

still around, but the temperature is supposed to rise to 40°.

We have had some near-zeros here the past two weeks. It went down to 6° one night about two weeks ago. I am, however, better prepared this time, and besides I have been here while all this has taken place. None of my palms have shown any damage at all. I did throw a crocus sack over the *Chamaerops* and the *Serenoa*. Of course I had already built a small "sack house" over my prize, the *Paurotis Wrightii* (*Acoelorrhaphe Wrightii*), and with the help of a 100-watt light bulb this plant is green and pretty.

I woke up Monday morning about two o'clock with the rain on the roof,

got up, turned on all the back lights and it was freezing just as it hit. You should have seen all those needle palms I dug last spring, with the weight of the ice bearing the leaves right on down to the ground. The other needle palms, two large ones I have had for many years, stood straight up covered with ice and later on snow, but never bending. The windmill leaves were downed by the sides of the trunk.

Next morning it was a sight to behold. I let air out of my tires and drove over to a hardware store and bought a sled for my grandson. He and his parents live seven miles out, with long hills around, so he really had a time with that sled.

---

## Date Culture in the United States

*An abstract consisting of excerpts, some of which are condensed, from Agricultural Information Bulletin No. 207, GROWING DATES IN THE UNITED STATES, by ROY W. NIXON, Horticulturist at the Date Field Station of the U. S. Department of Agriculture, Indio, California. Not all the information contained in the fifty-page bulletin could be summarized below even in condensed form for lack of enough space, and thus the matter reproduced is only a sampling of its contents. It is no longer available from the Government Printing Office. The accompanying illustrations are reproduced by courtesy of the U. S. Department of Agriculture.*

Dates are grown commercially in the desert sections of southern California and Arizona. Fruit production increased from 1 million pounds in 1926 to more than 48 million pounds in 1955. From 1949 to 1953 inclusive, importations of dates, mostly from Iraq, averaged approximately 40 million pounds annually.

In 1957 there were 4,808 acres of dates in California, distributed as follows: 4,850 in Riverside County (Coachella Valley), 151 in Imperial County (Imperial Valley and Yuma Valley, California side), 34 in San Diego County (Borego Valley), 35 in Inyo County (Death Valley), and 8 in San Bernardino County.

In addition there were approximately 350 acres of dates in Arizona. Of these, about 200 acres were in the Salt River Valley near Phoenix and about 65 acres in the Colorado River Valley near Yuma and the rest were scattered mostly in the Gila and upper Colorado River Valleys.

[Updating the above data on acreage: In 1962, the last year for which data have been published by the California Crop and Livestock Reporting Service, there were 4,543 acres of dates in California, 4,311 of which were in Riverside County (Coachella Valley). This represents a decrease of 260 acres from the total reported in 1957. No statistics are available for Arizona. See note in

brackets concerning acreage reduction at end of this article.]

Seedling date palms are found in Texas, principally in the lower Rio Grande Valley and in certain localities between Laredo and San Antonio. They are also found in the other Gulf States from Texas to Florida, but climatic conditions seldom permit the fruit to ripen.

The date is one of the oldest cultivated tree crops. The earliest known records in Iraq (Mesopotamia) show that its culture was probably already established as early as 3000 B.C. The date palm has also been in Egypt since prehistoric times, but its culture did not become important there until somewhat later than in Iraq. From western Iran (Persia) across Arabia and North Africa, dates have long been a staple food for the native populations.

The date palm was introduced into the Western Hemisphere by the early Spanish missionaries, who planted date seeds around many of their missions. A few of these original palms or their offshoot survivors, dating from plantings in the late 18th or early 19th century, are still to be found in southern California and below the Mexican border. However, the damp climate of the coast, where most of the early missions were located, is not favorable to fruit production. It was not until seedlings planted in the hot interior valleys of California and southern Arizona in the middle of the 19th century began to bear that attention was attracted to the commercial possibilities of date culture.

In 1890 the United States Department of Agriculture arranged through correspondence for a small importation of date offshoots, but these later proved to be inferior. It was not until 1900 and the years immediately following that offshoots of the better varieties were obtained by Department plant explorers,

who visited the date-growing regions of Algeria, Tunisia, Egypt and Iraq. The Department in cooperation with the State agricultural experiment stations made experimental plantings, first in the Salt River Valley, Ariz., and later in the Coachella Valley, Calif. These experiments attracted the attention of prospective date growers and led to several large commercial importations of offshoots during 1911-22 from Algeria, Iraq and Egypt, and acreage plantings were made possible.

The date palm is known botanically as *Phoenix dactylifera* L. The genus *Phoenix* is distinguished from other genera of pinnate-leaved palms by the upward and lengthwise folding of the pinnae and the peculiarly furrowed seeds. There are about 12 species, all native to tropical or subtropical parts of Africa or southern Asia. Several of these are fairly well known as ornamentals, the most highly valued being *P. canariensis* Chabaud, the Canary Island palm, extensively used along driveways and in parks across the extreme southern part of the United States. Another species, *P. sylvestris* (L.) Roxb., is cultivated in India as a source of sugar. *P. dactylifera* is distinguished from these two species by the production of offshoots, or suckers, and from other species by its tall, columnar, relatively thick trunk. Close relationship among the species is indicated by the ease of cross pollination and hybridization. All species are dioecious, male (staminate) and female (pistillate) flowers being produced in clusters on separate palms in the axils of leaves of the previous year's growth. Leaves of the date palm are 10 to 20 feet long and have a normal life of 3 to 7 years. Old or dead leaves are not shed, but are removed under cultivation.

For proper maturing of fruit, the

date requires prolonged summer heat without rain or high humidity during the ripening period. At Indio in the Coachella Valley, Calif., the maximum temperature frequently exceeds 110° F. and has been as high as 122°. Date leaves are injured by prolonged temperatures of 20° or below, but such temperatures are rare in the districts where dates are produced commercially in the United States.

Since rain at any time from early summer through the harvest season is likely to cause some damage to the fruit, commercial date culture has been developed only in districts where there is almost no rain during that part of the year. The amount of any particular rain is of less importance than the conditions under which it occurs. A light shower accompanied by prolonged periods of cloudy weather and high humidity may cause more damage than a heavy rain followed by clear weather and drying winds.

Dates are grown on a wide variety of soils. The maximum water-holding capacity consistent with good drainage is desirable. Coarse sand requires excessive fertilization and irrigation and permits rapid leaching of mineral nutrients unless underlain by more retentive soil of finer texture somewhere in the first 6 feet. On the other hand, good growth and production cannot be expected unless the soil takes water readily to a depth of 6 or 8 feet. Some of the finest date gardens in southern California are on deep sandy loams.

Dates may be grown either from seeds or from offshoots. When grown from seeds, approximately half of the palms will be male and produce only pollen. No two seedling palms are alike, and few of them are likely to produce fruit of good quality. However, when a seedling palm appears outstanding in any way, it can be propagated by its offshoots,

which will always reproduce the parent type. Then it becomes essentially a new variety or clone. Some new varieties originating in California and Arizona have been named, are being propagated and may have promise for the future, but it takes many years to prove their commercial value. In those parts of southern California and Arizona where the better imported varieties of dates can be grown, it is not desirable to plant seeds except for experimental purposes.

Where conditions are known to be unfavorable to fruit production, as in Florida and elsewhere around the Gulf of Mexico, the planting of date seeds of varieties more tolerant to rain is the most economical way of getting a few palms that may occasionally provide fruit for home use.

Date seeds usually grow readily when planted in well-aerated soil at a depth of 1 to 2 inches after the weather warms up in the spring. Seeds may be planted either in nursery rows or directly in permanent locations. To insure a good stand, two or three seeds may be placed in each permanent location and all but one of the seedlings removed later. Unless the young palms are grown in pots, where they can be handled without disturbance to the roots, it is better not to attempt to transplant them until after the second or third year. If the young palms are to be left in place until they can be culled out after flowering and fruiting, they should not be spaced closer than about 6 feet apart in the row. For best fruit production, each adult palm should be allowed a space equivalent to that used in commercial plantings, or about 30 by 30 feet.

A date variety, whether male or female, can be propagated only by offshoots, which develop from axillary buds on the trunk chiefly during the early life of the palm. When, after 3 to 5 years of





35. A commercial date garden in the Coachella Valley, Calif., consisting of Deglet Noor palms about 15 years old. Note the paper covers over the bunches to protect the fruit from rain and the high borders with irrigation water between.

attachment to the parent palm, these offshoots have produced roots and have started to produce a second generation of offshoots, they are then ready to be removed.

The cutting of a date offshoot from the parent palm requires care and skill, which can be acquired only by experience. Whenever possible the beginner

is advised to learn the technique by watching and assisting a skilled operator. The offshoot is cut from the parent palm by means of a specially designed chisel. [Illustrated in *Principes* 3: 136. 1959.] Two men are required for the cutting operation. A skilled workman handles the chisel, and under his direction a second man drives the chisel with



an 8- or 10-pound sledge hammer. The first cut is made to the side of the base of the offshoot close to the main trunk. The flat side of the chisel is put toward the offshoot and the beveled side toward the parent palm. This procedure will give a smooth cut on the offshoot and allow the beveled side to press away from the palm. A single cut may sometimes sever the connection. Usually one or more cuts from each side are necessary. No attempt to pry the offshoot from the palm should be made before the connection is severed.

Most varieties of dates are planted 30 by 30 feet apart. This spacing has generally given more satisfactory results than other spacings that have been tried. However a variety like Khadrawy, which grows slowly and makes a relatively small palm, can be planted 2 to 4 feet closer without undue crowding.

It is essential that the soil near the newly planted offshoot be kept moist at all times by light, frequent irrigations. Inspection should be made often during the first few weeks to see that the surface soil does not dry and shrink away from the offshoot. Irrigations every second or third day will not be too often on most soils, but on very heavy soils once a week may be sufficient.

Careful attention to irrigation in order to maintain good palm growth and high yields of fruit of the best quality cannot be stressed too much. Bearing gardens on the lighter soils are usually irrigated every 7 to 14 days during midsummer and every 20 to 30 days during winter. On the heavier soils irrigations are somewhat less frequent. In some localities where a permanent water table occurs at a depth of 6 to 8 feet, even as few as four to six irrigations a year appear to be adequate. In any case soils should be kept moist to a depth of 7 to 8 feet.

Experience in the Coachella Valley in-

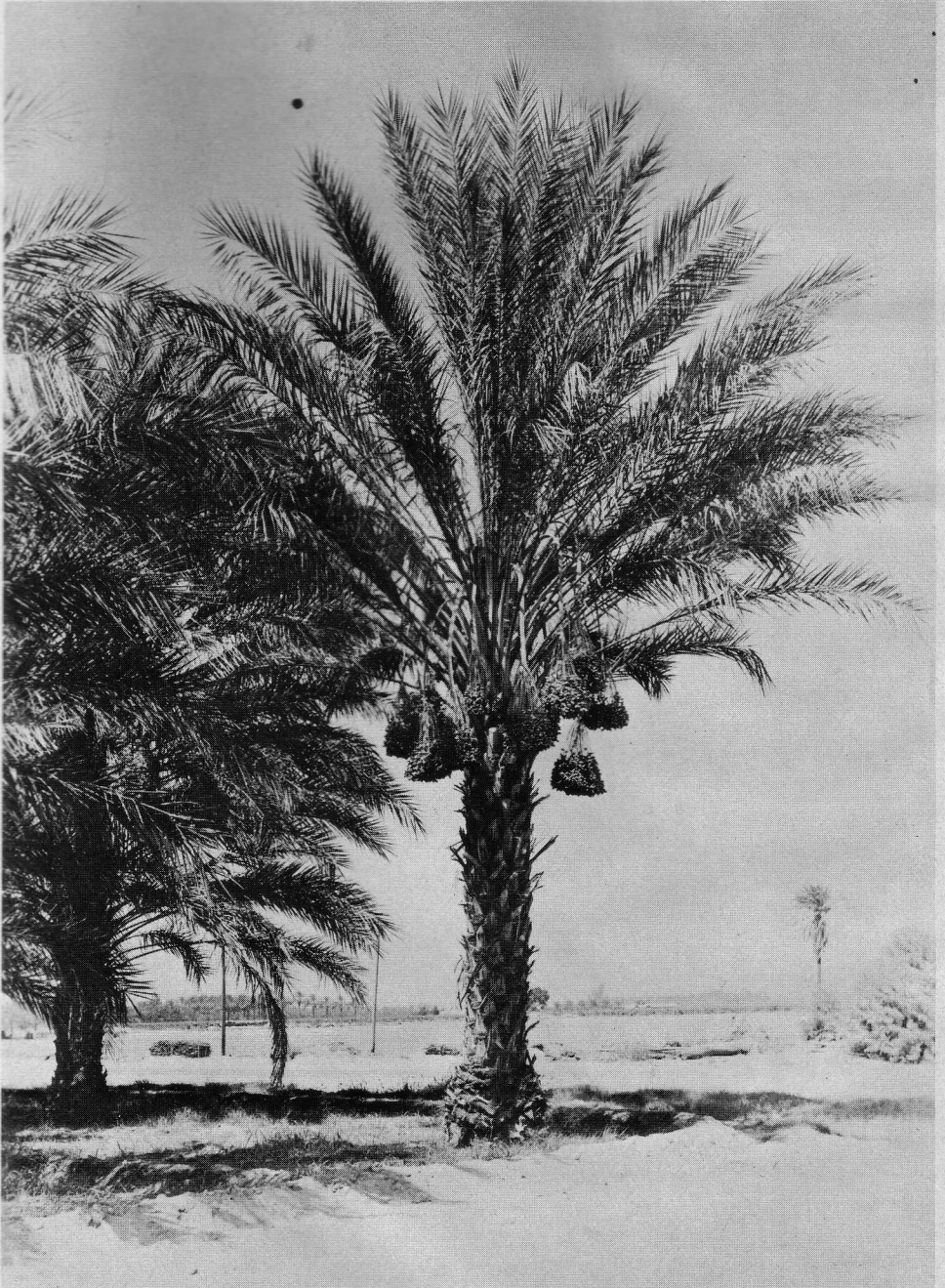
dicates that on light soils not less than 9 to 12 acre-feet of water per year is necessary for palms in full production and that from 12 to 18 acre-inches per month is required during the summer. On heavy soils in other districts half this amount may be enough.

Fertilization has generally been found necessary to maintain the quantity and quality of production, but there are few experimental data bearing on the kind and quantity of fertilizer or on the time of its application. Since a palm may make better growth in a good soil with little or no fertilization than in a poor soil with heavy fertilization, any program must be adapted to the soil type in each garden.

Animal manures are widely used in the better date gardens of the Middle East and North Africa. In California and Arizona barnyard manure is applied at the rate of 5 to 15 tons per acre. Inorganic nitrogen in its various forms is also often used in date gardens in California. The amount applied should be determined on the basis of whether it is used alone or in combination with manure or cover crops. Studies thus far indicate that the total application of 4 to 6 pounds of actual nitrogen per palm from all sources is adequate on most soils in the Coachella Valley.

Cultivation is commonly restricted to turning under cover crops or weeds and to preparing the land for irrigation.

Considerable evidence indicates that, other conditions being equal, the bearing capacity of a date palm is in proportion to the number of green leaves it carries, but removal of a few green leaves is justifiable under certain conditions. As many as 180 green leaves have been counted on a single palm unpruned for 6 years. With the Deglet Noor, which has long fruitstalks, removing the leaves up to about the point



36.A Deglet Noor palm at twelve years of age that had had 166 green leaves before the number was reduced to 88, as shown above, by pruning off enough to clear the tops of the fruit bunches. Such severe pruning tends to lower the bearing capacity and usually results in a light crop the following year unless the number of bunches is proportionately reduced.

where the lower ends of most fruit bunches are exposed has proved satisfactory on palms in full bearing. When Deglet Noor palms are over 20 years old, they seldom retain leaves below the mature fruit bunches; pruning should be confined to removing dead or dying leaves.

Occasionally during a severe freeze varying proportions of the green tissue on all the leaves on a palm may be killed. When the leaf area is drastically reduced in this way, it is desirable to retain all leaves with any remaining green tissue.

Sometime during the winter the spines are removed from all leaves of the previous year's growth to facilitate pollination and subsequent handling of fruit bunches. A sharp pruning knife with a long, curved blade mounted on a handle a foot or more in length is most frequently used for this work.

Date palms are dioecious; that is, the male flowers that produce the pollen and the female flowers that produce the fruit are borne on separate palms. For commercial fruit production the female flowers must be pollinated by hand. The most common method is to cut the strands of male flowers from a freshly opened inflorescence and invert two or three of them between the strands of the female flower cluster during the first 2 or 3 days after it has opened. Twine is tied around the pollinated cluster 2 or 3 inches from the outer end to hold the male flowers in place and prevent the strands of the female cluster from becoming entangled as the cluster pushes out between the leaves. To provide for expansion of the cluster as the fruit develops, the twine is commonly tied in a slip-knot with the free end long enough to permit later adjustment to the maximum size of the fruit bunch.

With most commercial varieties after the pollination season, the bunches are

pulled down through the leaves and the fruitstalk is tied to the midrib of one of the lower leaves. This prevents much scarring of the fruit and lessens the later danger of fruitstalk breakage by supporting the bunch as its weight increases. With young palms, bunches are held off the ground by attaching the fruitstalk to one end of a wooden stake.

With most varieties and in most districts it has been found desirable to protect the fruit from rain by covering the bunch during the ripening season. Paper bags or tubes attached to the fruitstalks immediately above the bunches, with the lower ends left open, are most extensively used. Covers are usually put on after the fruit begins to acquire its khalal color. Fruit enters the khalal stage when it has about reached its maximum size and the green of the growing period is replaced by a shade of red or yellow or a combination of the two colors characteristic of the particular variety at this time.

After the covers are attached, the sides may be turned under and rolled up so as to allow free air circulation about the fruit until rain threatens, at which time they should be pulled down. This is not often practicable on account of the labor involved, except with young palms or small plantings. The importance of bunch ventilation increases with the frequency of showers and periods of high humidity during the later stages of fruit growth and ripening. It may be necessary to protect the bunch beneath with a good grade of porous cloth or netting that will exclude birds and insects but at the same time not interfere seriously with ventilation. Bunch thinning promotes better aeration of fruit under covers, especially when most of the thinning is done by removing center strands.

As all dates on one bunch do not ripen at the same time, several pickings are



usually required to harvest the fruit during a season, which lasts from 3 to 4 weeks for early varieties to 2 or 3 months for late ones. The dates of a few varieties are not picked individually. Dry dates like Thoory are left until all the fruit is fully ripe, and then the entire bunch is cut. With the semidry variety Zahidi, entire bunches are also sometimes cut after all the fruit is ripe, and then the drier fruit is softened by hydration.

For picking soft dates, which require more care in handling than the firmer types, shallow trays should be used, and the fruit should be not more than two or three layers deep to avoid crushing and bruising. The firmer or semidry varieties may be put in deeper containers, buckets being commonly used.

Picking becomes somewhat of a problem as palms become older. Ladders of increasing length are used as the palms grow taller. Extension ladders of light weight metal are favored for palms over 25 or 30 feet high. Some growers simplify the problem of carrying very long ladders around to reach extra high palms by attaching a straight ladder permanently by the trunk to cover the 10 or 20 feet immediately below the crown.

### Ripening Fruit at Home

In many localities from southern California to Florida there are a few date palms in the home garden or yard. The fruit from such palms may often be utilized, but it must be handled with improvised facilities at home. Outside the commercial date districts of California and Arizona these palms usually will be of seedling origin, and the owner should remember that the fruit will not be exactly like that of any other date palm. The best way of handling the fruit will have to be determined by experimenta-

tion and will depend to some extent on its texture, time of ripening, and reaction to rain and high humidity. Wherever and whenever the climate is warm and dry enough, the fruit should be left to complete ripening on the palm, as the best quality is obtained in this way and less labor is required. However, when showers are likely to occur during the ripening season or when fall temperatures become too low, it may not be ad-



37. Pollination of date flowers: *a*, strands of male flowers being placed in the center of the female cluster; *b*, freshly opened spathe ready for pollination; *c*, flower cluster after pollination. Twine is tied around the strands to hold the male flowers in place and to prevent tangling in the leaves. The tips of all strands in the female cluster were cut back at the time of pollinating as the first operation of fruit thinning.



38. Harvesting dates, showing picking belt in use.

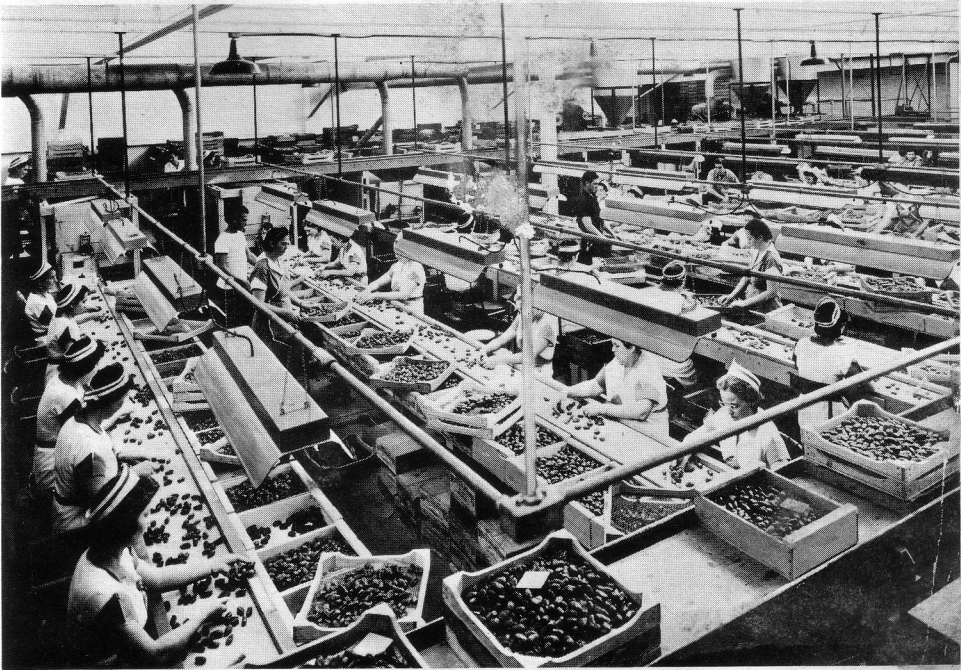
visible or possible to leave the fruit on the palm until it is fully ripe. The following suggestions are offered as a basis for experimentation.

Satisfactory results are sometimes obtained by cutting the entire bunch and hanging it in a relatively warm, ventilated room screened from insects and rodents. If as much as 10 percent of the fruit of certain types of dates has already ripened before the bunch is cut, a much larger proportion of the fruit will ripen later and can be picked as desired. This

procedure is often followed in southwestern Texas.

If the fruit cannot be handled by the bunch method, ripening may usually be completed off the palm if the dates are picked individually as they begin to soften at the tip. Small lots of such fruit may be completely ripened with a few days' exposure to the sun when they are placed either in glass jars with the lids loose or in trays screened to exclude insects.

For better control in handling, it may



39. Grading dates in a modern date packinghouse.

be desirable to construct a maturation box with glass or Cello-glass for the top and screened ventilators on the side to permit some regulation of the sun's heat. The fruit should be placed in shallow layers in screen-bottom trays which should be raised a little so as to permit circulation of air about the fruit. Until the fruit has completely softened, the humidity should be kept high by regulating the ventilators. If additional humidity is needed, it may be supplied by placing a shallow pan of water in the box, by hanging wet cloths near the fruit, or by adding water to the air with a hand sprayer. To ripen dates in this way may require from 1 to 8 days, depending on the maturity of the fruit at the beginning and on temperatures during treatment. If the temperature within the box during the day exceeds 120° F., partial shade with muslin cloth or similar material should be provided. An

old blanket placed over the box at night will help to retain the heat.

Controlled heat from any source may be used. Where electricity is available, maturation boxes or cabinets may be constructed so as to use the heat from either electric bulbs or small heating units, regulated to provide temperatures from 100° to 125°. The oven of an electric stove may be used if the temperatures are carefully watched and regulated. Unless there are accurate thermostat controls for maintaining temperatures below 125°, it is preferable to preheat the oven to a somewhat higher temperature, then turn off the heat, put the fruit in, and allow the oven to cool. Fruit should be placed in a single layer on wire trays or cooky sheets. If the flesh is not completely softened by the first heating, the trays should be removed, the oven preheated again, and the process repeated. Two or more treat-



ments may be required. A temperature of 200° or "low heat" is recommended for preheating in Arizona.

Small dehydrators have been designed for home use. They are very satisfactory and may be used for both maturation and dehydration by providing for increased humidity and temperatures before the fruit has softened. At the end of the dehydration process, if the fruit has not been previously fumigated, the temperature is sometimes raised to 150° for 1/2 to 1 1/2 hours to destroy any insects or their eggs that may be present. As temperatures above 150° are likely to affect the flavor adversely, it is well to use thermometers and check them from time to time.

In the United States there are no diseases or insect pests of the date palm that have reached serious proportions so far as the industry as a whole is concerned. [The Bulletin goes on to describe the diseases and pests that have been observed. It then describes seventeen varieties of dates. This is followed by a bibliography, or list of the literature cited, containing 110 titles.]

[Note on the reduction in date acreage since 1957: The principal reason for the reduction is the rapid increase in popula-

tion in California and Arizona and the mushrooming subdivisions springing up in the desert areas where dates have been planted. While dates have not proved to be as profitable as was anticipated fifty years ago, on good soil with good management in localities where the climate is favorable, returns during the past decade have been satisfactory and there is little doubt that the date industry is here to stay. An interesting result of recent development in the desert is the widespread use of date palms as ornamentals. Large palms are in demand for immediate effects in landscaping and those of any species grown in nurseries are expensive and in short supply. When a date garden is subdivided, about two-thirds of the palms must be removed, so are available for planting elsewhere. Of course special equipment is necessary for handling tall palms that weigh a good many tons. Many of these palms, 25 to 50 feet high, are being planted in groups on golf courses and in ornamental border or background arrangements. Some of these large date palms are actually being taken over the mountains for similar use around Riverside and even into some parts of Los Angeles and Orange counties.]

---

### THE EDITOR'S CORNER

Those who make it to Indio in April, shortly after the Biennial Meeting, will find the date gardens extremely interesting if they have never visited them before. And the same thing goes for the whole story of date culture. The account of it in this issue of PRINCIPES should prepare visitors better to understand and appreciate what they may see in a date garden . . . When last heard from, our editor Dr. Moore was still on the other side of the planet — down in Australia, but up in northern Queensland, at Cairns, on the coast of the Coral Sea. From there he writes "It takes two sheets of paper to keep my arm from sticking to this page, such is the heat." Palmwise he says that "Australia has been rewarding in that I now have complete sets of material for *Carpentaria* and *Laccospadix*, which have not been well understood. It has been interesting to see the two species, *Ptychosperma elegans* and *Normanbya Normanbyi*, in their native habitat. Now off to Lord Howe Island where I hope my luck will continue for *Hedyscepe* and *Lepidorrhachis*."