arisen out of these holes and a regular plantation is seen to be growing in the dunes. This method of planting is called in Arabic “Mowasah”.

**Cultural Operation.**

The alpha and omega of date-palm culture is irrigation. Once the palm has struck root, provided it has plenty of sunshine and abundant water, it is bound to flourish. The Arabs have a saying in this connection to the following effect: “His feet are in the water and his head in the sun”. No matter how much a palm be irrigated no harm can result as long as there is no standing water. The water is applied either in channels or basins, the quantity depending on the age of the tree. During the spring (blossoming time) and autumn (when the fruit ripens), however, irrigation is stopped, as then it is detrimental. It is believed that about 1000 to 1200 cubic metres of water are required per dunam of bearing palms.

Manuring is of considerable importance. It is practised by all date growers in contrast to regular non-manuring practice of other fruit trees. The manure, which is always organic, is applied once every two years in the following manner: Two trenches are dug on two opposite sites of the tree and filled in with manure. After two years two more trenches are dug on the other two sides of the date-palm. In this way manure is applied all around the palm. The quantity given each time is about 300 kgs.

During the first three or four years of the tree’s life after planting, it requires no special care; it is not pruned but attention has to be paid to the proper care and development of the offshoot which commences to
sprout. There are certain varieties of date-palms which produce many offshoots, their number reaching sometimes more than 20. Not all these shoots should be allowed to grow, even at present when there is a great demand for such shoots. The reason is that where there are many shoots they have no opportunity of developing properly and becoming fit for propagation. Furthermore, when the tree is in bearing, an abundance of offshoots around it has a detrimental effect on the quantity and quality of the fruit. It is therefore advisable to thin out the shoots leaving only the best ones, so that not more than six to eight per tree remain.

Pollination.

The work of artificial pollination in date-palm culture is the most important and delicate of all the cultural operations. Before approaching the subject, it would be useful to devote a few lines to a botanical description of the date-palm flowers.

The flowers of the date-palm are dioecious, that is to say, the male flowers appear on one tree and the female on another. From among the lower leaves encircling the tree there emerge in the spring a number of spathes which are at first of a green colour but later turn brown. These spathes enclose the flowers which are revealed when the spathes split open.

The male flowers consist of a stalk entirely surrounded by minute strands over a hundred in number each bearing a large number of minute flowers. The flowers contain the stamens which are covered with the pollen. The pollen, which is yellow in colour and has a special odour, falls out and is scattered immediately the spathe-sheaths open.

The female flower is similar to that of the male except that its strands are joined to the end of the stalk and are long and open, like a broom whose strands are not together. When the spathe opens the flowers, which lie dispersed on the strands, open up and are ready for pollination. If pollen from the male flower then reaches
hem the ovary will be fertilized and the fruit will set.

Generally the pollen is brought to the pistils by insects and the wind, but in date culture pollination is more certain if done artificially. It is carried out in the following manner: A few strands of male flowers (called in Arabic “Tallah”) are taken and one or two are bound to each female spathe as soon as it opens. Some growers shake the pollen into the female inflorescence. Pollination is carried out during the hottest part of the day. It is not done when cool breezes are blowing from the North and West. Furthermore, if after the operation rain falls, the work is to be done over again. In general, it is not sufficient to pollinate once, as it may sometimes happen that not all the flowers-spathes on a tree are open at the same time and therefore it is necessary to go over about three or four times. One male palm will provide sufficient pollen to fertilize fifty female palms.

There are a number of problems involved in pollination which require solution, but no research on the subject has yet been done in Palestine. The majority of the men engaged in the work are of Algerian or Egyptian origin, and they follow the custom of their respective countries.*) The pollen is usually taken from old male trees growing in the area. In Jericho pollination is carried out in the middle of March, and in Gaza in March and April. It sometimes occurs that the male and female flowers do not open simultaneously. Thus the palm-growers of Acre state that in their part of the country the male flowers reach maturity some time after the female flowers; consequently, in order to effect pollination they have to fetch pollen elsewhere or keep some pollen from year to year.

The pollen undoubtedly exerts considerable influence

*) It would appear that the ancient Hebrews followed the same customs, as mentioned in the following passage in the Talmud: “A female palm was very backward in bearing fruit. The palm-grower said: she loves a palm in Jericho. Strands from the Jericho palm were then brought to her and hung on her. Immediately she brought forth fruit”. (Berahot III)
on the quality of the fruit fertilized by it, it is known that a large number of male-palm flowers now used for pollination are not the best for the purpose. No research work on the subject has yet been undertaken in Palestine. It is to be hoped that the male palms recently brought into the country from Iraq will help to improve the quality of our dates.

These problems and others in this line will be solved in the course of time, when date culture develops here.

Pruning.

Little pruning is given to the date-palms during the first few years. After the sixth year a regular pruning is given in which a number of dried branches are removed equal to the number of the new leaves which have grown during the year. Some twenty or thirty new leaves grow on a date-palm every year; so that a similar number of the lower leaves may be removed every Autumn, leaving forty to fifty on the tree. Pruning in excess of this is detrimental to the palm, particularly in the Jordan region where the heat of the sun is great and where the leaves serve as a protection to the palms. On the other hand, in places with high humidity, along the sea coast, more pruning is advisable so as to expose the fruit and the trunk fully to the sun.

In Palestine the date-growers tend to prune their palms more than is necessary, owing to the value of the leaves. Date-growers in the vicinity of large cities sell date leaves for the Feast of Tabernacles at good prices, as the leaves are used in making "Succoth" (Booths).

Harvesting and Packing.

It is customary to bind the fruit stalks to the branches above them before the fruit ripens, as they then develop and become heavy and are liable to break off. Further, in the case of improved varieties it is usual to bag the bunches in canvas sacks in order to protect them from the attack of wasps and hornets, which have a great predilection for dates.
While the palm is still young and short the work of harvesting the fruit is easy. This is not the case when it gets old and taller; then the operation is difficult as the harvester has to climb the tree until he reaches the top. Once there he binds himself to the palm with a belt or rope, and picks the fruit which he then lowers in a basket by means of a rope (Fig. 4).

![Harvester climbing on the tree.](image)

In certain varieties all the fruit does not ripen at one time, so that it has to be picked over a number of times. Once every three days the ripe fruit is picked and placed in boxes. The dates are packed in crates or cases in which they are delivered to market. If left on the trees too long the fruit is of poor quality and lacks uniformity.

Sometimes the fruit is ripened artificially, either by being kept in cold storage for a few days at a tempe-
nature of $0^\circ - 12^\circ$C below zero, or left for 24 hours in a chamber filled with carbon dioxide. After the latter process, the fruit is spread out on matting in a damp atmosphere having a temperature of $36^\circ - 40^\circ$C and left for 48 to 60 hours. Some Palestinian date-growers dip their fruit in vinegar which browns it and accelerates ripening. In such cases whole bunches are picked. The dates are not separated therefrom, dipped in vinegar and thus artificially ripened. The most common method, however, is to leave the fruit on the tree until it ripens naturally and is picked as it ripens.

By-Products.

In addition to being eaten fresh (either in the dry or soft forms), or when pressed together and packed in boxes or in mats, dates are utilized for making syrups, various kinds of jam, and also a strong spirit called arak. The preparation of these by-products on a domestic scale is very widespread in Egypt but not so extensively in Palestine.

The main by-products are, however, obtained from the tree itself. As in Talmudic times, so also to-day, the midribs of the leaves are used for making crates for transporting the dates themselves as well as other fruits and vegetables to market. The date-growers in the Gaza district are especially handy in making the crates, which are light and yet strong. The pinnæ (or leaflets branching from the midrib) are also put to use in the making of all kinds of household articles, such as mats, ornamental baskets, crates and fans. In Acre and Gaza mats and crates are made of them. The pinnæ also serve for making ropes, for which purpose the sheath fibre is also used. The trunks, furthermore, are used by the Arabs for roofing. The city of Acre used to be especially noted for its manufactures from palm by-products, and although its production has fallen of late, even now one may see in the bazaar of the town basket-makers and mat-makers plying their trade.
Varieties.

(a) The Hayani is the leading variety of dates in Palestine, and is noted for its soft fruits which are eaten fresh. It would appear to have been introduced into the country from Egypt where it is numbered among the most important varieties of date-palm. Mr. T. W. Brown, F.L.S., Director of the Horticultural Section of the Egyptian Department of Agriculture describes the Hayani date as follows: "It is rather a large date, 40 to 50 millimetres long and 20 to 30 mm. in diameter, base rounded, apex bluntly pointed. Skin smooth and dark red when unripe. When the fruit is ripe the skin is almost black in colour. Although it does not rise naturally from the flesh, it is nevertheless easily removed with the finger and thumb. Cavity of date empty at the apex. Flesh moderately thick, sweet and crisp, but astringent in the unripe state; when ripe it is soft and sweet, with a small amount of fibres. Stone of medium size, widest near the rounded apex, base rounded. Surface smooth. Ventral groove regular and deep. Micropyle above the centre of the stone."

Fig. 5. Dates from Jenin.
The yield of the Hayani in Egypt varies between 200 and 250 kgs. per tree.

In Egypt the fruit of the Hayani ripens in the second half of August, but in Palestine it is ready a fortnight earlier and is consequently first on the Palestinian market. Experts consider that the Gaza Hayani is superior in flavour and taste to the Egyptian although it is smaller in size when compared.

(b) Bint Aisha. — This is also a variety which has been introduced from Egypt. Its fruit ripens a month after the Hayani, almost in October, and is therefore considered a late variety. The fruit is small, and as a date for consumption in the fresh state it is not the equal to Hayani. It is mainly grown in Palestine for the preparation of jam and confectionary.

Mr. Brown describes the variety in the following words: "The fruit is a medium-sized date about 40 millimetres long and 22 millimetres in diameter. Skin covered with a "bloom" similar to that of grapes, dark red in colour.
afterwards becoming black and shiny. Although the skin
is harsh and thick in the ripe state, it leaves the flesh
readily and is easily removed. The persistent perianth
becomes dark red in colour and is a distinctive characteristic
of this date. Flesh thick, sweet in the unripe condition.
In the ripe state the date has an excellent taste, the flesh
is soft and tender, without much fibre, but not very juicy....”

Owing to the scarcity of the fruit of this variety on
the market it fetches higher prices than the Hayani.

(c) Among other varieties introduced from Egypt
and Iraq, the Amhât of Egypt is worthy of mention. Its
fruit if of average size (20–35 mms.) and turns brown
when ripe. Mr. Brown describes it as follows: “.... apex
rounded, base flattened, skin pale yellow in the unripe
fruit, becoming light to dark brown later. Flesh... soft and
tender, with very little fibre in the ripe state. It is then
full of syrup and has a rich sweet flavour...”

(d) In the palm-groves in the Gaza district there
are to be found also a few trees belonging to the Amri
variety. This is a late variety, the fruit ripening in November.
It is used sometimes in the dry state, and as such commands
a high price (80 to 100 mils per rottel). Trees of this
variety are few in number, owing to the difficulty in
obtaining offshoots for propagation.

Following is Mr. Brown’s description of the Amri:
“The fruit is a large date 50 to 55 millimetres long and
about 25 millimetres wide, widest at or near the centre;
apex rounded, or bluntly pointed; base flattened. Skin
smooth, orange colour in the unripe state, becoming dark
brown later. Flesh moderately thick, not very sweet when
unripe, sweet and soft but rather dry when ripe...”

In Daganiah and Ain Harod there are also to be
found a few specimens of the variety Zaghlul and Samani.
These trees were introduced from Egypt where they enjoy
considerable repute particularly in the coastal regions.

The Department of Agriculture of the Palestine
Government introduced some time back from Iraq offshoots
of the following varieties and planted them at the Expe-
rimental Station of Jericho: Khadrawi, Halawi, Zahadi, Maktoum and Brem.
The trees have developed well, but have not yet reached the bearing stage.

(e) Among the local varieties, which apparently originate from seeds we can mention the following:

1. Baladi.—Small fruit, yellow, very sweet, prolific bearer, but flesh thin and stone large in proportion to the fruit. It fetches a low price. This variety includes the majority of the palms at Jaffa, Haifa, Acre, Jericho and Jenin. (Fig. 5)
2. “Jericho”.—The fruit is long and broad, measuring from 3.5 to 4.5 cms. by 2-2.5 cms. Colour reddish. Flesh thin and very sweet. Dries up rapidly. A very prolific variety. (Fig. 6).

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