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REPORT OF
THE FIRST DATE GROWER'S INSTITUTE

AT COACHELLA IN
COACHELLA VALLEY
CALIFORNIA

FEBRUARY 29th and MARCH 1st, 1924



Held under the auspices of the Agricultural Extension Services of California and Arizona and the Farm Bureaus of Riverside and Imperial Counties of California, co-operating with the U. S. Department of Agriculture.



Published by
COACHELLA VALLEY FARM CENTER
April, 1924

Date Grower's Institute, Report.

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FOREWORD

THE transposition of date palms from the Old World to the New and the successful establishment on a new and modern basis here in our own Southwest of an industry as old as civilization itself, marks what is perhaps the most wonderful of all great achievements in the realm of Horticulture.

Those who have worked with and watched the development of this fascinating new fruit industry from the first few purely experimental plantings to a point where there are now between twenty and twenty-five thousand thriftily growing young palms of choice varieties set out in orchard form are now able to take much satisfaction in the promise of the approaching high rank of date growing among other great fruit industries of this country.

In the publication of the experiences and personal opinions of pioneer growers and others closely identified with date culture, as set forth in these papers given at the "First Date Institute Held in America" it is hoped that a beginning has been made toward the recording of date history that may be said to be truly American.

T. J. GRIDLEY
Chairman of Date Growers' Committee
Coachella Valley Farm Center

Program for Improvement of Date Industry

By Dr. H. J. Webber, Professor of Sub-Tropical Horticulture and Director of the Citrus Experiment Station, University of California

WE are opening the first annual Date Growers' Institute. No such institute has been held before in the United States and as far as I am informed no such meeting representing the great date industry only has ever been held in any country. While the date industry was started thousands of years ago in the beginnings of human civilization, its development and extension have until recently been limited to countries where little attention has been given to the development of science and thus through all the many long centuries of its culture little advance has been made toward an exact scientific understanding of the problems involved in the industry.

The speaker very clearly remembers that it is only a short time ago in the early years of the 20th century that he first heard Mr. W. T. Swingle's discussions in the Department of Agriculture at Washington regarding the possible feasibility of growing Date palms in the warm dry regions of our arid Southwest. Mr. Swingle's enthusiasm was convincing and he was soon commissioned by the Department to visit date regions of the old world to secure plants or offshoots of desirable varieties to test at favorable points in the Southwest. This was the beginning of the American date industry. True many seedling date palms had been grown in California, Arizona and other countries of the new world long before this time but no advance had been made anywhere toward the establishment of an industry and no interest in the matter had been manifested. In a short time the offshoots secured by Mr. Swingle were planted in experimental orchards in Arizona and California and an American date industry was established.

While this first pioneer work is quickly passed over and seems simple, it was a task requiring painstaking study and the overcoming of great difficulties. Where could the palms be obtained? What varieties should be imported? How could they be shipped such a long distance? Where among the many possible places would they be most likely to

succeed? All of these and many more questions must be studied and answered and the machinery for handling the project organized. It is not the writer's purpose to explain the details of this great work which are well known to the majority of date growers of California and Arizona. He cannot pass however without calling attention to the noteworthy achievement of Mr. Swingle in correctly judging the climatic requirements of the industry. After a very thorough and extensive study of the complex climatic requirements involved, gardens for experimental trials were chosen at Tempe, Arizona, at Heber in the Imperial valley and at Mecca in the Coachella valley in California. It is in these three sections in general that the American industry still remains the most promising. Had a mistake been made in the regions chosen for the first trials, failure might have resulted and the establishment of the industry been delayed for many years.

It is less than a quarter of a century since the first imported offshoots were planted in the United States and yet in this short time material advance has been made toward a rational understanding of the problems involved in the prosecution of the industry. We Americans are prone to be dissatisfied with the normal slowness of development. We want results at hand when we need them. The development of the date industry may seem slow to the man in the field toiling daily in his struggle to succeed yet we have advanced in our understanding of the industry by leaps and bounds. I doubt not that already the most advanced methods of date culture in the world and the best general understanding of the industry is to be found among the growers of California and Arizona. We have made more advance in two decades than some countries have made in many centuries. Already the available literature on the date industry is largely to be found in the United States for which we have to thank such men as Swingle, Popenoe, Forbes, Vinson, Fairchild, Mason, Kearney and others.

While our advance has been phenomenal, and I think we are justified in so considering it, yet I am sure we are all keenly alive to the fact that much yet remains to be done. In the words of the street we know that we have not yet arrived. Indeed every grower appreciates fully that the American industry is still in an early pioneer stage. It is well for us at this period to thoughtfully inquire how far we have advanced, whither we are drifting and what can be done to guide the industry in the best and safest channels.

It is not the writer's intention to attempt to analyze the situation as time would not permit of this even if he had the requisite knowledge of the industry. He is not a date specialist as all of you know. He may, however, as a student of California horticulture be justified in making certain suggestions for your consideration in an attempt to justify the title of the address scheduled by the organization committee.

The most important factor now necessary to insure the thorough success of the date industry in the judgment of the writer which is based on talks with various growers, is to be found in that magic word of so many and varied meanings—cooperation. I do not mean cooperative marketing although this is involved, but thorough cooperation in every direction and in every way every day to push the development of the industry. What is needed is cooperation in management; cooperation in development; cooperation in advertising and developing markets; cooperation in guiding legislation relating to the industry, both state and national; cooperation in developing standards; cooperation in solving cultural and scientific problems; cooperation in disease control and all like problems.

In date growing a wonderful opportunity exists that cannot be realized in widespread industries. From its nature, the industry is likely to be pursued in an intensive way in regions of limited area. In this relatively small valley in which we are meeting it is already the dominant

industry. The problems of every grower are practically the same and all are engaged in an attempt to reach the best solution. How can these solutions best be obtained? The answer is by cooperation. You may cooperate in demanding more assistance from the government and from the state but after all the solution of most of your problems must rest with you. It is only on the difficult problems requiring painstaking investigation that you are justified in requesting the aid of the government. As I see the matter, the solution of most of your local problems with reference to methods of culture, how to apply water, when and how much to apply, how and when to fertilize and the like, are problems that can be most quickly solved for local conditions by local cooperation. Already a great fund of information has been created that exists mainly in the minds of different growers in the valley. How are we to make this information general? By cooperation. No farmer should ever pretend to have any "trade secrets" regarding his cultural methods. Time and time again it has been demonstrated that the most successful farmers are those that give freely at all times of their experience and knowledge.

I presume that the reason I have been asked to appear on your program is that keenly realizing that a great deal of information had been accumulated by different growers which was as yet not generally distributed or available in published form, I was led over a year ago to suggest and urge such a conference as this in order to bring together and publish the papers given and the experiences related. This urging has finally crystalized into this institute in which many growers are freely cooperating to spread information, a meeting held under the auspices of the Farm Bureau and the Agricultural Extension Service of the state and national government.

Gentlemen I feel that this meeting is likely to mark an epoch in the date industry of the United States. We lack printed information on the every-day methods. This, the published reports of these institutes will supply and by annually exchanging ideas at these meetings and publishing the papers, you will soon establish a literature of date growing that will be unequalled in any industry. I feel that these proceedings should be published in good form with good illustrations rather than in cheap and temporary form, so that they will be preserved in the library of every grower and in the public libraries of the country. May I urge this point as very important. In my judgment, nothing will more quickly focus the

attention of the world on your industry than the publication regularly of good literature regarding it. We have an illustration of the great value of such united effort in the publication of the proceedings of the California Avocado Association which now form by far the best and most extensive literature on that industry.

Cooperation in the solution of local cultural problems is one of the important factors, to which growers should give more and more attention. Committees of the local Farm Bureau working in conjunction with specialists of the University or of the Federal Department of Agriculture should be able in a few years to secure information of value on many perplexing problems now confronting date orchardists. As an illustration the perplexing problem of fertilization is one on which definite information is much needed. To purchase land, establish a special station, equipped with teams and tools and properly manned would be an expensive project and require many years to get results. Almost or possibly fully as reliable results could be obtained much more cheaply and quickly by a cooperation of growers where each one carried out under a general plan certain portions of a large experiment. This cooperative method I believe to be fundamental to the quick solution of many of our orchard problems.

Such a method could be used to determine kind and quantity of fertilizers to use on different soils and the best time of application, the methods of irrigation and quantity of water to use as well as frequency of application. Such methods can also be used in finding solutions for certain economic problems confronting the industry. Such for instance as the best intercrops to grow to obtain an income while orchards are developing.

Of interest in this connection is also the obtaining of definite data on the problem of combined or single cropping systems in which the writer has become much interested. Is the greatest income to be expected from growing orchards of dates alone or by a combined culture such as is described as common in the best orchards of the great Mesopotamian date region where citrus trees are commonly grown among the dates even though the latter are planted in general much closer together than is the practice in this valley. In the Coachella and Imperial valleys where dates and grapefruit are being planted extensively and are expected to develop into important industries, conditions suggest that possibly a combined planting might be more successful financially than either

crop grown alone on the same land. It is an interesting fact or at least I believe it to be a fact that citrus trees show no injury from competition when grown under palms such as the date in California or the palmetto in Florida. The shade of the palms and the protection from wind injury apparently results in an improved growth of the citrus tree and the production of an increased quantity of superior fruit. Furthermore as far as I have been able to observe from isolated cases here and there the palm is not injured in any observable way. After date orchards begin to develop trunks and get the crown of leaves up out of the way, it thus seems probable that grapefruit trees might be interplanted and serve to greatly extend the profits from the same area of land. A slight increase in water supply and fertilizer might be demanded but very slight in comparison with what would be required for the same number of trees planted separately. From what he has observed the writer would feel reasonably certain that the grapefruit trees would do just as well or better under such combined culture than if planted alone but he is not so certain of the effect to be expected on the yield of the dates. Many other crops might give good results planted in combined culture with the dates but all such combinations will require to be determined by trial.

The writer does not wish to be understood as recommending the combined culture of dates and grapefruit other than as promising for experimental trial. It seems likely that the planting of grapefruit in date orchards had best be made after the dates have reached an age of 8 or 10 years or older, and it is to be hoped that growers in the near future will make a number of such experimental plantings.

Much information of great value to the industry could unquestionably be obtained by the orchard survey method such as has been used recently and very successfully by Professor Vaile of the Citrus Experiment Station in following the history of about 1,000 citrus groves during a period of five years. Every orchard by this method is an experiment station and its methods and results are followed comparatively.

In closing this talk I wish to express to the Directors of the Farm Bureau, and to the farm advisors of Riverside and Imperial counties who have been active in arranging for this Institute my appreciation of their efforts and my belief that they have started a movement that will be of great value to the Date Industry.

Management of a Bearing Date Garden

By T. J. Gridley, Manager of Narbonne Ranch, Coachella Valley

LIKE other branches of fruit growing, the care and management of a bearing date garden resolves itself generally into the main problem of maintaining the palms in a condition of maximum productivity from season to season. Unlike most other fruit trees, the yield of which may be very largely controlled by pruning, the date palm is very much a law unto itself and has the power, when unfavorably reacted upon, to either materially reduce, or even entirely withhold its fruit. It would follow, then, that the care of a date garden should be directed specifically toward the maintenance of each individual palm, in as uniform a state of productiveness as possible.

Given land of average fertility, after the offshoots are well started, it will be found that during the first four or five years of the life of the young palms, neither unusual amounts of water or practically any fertilizer will be required to promote such growth as will be satisfactory in the production of some fruit and the development of hardy and well matured offshoots. By the sixth or seventh year, it may reasonably be expected that with average good care, a majority of the palms will have matured most of their offshoots, and they will have been removed, thus rendering the whole strength of the palm available for fruit production. It will be from this time on that the grower will most fully appreciate the effects any extra labor and planning that may have been put into the grading of the land and the laying out of his date garden. For the date palm is no different from other trees and growing things in being truly responsive to all good treatment that may be lavished upon it. And once it has settled down into the business of fruit making, it may be depended upon to return many fold extra expenses incurred for its care and nourishment.

That water is of prime importance in the production of a date crop no one will question. All history of the date palm, down from the very dawn of civilization itself, indicates that its culture was carried on only in spots where abundant water was available. It has been found through practical experiments

in this valley that the usual furrow system of irrigation, except perhaps in the most sandy soils, does not afford the maximum amount of penetration necessary to insure the ample and uniform supply of water required by a date palm, particularly at the time of fruit formation and during the earlier stages of its ripening. Whether or not a date palm may be given too much water, must, in the light of limited experience, be seriously doubted, particularly on well drained soils. Of course, if water is allowed to flood continuously around palms, and to stand more or less stagnant over considerable periods of time, it is quite evident that injury would likely result through lack of soil aeration and consequent suffocation of feeder roots. The border and check system of irrigation has been found highly desirable wherever the lay of the land can be adapted to this method. Water should be applied at regular intervals according to the season, and just as soon as the soil has dried out sufficiently, clean cultivation should be practiced between each irrigation, except, of course, during such periods as may be devoted to the raising of cover crops, which unquestionably are destined to play a very important part in date garden management.

What is perhaps of really more importance than the crowding of a lot of expensive fertilizing materials into the ground, is the first placing of the soil into proper condition to allow the small feeder roots of the palm to take up and assimilate to the greatest degree the ingredients essential to maximum plant growth. Annual cover crops have demonstrated their efficiency as soil conditioners in supplying the humus that is usually so deficient in our desert soils. In this connection the fact must not be overlooked, as it too frequently is, that in the growing of a cover crop in any orchard, sufficient water must be supplied to meet the requirements of two crops at the same time. At certain seasons this will mean that at least double the usual amount of water must be held in readiness to be applied when needed, particularly near the close of the period of maturity of the cover crop, or just before it

is plowed under. Recent experience has shown that it is not too much to expect that copious irrigations may be desirable every seven or eight days during the last thirty days of cover crop growth, especially so if this growth should extend into late April or early May.

The annual application of barnyard fertilizer has proven to be of distinct value in the production of heavy crops of dates. Provided ample and frequent irrigation is practiced afterward, there seems at the present time no limit, within reason, that may be set on the amount of such fertilizer that may be advantageously applied. Commercial fertilizers have not yet been tried to such extent that it is possible at this time to draw any definite conclusions or make recommendations. There is no reason to suppose, however, that, once the proper formulas have been developed, the action of such fertilizer would be anything other than beneficial.

Unlike many other fruit bearing trees, the date palm, not relying largely upon methods of pruning for the formation of fruit wood, can be handled with a minimum amount of trimming. After the palms have reached the age of seven or eight years they will have had a sufficient number of bottom leaves removed, in the natural course of events, so that teams or tractors can work close to and under them. From this time on, it seems desirable to allow the palm the full possession of all the leaves it is willing to carry in a thrifty condition, removing only those from season to season that dry back naturally or are found to be absolutely in the way of handling the fruit clusters. It is generally accepted that a date palm in full bearing should carry from 100 to 150 full sized leaves.

In the matter of the pollination, the grower will undoubtedly select the method best suited to his particular location and individual preference. Given an ample supply of fresh, fertile pollen, any of the several methods of application now generally used will accomplish excellent results. To this end the careful grower will do well to select his male palms with the greatest care from either early blooming seedlings

of good type, or, as may later be possible, propagate them from offshoots descended from a few good males that were brought in with the earlier palm importations. The matter of securing good pollen is something that cannot be too strongly emphasized, and the male palm should receive just as much water and good care as any bearing palm in the garden.

After pollination, it has been found very desirable to keep the young fruit cluster in fairly compact form while it is making its way downward through the leaf branches. Tying loosely at the time of pollination with any sort of strong inexpensive twine and using a slip knot to facilitate frequent loosening, will usually serve to keep the fast expanding cluster from becoming tangled up with the leaf stems, and also prevent in great degree the scarring and chafing of fruit by winds. After the clusters have begun to pass downward through the leaf branches it will often be found necessary, in order to avoid "kinking" of the stems before they are fully hardened, to lash them to adjacent leaf branches as a means of temporary support. It is always best to pass the twine through the threads at the head of the cluster to avoid slippage. In propping, a certain proportion of the clusters will at first have a tendency to bounce off the props, particularly during a hard wind. Tying down with coarse twine for a week or so until the stem becomes fitted to the prop will usually remedy this difficulty. It is absolutely essential that care be used in the placing of the prop, particularly so on younger palms which have a tendency to throw out very long slender fruit stems. Hooking one end of the wire support into the first few threads of the cluster will usually correct the tendency of these stems to whip and perhaps kink above the prop. As the date palm grows older, the grower will find his propping difficulties gradually decreasing. Nature provides for the support of increasingly heavy clusters of fruit by thickening and strengthening of the fruit spathes. Beginning about the sixth or seventh year, many of the spathes will be noticed coming forth from the palm in an edgewise position, with a strong tendency to curve inwards toward the trunk. Season by season this strengthening increases, until at length about all the artificial support necessary is a short prop to keep the fruit clusters far enough away from the trunk to facilitate working around them.

Dates, like most other stone fruits, have been found responsive to thinning. However, the time for experimenting has thus far been so short that it is not possible at this time to draw very definite conclusions or make any especial recommendations. It may be definitely stated, however, that it is possible to allow individual date palms, under certain conditions, to put on so much fruit that they are obliged to "lay out," or rest up, the following season. The individual grower will necessarily have to experiment and find out for himself just how much fruit his palms are capable of bearing and "coming back" each season. As to the methods of thinning, of several that have been tried so far, that of clipping off a portion of the end of each individual cluster, rather than the removal of entire clusters, appears to hold forth the most in practical possibilities. However, it has already been demonstrated that there is a point beyond which it may be unwise to carry this method. Speaking generally, it may be assumed that cluster reduction can be carried to an extreme whereby the fruit may be increased in size at the expense of quality, and, furthermore, result in the ripening of some varieties unseasonably early. There is, no doubt, a nicely balanced point past which it is best not to carry thinning of date palm fruit, which for the present, at least, must needs be determined by each grower for himself. Whatever thinning is done, to be really effective, should take place before the seeds of the dates begin to harden.

After the fruit has attained its size and the processes of maturing have begun to set in, the grower who expects to get the most out of his crop will do well to consider some form of individual cluster protection, both from the attacks of birds and from unseasonably wet weather. Such varieties as ripen their fruit wholly on the palms may be cheaply and satisfactorily protected from bird damage by the use of light muslin or heavy cheesecloth bags, sewed in the form of cylinders of ample size, to be pulled up and tied both above and below the clusters. The use of paper bags for protecting this class of dates has not proven uniformly successful on account of the high temperatures usually prevalent at that particular time of year, and the consequent rise of humidity within the cluster, causing possible fermentation, or at least marked increase in stickiness of the fruit. Dates of the firmer

types, which usually do not begin to ripen quite as early as the softer varieties, will not often require protection from birds during the early and warmer parts of the season. While cloths may also be employed on these to advantage, a form of very light, tough paper bag has been found doubly efficient, in that it also tends to equalize temperature and moisture conditions within the clusters, which will be found of most value during the short periods of low humidity and high temperatures which often occur in the early fall. It must be frankly stated, however, that the use of paper bags for the tree ripening of late dates has not so far worked out to the point where it is "fool proof." For instance, should a period of high humidity suddenly set in, the use of paper bags may cause real damage to the fruit. To that end it is wise to provide holes near the bottom of the bags, that can be readily opened or closed according to the weather, and in extreme cases it may even be desirable to entirely remove the bags for a few days. In the matter of rain protection a very practical method has recently been worked out, which employs a cylinder of double water-proofed crepe paper, which is tied water tight around the stem just above the cluster, and then belled out to form a wide, sloping, hatlike cover just above the fruit. The skirts of the hood are purposely left long enough so that they may be tucked up under all around, thus further enhancing the spreading and hat effect. This form of protector will shed a light rain very effectively, but in case of an impending downpour the tucked under portion may be quickly pulled down, thus affording cover for the entire length of the cluster. Combining this method of hooding with the cloth or paper bags below assures the maximum amount of protection of both kinds and has the added advantage of affording quick access to the cluster for inspection and picking.

The best methods now in vogue for picking dates do not differ materially from those employed in the harvesting of other high grade fruits. Attention to the preservation of the shape and attractive appearance of individual fruits should be insisted upon. Soft dates should be picked only in one layer, or at most, two layer berry baskets and brought the same day to the packing house where they may be spread out. Firm dates may be picked in shallow lugs, never filled quite full. Pickers should be trained to distinguish be-

tween fully ripe and partly ripened fruit, and to place them, as far as possible, in separate baskets or boxes. They should also be instructed to sort out any fermented fruits and to

throw them not directly under the palms, but far enough out, so that they may be cultivated into the soil. In conclusion, these high points may be emphasized for the consideration of the grower—abundant water, ample fertilization, protection of the fruit, and at all times careful study of individual palms, with the view of bringing out the most that is in them, to the end of producing more and better fruit.

Growing and Marketing Dates with Low Overhead Cost

By Roland Reed, El Centro, California

FOR economical reasons, thirty feet square seems to be far enough apart for date palms. If an acre of land will not support forty-eight palms, it will probably not support forty and all date growers who are not cultivating and fertilizing the soil for date palms will surely do so in the near future. The more leaves and luxuriant growth of the palm, the more and better fruit it will produce. It is not advisable to take the leaves off the palm until they droop down and are dying back, although it is advisable to trim off thorns and spikes on the leaf stem. This will save much time later on harvesting the crop and may save injury or loss of eyesight. I have found a short heavy knife, such as a corn knife, mounted on a six or eight foot hard wood handle, convenient for cutting these thorns and spikes.

We know that plenty of water and a rich soil are necessary to grow a thrifty palm; but just what to apply to the soil in the way of a fertilizer to improve the fruit we do not know. It is advisable to plow under cover crops and apply manure. Cover crops between the palms will help toward the expense of maintenance. Peas, beans or any legumes are excellent for the soil. One year a gardener working between my palms netted over six hundred dollars an acre on a crop of peas. After the palms are nine or ten years old and have had most of the offshoots removed a crop can be cultivated within a foot of the palm. The leaves reaching out above form a latticed arch to shield the garden crops from the hot sun and in winter will protect them from a light frost.

The date palm blooms the last week in February and through the month of March. If the spikes have been trimmed off the leaf stems, it will be much easier to pollinate the blossoms; but it is a task to climb into every palm, especially if they

are ten or twelve feet high or more, pull back the spathe and insert the sprigs of male pollen; and then to have to climb up the same palm two or three times to pollinate later blooms. Being a bit lazy, I devised an apparatus to pollinate the blooms from the ground. Take a fish-pole, ten or fifteen feet long or whatever length needed, and with a wire, the end being red-hot, push through the pole to make a hole through the joints; next push through the pole a length of one-eighth inch copper tubing; cut the tip off the pole and flatten out the copper tube slightly. Bring the tube out at the butt of the pole a foot or so from the end; get a thick four ounce bottle, run the end of the copper tubes just through the cork into the bottle; get a rubber bulb with a valve in it and attach this to a tube running through the cork into the bottle. Fill the bottle with pollen and you will find that a slight squeeze on the bulb will send the pollen up the tube and if the tip has been flattened out, will spray it wherever directed. After a bloom had split open, I sprayed it with pollen giving the bulb one squeeze; on examining the inside of the spathe, I found plenty of pollen to take care of the bloom as it opened. However it was such an easy matter to give it another on the following day that the blooms were sprayed possibly three times as they were opening. I pollinated, in a few hours with this fish-pole, atomizer palms that had taken formerly a day and a half to go over once, and had a perfect set of fruit.

After the bloom has grown out of the spathe, it is a good plan to cut the spathe off and tie the date stringers together loosely; this will keep the stringers of the bunch from getting tangled with leaves and other bunches. If you have ever tried to untangle several bunches of dates to get sacks on them, you will realize

that it is more economical to tie them early. If the dates on the bunch are to be thinned, that should be done at this time.

Along in June dates are about the size of olives and it is a good plan to go over the garden and adjust the bunches. Some of them can support their own weight if they have grown out clear of the leaf stems; others have to be supported with the one by two inch wooden prop with wire hooks to fit the stem. I have tied the fruit stem to a leaf and find in many instances that this is better than the prop.

Late in the summer the dates have turned yellow or red and commence to show translucent spots. It is time to put sacks or some protection on them to keep birds from pecking them. Just what is the best material to use, I do not know. I have tried white muslin sacks; they cost from fifteen to twenty cents apiece and three or four seasons with good care is all they will stand and I do not believe that the glare and reflection from a white sack is good for the dates; it may or may not cause some blistering. A burlap sack or one made from ordinary grain sacks seems to be all right. They will not be tight enough to keep out weevils, but if the birds cannot peck holes in the dates, the weevils will have no opening into them. In case of soft dates it is a good plan to put a heavy wire ring, six to eight inches in diameter in the center of the bunch to hold it open to the air and keep from mashing and bruising the dates, also they will ripen more evenly.

By the last of August or the first week in September, a few dates on the bunch will be ripe. Most every grower picks these and from then on goes over his garden every week with a picking crew. I doubt if this early picking is profitable except for samples and to fill a few early

orders. I find that the best market is about Thanksgiving, getting better until Christmas and dropping down after the first of the New Year. This going over the bunches every few days is expensive. It cost me about four cents per pound; it means untying the sack, pulling it up over the bunch and hunting around through the bunch for forty dates or more. In case the dates are of a soft variety, they will be extremely soft and syrupy at this time and difficult to pick without smashing. These same dates while ripe at this time will be of better flavor and better cured in another ten days; at this later date there will be enough more dates ripe to make the picking worth while. If you have to climb a ladder to reach the bunch, construct a large, round, platter-like tray from canvas, screen, wire or something light in weight; put straps on it to go around your shoulders and adjust it to come just below the bunch; you can then pick dates with both hands rapidly. Some varieties have to be picked every week or ten days to get them at their best, while others will cure on the stem and can be gathered in bunches. I feel certain that later on when our palms become twenty or more feet high, we will be gathering all varieties by the bunch with perhaps one early picking. It costs about two cents or less to pick by the bunch—just half as much as going over them every week. Two cents a pound saved means two dollars per palm or about one hundred dollars per acre. The Zahidi date is as good when picked at Christmas time as earlier and can be processed just as easily and perfectly. I cut off a bunch in January and they turned out as fine as any dates I have packed.

After picking the dates and getting them to your packing house it is advisable to fumigate the bunch or tray with gas, heat or sulphur to get rid of all weevils and small insects possible. I sort my dates on wire trays, place them on racks and wash them with water from a garden hose. They will dry out in a day or over night; judge this drying by comparison with the same before they were washed. I then place about four or five hundred pounds in

my pasteurizing oven; turn on electric heating elements and bring the temperature up to 165 degrees. If the temperature is brought up rapidly, the dates should remain long enough to be heated through at that temperature. I find that dates will stand 175 degrees without spoiling their flavor, but over that they have a slightly cooked taste and at 190 degrees caramelize. Some growers claim that this pasteurizing by heat spoils the flavor of the date. I have heard many customers who were not growers, claim that they could taste something disagreeable about dates which I knew to have been pasteurized with a vacuum gas process, probably carelessly done. I have had more than one packer, who tasted fresh dates for the first time, exclaim how delicious they were fresh from the palm and after a week on the job have decided that they were of better flavor and richer pasteurized. At least the electric heat with a good recording thermometer is efficient and inexpensive. It cost less than one half cent per pound with practically no overhead expense.

After dates are properly cleaned and pasteurized, they will keep indefinitely, at least three or four years. There are no weevils or eggs to hatch out, but they must be kept protected until they are sealed up in a tight box; an ordinary pasteboard candy box is not tight. A certain miller will lay an egg and spin a cocoon under a projecting edge or in a paper fold on the side of the box; later a tiny worm develops and bores through the box, generally on the corner where there is nothing but the paper covering. However there are cardboard boxes that will keep them out and cold storage is not necessary.

This brings the dates up to the actual packing. I prefer the above mentioned cardboard container that is round in shape. It can be as deep as desired; it is much easier packed because it is round and the dates do not have to be sized as carefully, as when packing in a rectangular box the dates must be sized for thickness and length. In the round box, one date will wedge or tighten the layer; a mailing case or carton is necessary however to ship them.

The sorting and packing of dates for extra fancy and fancy packs and the prices received per pound, is a question up to the grower and his customers. Take a twenty-eight pound bunch of dates and handle them carefully, picking them individually from the palm; I figure that one fourth or seven pounds will sell for one dollar packed in one pound boxes extra fancy grade. The cost for handling will be about fifteen cents per pound; this leaves \$5.95 net. One half or fourteen pounds of the bunch will sell for a fancy grade at fifty cents per pound and cost about eight cents to pack; this amounts to \$5.88 net. The remaining seven pounds will be good dates and sell for twenty-five cents per pound and cost five cents to pack, leaving you \$1.40 net. Adding these figures, you find that the twenty-eight pounds have brought you \$13.23. Now if you save the expense of sorting (excepting sour or smashed dates) and pack in cartons holding from one to five pounds and sell the twenty-eight pounds for fifty cents per pound less five cents for packing charges you will net \$12.60 or within sixty-three cents as much as you would receive the other way. Your packing troubles will be greatly simplified and you will have no trouble in disposing of your crop if you will sell the dates at a price at which people can afford to eat them. These figures I give you simply to show that there are many sides to the packing and marketing question; it is not always the man who sells a few hundred pounds at \$1.00 per pound who makes the money. He may have tons of dates to sell. As a food I figure that clean, well pasteurized dates are worth fifty cents per pound—as a scarce American fruit from sixty to seventy-five cents—and as a confection seventy-five cents to one dollar and a half or all you can get.

To sum up what I have been trying to convey to you; plant only palms that grow the kind of fruit you know your customers want; water and cultivate them well; attend to all the detail that is necessary to grow good fruit; pack your fruit conscientiously and give the people something for their money.

The Chemistry of the Date

By A. E. Vinson, Professor of Agricultural Chemistry, University of Arizona, Tucson, Arizona

OUR subject is susceptible of many lines of discussion, any one of which might well occupy the time appropriate to be given it in a paper before this Date Institute. I, therefore shall endeavor to limit myself to a few fundamentals which seem to me to be of first importance as the basis of rational practice in the date industry. More detailed accounts of my studies with the date will be found in the original sources, a list of references to which will be given at the close of this paper. Some of these, such as the Effect of Climate on the Rate of Growth, are only remotely connected with the chemistry proper of the date. A digest and correlation of these papers, together with the writer's impressions of the date industry, especially in Arizona at that time, was prepared in 1915, but has not been published. The following summary is taken from that manuscript.

1. Two distinct chemical varieties of dates exist: the invert sugar and the cane sugar types. These are determined by the presence or relative absence of the enzyme invertase.

2. All, or at least nearly all, of the sugar in the invert type has passed through the form of cane sugar, and at some stage of their development all dates contain a high percentage of cane sugar.

3. The greatest influx of sugar into dates takes place shortly before ripening. Dates, therefore, cannot be artificially ripened into an economic product before a certain minimum accumulation of sugar takes place.

4. The invertase of the unripe date is in the intracellular or endo form and possibly forms an insoluble compound with the protoplasm. When ripening begins, the invertase, at least in the invert sugar date, passes into the extracellular or ecto form, and is then readily soluble in water or glycerine.

5. The presence of soluble tannin in the green date does not prevent the invertase from dissolving in glycerine, nor does invertase precipitated by tannin or by lead subacetate lose its property of inverting cane sugar.

6. Most of the tannin of the date is deposited as insoluble grains in a zone of tannin cells near the cuticle. There appears to be no translocation of tannin, but deposition takes place in the same cells where it is generated. Deposition may be accomplished at any time by subjecting the fruits to the vapor of nitrous ether.

7. Premature ripening may be in-

duced artificially in some varieties by the action of various chemicals, of which the best for practical purposes seems to be carbon dioxide, or by killing the protoplasm by heat. Ripening appears to be the result of the release of previously insoluble intracellular enzymes, and may be accelerated by the application of moderate heat.

8. The keeping quality of fresh dates may be improved, insects and their eggs destroyed, and in most cases the palatability of the date improved by pasteurization.

9. The rate of growth of date palms depends more on minimum night temperature than on maximum day temperatures, or on duration as well as degree of heat.

10. A remunerative American market for fresh dates can be made, and in this field there is relatively little to be feared from foreign competition.

11. The competition of foreign cured dates with the American product will become sharper with the improvement of economic conditions already taking place in the Old World.

The Sugar of the Date

The flesh of the date contains three important sugars: cane sugar, glucose, and fructose, the last two collectively being called invert sugar and resulting from the splitting of cane sugar. This splitting takes place by the addition, chemically, of water to cane sugar, and may be accomplished by heating with acid or by the action of an enzyme called invertase, which occurs in dates, yeast, and many organic tissues. These three sugars make up the greater part of the date substance and, consequently, have considerable practical importance. The water insoluble materials collectively are called marc and constitute the larger part of the nonsaccharine material. Marc is mostly cellulose and, in the ripe fruit, insoluble tannin grains. In less amounts occur pectin material, acid, mineral salts, protein, and ethereal flavoring principles which are often evanescent, in fact so much so as to make some varieties commercially worthless. The unripe date also contains tannin which gives the astringent taste.

As pointed out by my predecessor, H. B. Slade, dates may be classified chemically as cane and invert sugar dates, according to whether they contain much or little cane sugar.

The Deglet Noor and a bread date known as M' Kentiche Degla are true cane sugar dates. Most other varieties belong to the invert sugar type and, although when green or newly ripened they contain an amount of cane sugar comparable with the Deglet Noor, this cane sugar has no practical significance, even though it is much sweeter than invert sugar. I say it has no significance because the cane sugar in such varieties is being slowly inverted and sooner or later will almost entirely disappear. A chemical analysis of the sugars of such dates is useless because it shows only the stage of inversion and no permanent character of the date. On the other hand, syrupy extracts of Deglet Noor dates have been observed to yield beautiful crystals of sucrose or rock candy after standing for many months.

The peculiarity of the cane sugar varieties has been found to depend on the almost, if not complete, absence of the enzyme invertase. It is true that Deglet Noor dates do suffer some inversion if ripened artificially by heat, and some invert sugar is found even in the green Deglet Noor. This absence of appreciable amounts of invertase in the two named varieties is correlated, as the plant breeder would point out, with the strange property of their extracts to turn red on contact with oxygen, although they remain uncolored like other date extracts for days in air from which the oxygen has been absorbed. This might prove an easy means of discovering other cane sugar varieties or of determining the transmission of this character in Deglet Noor seedlings.

Unripe and bruised invert sugar dates change their cane sugar to invert sugar very slowly, if at all. The cane sugar of such dates is shown by their extreme sweetness when the skin and tannin layer just beneath it are pared away. If such dates are pounded or ground to a pulp, however, the cane sugar disappears entirely in a few hours, and, furthermore, large amounts of cane sugar added to the pulp will also be split rapidly into invert sugar. If, however, the juice be pressed quickly from the pulp, filtered and preserved

with chloroform or thymol, no further change takes place. The pomace, however, remains exceedingly active even after prolonged washing with water, and neither water nor glycerine will give an active extract. But when the fruit ripens, this active property caused by invertase, dissolves easily in water or glycerine. The insoluble invertase of the green fruit we call an endo enzyme, meaning that it stays permanently within the cell, while the soluble invertase of the ripe fruit that dissolves so readily in water we call an ecto enzyme, meaning that it exists outside the cell.

Invertase is not essential to ripening, as shown in the Deglet Noor, but its behavior at the time of ripening, which is easily traced, is probably indicative of the behavior of other enzymes more intimately responsible for ripening. This gives us a clew as to what takes place when dates ripen naturally, or when we hasten their ripening by artificial processes such as heating or chemical shock with carbon dioxide, acetic acid, gasoline or other means.

The total amount of sugar in the date is by far its most important chemical character because on this depends its keeping quality. Since sugars make up a very large part of the dry matter, the amount is inversely proportional to the amount of water present—a constituent that can be determined fairly easily. By knowing the amount of sugar or dry matter present we have an index of the maturity of the unripe fruit or of the keeping quality of the finished product.

The development of a bunch of dates may be divided roughly into three periods. First, the stem develops rapidly with very little enlargement of the fruit. Second, the green fruits come to full size and the seed appears to reach maturity, but during this stage there is no marked accumulation of sugar. After full size is attained, the accumulation of sugar goes on more rapidly and the fruits increase in weight. It is possible to get some idea of the progress of the crop by testing the specific gravity of thirty or forty fruits picked at random. After the sugar content—or perhaps the dry matter content—has reached a sufficiently high percentage, the skin of the fruit takes on a translucent appearance and ripening soon begins. At this stage most varieties become susceptible of artificial ripening, or will ripen spontaneously if picked and layed away.

This suggests the very interesting

and important question: Why do not all the fruits on a bunch, even on the same stem, mature evenly? It is evident that if such were the case, the crop could be handled more economically and a good business could be established in bunch dates. The hard fruit on the bunch could be shipped to distant markets and there ripened. The Deglet Noor crop of North Africa is handled in part in this manner. It occurred to the writer that perhaps even-maturing was a variety character, and a search was made for even-maturing varieties. That year the Khadravi ripened artificially one hundred per cent in every case, and we believed a reliable, even-ripening variety had been found. The next year fruit from the same tree behaved so irregularly that it was out of the question to get economic yields by bunch harvesting at the time the earlier fruits were ripe.

The amount of sugar also determines the keeping quality. Fresh dates marketed in humid climates are prone to sour unless the moisture content is run down considerably. Here the kind of sugar also plays its part, since invert sugar takes up moisture more readily than cane sugar; but, since all dates contain some invert sugar, they usually get sticky and often sour. Incipient fermentation has the double effect of destroying sugar and producing water in its place, so that souring once starting, progresses rapidly. Often, at the close of a few rainy days, dates which have been left on the tree and then harvested and ripened artificially will sour almost immediately unless the water content is reduced somewhat by pasteurization and artificial drying. Other dates from the same tree ripened just before the rainy weather, but exposed under shelter to the humid atmosphere, will usually go thru without giving trouble. These are all difficulties depending entirely on the total dry matter content of the date.

This paper would be incomplete for its purposes without a short discussion of date tannin, not so much for its economic importance as for its spectacular interest. The astringency of the unripe date is familiar to all, and the most striking phenomenon of ripening is the loss of the "pucker"—the date like the persimmon becomes sweet on ripening. Most of the tannin resides in a layer of giant cells visible to the naked eye just a little beneath the skin of the fruit. This material gives the juice of the unripe fruit many interesting chemical reactions, only one

of which we will discuss. While studying the influence of various chemicals in stimulating premature ripening, I was surprised by the deep brown color produced by such volatile nitrites as ethyl and amyl nitrite, and also at the speed with which the effect became apparent. Further investigation showed that a direct combination of the nitrites with the tannin took place, and that tannin wherever distributed in the fruit was immediately rendered insoluble and stained a dark brown. Ethyl nitrite in dilute solution may be had in the drug stores under the name of sweet spirits of niter, and the demonstration may be carried out by placing dates, persimmons, or other unripe astringent fruits in a tightly closed jar over a few spoonfuls of the drug, which must be fresh. After standing a time, sections of the fruit cut with a sharp knife will show the exact location of the tannin.

When the date ripens, the tannin forms a compound with other constituents of the cell and produces small tannin grains which bear an analogy to leather in composition. These may be demonstrated by mixing a quantity of ripe date pulp with water in a glass vessel. The heavy tannin grains settle to the bottom more rapidly than the other parts of the marc. With some skill, the grains may be panned out and concentrated much as the bold miner pans out gold.

The following list includes the more important technical and scientific papers by the writer. Reprints of some of these are still available and may be had on application to the Arizona Agricultural Experiment Station.

The Function of Invertase in the Formation of Cane and Invert Sugar Dates—*Botanical Gazette*, 43; 393, 1907.

Some Observations on the Date—*Plant World*, 10; 245, 1907.

The Endo and Ekto invertase of the Date—*Journal of the American Chemical Society*, 30; 1005, 1908.

The Chemical Stimulation of Artificial Ripening in Fruits—*Science*, 30; 604, 1909.

The Chemical Organization of a Typical Fruit—*Plant World*, 13; 1910.

Fixing and Staining Tannin in Plant Tissues by Nitrous Ethers—*Botanical Gazette*, 49; 222, 1910.

The Stimulation of Premature Ripening by Chemical Means—*Journal of the American Chemical Society*, 32; 208, 1910.

Chemistry and Ripening of the Date—*Arizona Agricultural Experiment Station, Bulletin* 66, 1911.

The Effect of Climatic Conditions on the Rate of Growth of Date Palms—*Botanical Gazette*, 57; 324, 1914.

Summaries of Progress in the Sixteenth to Twenty-fourth Annual Reports of the Arizona Agricultural Experiment Station.

Eradication and Control of Date Scale

By A. J. Shamblyn, Superintendent of U. S. Date Garden, Indio, California

PARLATORIA scale was first introduced into the United States in July, 1890, this being the date of the first importation of date palms from the Old World. There were three shipments of palms this year, which came from Algeria and Egypt. Parlatoria scale was found on these palms or offshoots when they arrived in Washington and they were treated there before being sent to the Southwest for trial. Nine of these palms were sent to the Arizona Experimental Station. These palms grew and soon developed scale, which showed that the treatment given them in Washington had failed to exterminate all the scale. These palms were repeatedly sprayed with kerosene emulsion and whale oil soap emulsion till 1898. In 1897 and 1898 these palms were given in addition to spraying repeated fumigations with hydrocyanic gas under treated canvas tents, but in no case was a complete kill of scale gotten on old palms.

My first introduction to Parlatoria scale was in 1900, when as a station worker I was called on to help with the fumigation of these nine originally scaly palms imported in 1890. This work was done under the direction of Prof. R. H. Forbers, then Director of the Agricultural Experiment Station of Arizona. These fumigation and spray methods were continued until August, 1905.

In the meantime there had been other importations of palms made in 1900, most of which were planted in the Tempe Cooperative Date Garden at Tempe, Arizona. A few more were set on the Station farm at Phoenix. In 1901 an importation was made and planted at Heber, California. Some palms in all of these later importations proved to be infested with Parlatoria scale.

The use of the gas torch method of eradication of scale was begun in 1905, after a visit of Dr. Forbers to San Francisco following the earthquake and fire. There he saw ornamental palms, which had all their leaves completely burned off from the intense heat of burning buildings, with the center leaves growing out of the burnt and blackened trunks; with this he came to the

conclusion—why not use this treatment for Parlatoria scale on date palms in Arizona. In August, 1905, I pruned and torched the first date palm on the Experimental Station at Phoenix, which proved to be the first old palm on which Parlatoria scale was eradicated. After this we adopted this torching method for all old deep-seated infestations. The method is to first defoliate the palm completely, cutting terminal leaves off to 6 to 12 inches in height; then commencing at the root of the palm, cut off very close all old leaf stubs, examining each one, and cut to within 12 inches of crown. In some extremely bad cases it is necessary to wait till new leaves have grown and make a second pruning and burning. Small offshoots have in most cases been cleaned by fumigation under galvanized tanks using one ounce of sodium cyanide to 100 cubic feet. An occasional shoot becomes so deeply infested that it becomes necessary to use the torch.

In this way the Parlatoria scale was cleaned up in the Tempe Date Garden and on the Experimental Station near Phoenix. The Tempe Garden was reinfested again by an infested offshoot being set in the garden without disinfection. This shoot was supposed to carry parasites that would control Parlatoria scale. This shoot of course was planted inside of a wire cage, but the scale escaped and reinfested the palms. This experiment has cost several thousand dollars and forced complete defoliation of the Tempe Garden again.

In 1911 I made my first visit to Coachella and Imperial Valleys. I came at the suggestion of Dr. Swingle to start the torching of the old palms in the Government Garden at Mecca and the large private planting at Heber, California. In 1914 I was asked again by Dr. Swingle if I would consider coming to California and undertake eradication work for the Federal Horticultural Board, which position I accepted. When I came here I expected to clean up the Mecca Government Garden and possibly the Indio Garden, and go home, but in place of that I found a lot of small plantings of palms

here and there over this valley and the Tropical Date nursery with 15,000 shoots—Parlatoria scale everywhere. In July, 1914, five thousand more shoots were imported and in 1915 an additional five thousand. Up to and including the 1915 importation we had received approximately 35,000 shoots with probably 20,000 infested with Parlatoria scale and each one infesting its neighbor. Again in 1920, 1921 and 1922 we made further importations amounting to approximately 12,000 offshoots which are in quarantine nurseries. The consolidation of these plantings under quarantine is the only thing that saved our eradication fight, making it much easier to inspect and treat them. You can imagine what would have happened if these shoots had been scattered over all of the lower valleys of Arizona and California to probably 500 to 1,000 different growers.

I would like to state here that I feel sure there is less Parlatoria scale in the United States now than there has been since I saw my first scale in 1900 at Phoenix, Arizona, probably less than on the original importation of 1890. In regard to Marlatt scale I wish to state that most of my time and effort has been spent on eradication of Parlatoria scale. I have, however, done some work on Marlatt scale. During the clean-up of the nine old palms (imported in 1890) on the Experimental Farm at Phoenix, by very close pruning of all old leaf stubs and bits of fiber from trunk of trees and severely torching we succeeded in eradicating the Marlatt scale from these palms as well as Parlatoria scale. This work was in 1905. This is the only time I ever saw a complete eradication of Marlatt scale. I probably should state that the early pruning and torching was done more severely than was found necessary in later years for eradication of Parlatoria scale. As most of the growers in this valley know, I have been a strong advocate of spraying with cresolis emulsion for Marlatt scale. I'm still fully convinced that if our palms were sprayed regularly at least four times a year we'd have better dates and less date pests. Per-

sonally I believe in eradication of all pests rather than control.

We will find as our palms get larger each year our expense in control by spraying will become more and more expensive and I should not be surprised if we resort to the pruning and torching method used in Arizona twenty years ago—I mean on old palms which have no shoots left on them.

It is difficult to over-estimate the value of scale-free palms or offshoots, which could be used to start a scale-free zone from which we could secure scale-free shoots which could be shipped to any part of the

date growing regions of the United States or to foreign countries without being interfered with by quarantines.

I have made some observations in regard to Marlatt scale control which may be interesting. I found by careful inspection that Marlatt scale is partially controlled by extremely hot weather. I found that the extreme hot summer of 1917, when the mercury reached $123\frac{1}{2}$ in the shade that the Marlatt scale on the foliage was killed off. I also find that deep setting of offshoots in basins and frequent irrigations tends to lessen the scale—probably

drowning some and filling space behind leaf bases with silt killing others. This I find to be especially true in Arizona. In the Bernard Johnson nursery at Yuma where muddy water was used for irrigation and the old palms removed leaving a single shoot in the ground, we find less Marlatt scale than anywhere I know of. Deep setting, irrigating heavy in basins, frequent and regular spraying of young palms is one of the best treatments I know of for eradication or control of Marlatt scale. I want to say that I'm strong for drastic quarantine regulations both Federal and State.

Packing of Dates

By T. J. Gridley, Thermal, California

THE packing of dates is similar to the handling of other fruits, in that success is very apt to rest on the strict observance of a few fundamental points. Briefly stated, the most important of these are insect control and cleanliness, to which should be added proper curing and elimination of fermented fruit from the pack.

Vacuum fumigation has opened one very practical way to efficient elimination of insects. It must, however, not be assumed that just because dates have been subjected to the vacuum treatment, they are immune from insects for all time to come. The most scrupulous care must be observed by the packer at all times to prevent re-infection, and additional treatments should be given whenever any doubt exists.

The need of efficient mechanical methods for the cleaning of dates is confronting packers at this time. There is at the present time a regrettable lack of really effective machinery for this purpose. The experiments of numerous growers and packers have resulted thus far in several devices that do excellent work under certain conditions, but

machinery is yet to be built that will properly meet the varying requirements constantly encountered. For the cleansing of dates, nothing has been found so thoroughly efficient as washing with water. However, as its application is fraught with many complications, its use has thus far not become universally popular among packers.

The proper curing of dates rapidly and in quantity presents one of the greatest problems. It has been possible up to the present time, to spread the fruit thinly on trays, leaving it there until sufficiently dried out for packing. This is necessarily a rather slow process. There is yet to be devised a method for the rapid curing of dates, which does not, in some measure, injure their quality and detract from their appearance.

The providing of storage facilities for the proper keeping of fruit after packing, is of prime importance. It has been fully demonstrated that, given a tight, well insulated room, it is not essential to provide artificial refrigeration. A temperature of from fifty to sixty degrees may be maintained through a large portion

of the year by the introduction of cool night air, by means of an inexpensive blower. If it is desired to cool such storage rooms during a period of warm nights, it is entirely practicable to obtain sufficient cooling by passing the air through a mixture of ice and salt.

The packer who is genuinely interested in building up a high reputation for his output will early seek to classify his products and establish them under certain brands. This method will gradually eliminate the practice of designating dates by classes or grades, which is always more or less confusing to the buying public. The grower, who, by reason of his location, is, at this period of limited production able to pack and sell his fruit for the most part to the passer-by, will not necessarily have to meet the same requirements as to style of pack and container as the packer who is selling wholly through high class retailers in large cities. Nevertheless he may be obtaining fully as much, if not more, for his product and should exercise equal care in its preparation for the public.

Quarantine Protection of the Date Industry

By A. E. Bottel, Horticultural Commissioner of Riverside County

PROBABLY the most important duty of the State Department of Agriculture is the enforcing of Plant Quarantine Laws. Under this law the County Horticultural Commissioners are made State Quarantine Guardians and are empowered to enforce the provisions of the act in their respective counties, under the direction of the Director of Agriculture.

Unfortunately the matter of Plant Quarantine was not given sufficient consideration in early days in California, at the time when our plant life was practically free from all dangerous insect pests. Nearly all insect pests attacking citrus as well as those pests attacking our other horticultural and agricultural products have been introduced from foreign lands and at the present time are costing the growers of this state millions of dollars in pest control.

In March, 1913, the United States Department of Agriculture issued a quarantine order prohibiting the movement of date palms, known to be infested with *Parlatoria* or *Marlatt* scale, interstate, into so-called clean territory and provided, in this order, rules and regulations under which such palms might be moved within the infested areas.

The California Date Palm Law was passed and approved April 2nd, 1915. This act makes it unlawful for any person or persons, their agent or agents, employe or employes, possessing or owning date palms or date palm offshoots, or who may introduce palms from any region of this state, or any other state, or from foreign countries after they have been released by Federal authorities, which are infested with either of the two scales, *Marlatt* or *Parlatoria*, to place or plant the same except under the supervision and direction of the state quarantine guardian of the county where the said date palms or date palm offshoots have been introduced.

This act also makes it unlawful to move any date palms or date palm offshoots after the same have been planted, unless permission is granted by the State Quarantine Guardian and a permit issued for same. Any

one who shall violate any of the provisions of this act shall upon conviction be deemed guilty of a misdemeanor.

The County Horticultural Commissioner's office maintains an inspector in this district whose duty it is to inspect any and all date palm trees and date palm offshoots either in transit, orchard or nursery and only upon permit issued by him may such palms be moved or planted.

A few weeks ago it was brought to our attention that a certain fungus or bud rot of palm trees had been found infecting ornamental palms in the coastal counties in this state. We immediately started an investigation and received a report from Mr. D. G. Milbrath, Plant Pathologist of the State Department of Agriculture, in which he stated that this disease was found widespread and serious on Washingtonia Robusta in the San Francisco Bay region, both young and old trees being affected. In Hollywood, near Los Angeles, the disease was found on Phoenix Canariensis.

Associated with this disease is the fungus *Penicillium Roseum*. The effect is a watery soft rot of the top or bud of the tree. The affected tissue becomes brown, soft and frequently covered with a luxuriant pink fungus growth. Innumerable spores are produced which scatter in cloudlike masses when disturbed. The rot gradually descends through the interior of the tree until the latter is completely killed.

It is very evident that the fungus has adapted itself to the above named palms and consequently can attack other related palms.

This matter was discussed at the recent meeting of the Southern Counties Horticultural Commissioners' League, at El Centro, and the following resolution passed and forwarded to George H. Hecke, Director of Agriculture: "Moved that the Southern Counties Horticultural Commissioners' League ask the Director of Agriculture to investigate and quarantine against the introducing of host plants of bud rot (*Penicillium roseum*) from Arizona and known infested California Counties into Imperial County and Riverside

County East of the San Bernardino Meridian."

We have received a letter from the Director of Agriculture in which he states that an investigation of this situation will be made in order to fully ascertain the conditions surrounding the spread of bud rot and to learn whether it possibly would be a serious disease in the counties for which the quarantine might afford the protection asked for.

In view of the fact that this fungus is not known to occur in the Coachella Valley or Imperial County it would seem advisable to quarantine against the importation of any and all known host plants.

The possibility of organizing and maintaining a scale free area district in this valley has been considered. If such a district could be made possible it would undoubtedly provide a way whereby date palms might safely be moved into other localities in California and would in all probability open up a market for such date palms as are undesirable for commercial use and which might possibly be of some value for use as ornamentals.

It might be possible, for instance, to set aside the district lying between Palm Springs and Indian Wells, using as a North and East Line the Southern Pacific Railroad tracks, as a scale free district. In order to do this of course it would be necessary to make a thorough inspection of all date palms now planted in this district and if it is found that some palms were at the present time infested they would have to be moved or destroyed.

Then in planting this district it would be necessary to secure offshoots or palms that were free from *Marlatt* or *Parlatoria* scale. Such stock would not only have to be found free from scale upon inspection but "if there was reasonable cause to presume that it might be infested," they should not be planted in the proposed district. In my opinion such a district is possible only if agreed to by everyone owning property in its proscribed limits and everyone interested taking a hand in seeing that nothing but clean stock is planted.

Date Palm Insects

By Dr. Fenner Stickney, Entomologist, U. S. Department of Agriculture,
Indio, California

THE date insects can be discussed under two general heads: one, those that attack the growing or live tissue of the palm, and second, those that attack the ripe fruit.

Insects attacking the growing tissue

The most serious pest in either group is the *Parlatoria* scale, *Parlatoria blanchardi* (Targ.-Tozz.) Ckll., for the following reasons: It may cover the entire green tissue of the palm, a feat not performed by any of the other pests, and if left undisturbed can do this in a remarkably short time,—within a year, according to Mr. A. J. Shamblin. It can withstand, even when quite exposed, the natural adverse influences met with in date growing localities, such as heat, cold and dryness, and can do this more successfully than any other date insect. It is disseminated with ease, particularly by wind and birds. The eradication and control of this scale has already been discussed by Mr. Shamblin.

Another important date insect is the *Marlatt* scale, *Phoenicococcus marlatti*, Ckll. So far, it has been found only on the date and canariensis palms. It occurs on practically all imported palms. The bulk of the scale is found behind the fibre, deep down on the leaf bases and fruit stems, breeding continuously throughout the year. Only a relatively small number are ever seen in exposed places anywhere that I have been. They migrate out constantly in fair numbers, in the late spring more than at any other time, settling in any crevice, and often even in mere depressions. One place they settle is just above the fibre along the sides of the leaves, where the scale appear as small white spots, which are the matted white filamentous coverings, the scales themselves being from light pink to deep red. Another place they settle is at the bases of the pinnae, or pinnae "cups," as we say. Here in time the cups become a deep, distinct brown. The scale also appear to view by being brought up as settled scale, on the growing leaves. The crown leaves bring up considerable scale in this way, especially in the late spring, when, as the leaves expand, they are found largely along the

midribs and the edges of the pinnae. But if you want to know whether your trees are scaly or not without cutting into them, the best place to look, in my opinion, is on the curled-up, rather deformed-like leaves that issue directly from the bole of the tree.

Marlatt scale living anywhere else than behind the fibre does not survive long the dryness and heat characteristic of the desert. Otherwise, they would probably in time cover and overcome the tree. The scale does its greatest damage to small offshoots that are not growing well, and to the fruit stalks bearing the season's crop, that may become on their bases, not, of course, exposed to view, entirely "caked" around with the insect, which may do more damage than is realized.

The seriousness of the *Marlatt* scale problem is enhanced by the degree of difficulty met with in reaching it behind the fibre with an insecticide. We are at the present time working on the eradication of the scale from the offshoots with promising results, but I am not ready to say anything about this yet.

A third pest attacking the growing tissues is not an insect, but for all practical purposes can be treated as one. I refer to a small whitish mite, *Paratetranychus heteronychus*, Ewing, belonging to the same genus as the so-called citrus "red spider." It does not limit itself to the date palm, being found also on the native *Washingtonia* palm in this valley; also the canariensis and doum palms. In addition it lives continuously through the year on the various grasses found in date gardens.

This mite is not generally noticed except during the summer upon the green fruit. By June it becomes abundant here, and if left undisturbed will practically ruin the entire bunch, scuffing up the skin of the fruit so that it grows hard and cracks and shrivels. As the fruit turns yellow in the fall the mite leaves it, dying for the most part, since but comparatively few are found during any other time of year. But enough are found down behind the fibre on the white tissue of the leaves, particularly the younger

leaves of offshoots on small seedlings growing near the old palms, and on the various grasses in the neighborhood, to insure an infestation on the fruit the coming year.

The mite spins a very fine webbing, much finer than a spider's web wherever it lives. The web is rather easily discerned on the fruit, but the mite, being so small and more or less of the same general color as the fruit, is frequently not observed. Many people have thought this web was spun by a spider.

The mite passes its entire life cycle within or beneath or along the edges of the web. As old tissue is destroyed it gradually spreads over more surface, or starts new colonies elsewhere in the neighborhood.

The mite is easily controlled during the season by a dust insecticide. The best is probably a nico-sulphur dust. The disadvantage of a dust is that it will stick to some extent to the fruit all season, and perhaps is not to be recommended for soft dates. Another good remedy is a cresylic-distillate emulsion the standard formula for *Marlatt* scale having been tried with success.

The fourth and last of the important pests attacking the growing tissue is the date bug, *Asarcopus palmarum*, Horvath, a genuine bug, in fact, belonging to the spittle bug family. The female is twice or more the size of the grape leaf hopper, when mature. The male is smaller than the female. The bugs are reddish or light brown when small, but become very dark brown in the older stages, wingless throughout except sporadically, and jumping when violently disturbed. This is a new pest, and has not been found on other plants yet.

This insect confines itself largely to that part of the crown leaves below the fibre line, especially in the cooler part of the year, and to the bases of the season's fruit stems. There are scattering bugs, however, anywhere on the leaves, particularly, hiding in the pinnae. The most discernible feature about the bug is the large amount of transparent sticky substance it exudes. As the crown leaves develop, this sticky substance is brought to view, becoming

ing very quickly filled with dust, making an unlovely picture on the leaves.

The damage done to an ordinary palm is not discernible, though there have been instances where the bug seems to weaken the crown leaves. On small palms, though, particularly on unthrifty ones, the bugs appear to weaken and even kill them. We have tried a nicotine-soap spray for the bug with splendid success. The cresylic-distillate emulsion by itself does not seem to be effective against this insect, but on the addition of nicotine is as effective as the nicotine alone.

A noteworthy feature, worth bearing in mind, of all four of the pests mentioned above is that they pass through no dormant period. Cooler weather simply slows up their activity.

All four have been imported from the date growing regions of the old world, and are largely confined to the date palm; two of them (the Marlatt scale and the bug) almost entirely so; another (the Parlatoria scale) just to palms alone; and the remaining one (the mite) to palms and grasses.

It may be interesting to note that notwithstanding their old world ancestry, two (the Marlatt scale and the mite) have been first described from this country; another (Parlatoria scale) was first discovered in this country; and the remaining one (the bug) missed by about a year being first described from this country.

Insects attacking the ripe fruit

We have found in this valley at least five species of beetles injuring the ripe date. Of these only two are really important enough to be discussed here. One of these, the so-called "fig" or "two-spotted" beetle, *Carpophilus*, hemipterus, L., attacks the dates as soon as they are mature, even in the field. It is the beetle that is most in evidence during packing time. There is one optimistic remark I should like to make in regard to this beetle. It will deposit few or no eggs in the fresh fruit, and therefore few if any of the other stages of the beetle are found here. Just another cheerful remark,—this beetle likes the dates only when they are soft and juicy. It won't attack the dry dates at all. But here is a less cheerful statement,—the beetle finds sour dates an ideal environment and breeds in them freely. If you find little white flat-like grubs in numbers in any of your fruit it has in high probability soured. Fruit left lying beneath the trees suits the beetles par excellence for breeding and feeding purposes. Discarded fruit left around packing houses is also to the beetle's taste. It breeds slowly all winter in old dates left rotting in the soil.

The other important beetle is the notorious saw-toothed grain beetle, *Oryzaephilus surinamensis*, L. This insect is usually not found in the fruit in numbers until the latter has reached that semi-dry, nutty-flavored stage. This pest is so small and

flat that it is a difficult problem to prevent its access to the stored product. Cold storage may help to solve this problem. Natural winter weather only slows up its activity.

There is one other important pest of the ripe fruit, the Indian meal moth, *Plodia interpunctella*, Hubr. This insect will breed in any kind of date, soft, semi-dry or dry. It sometimes, though rather infrequently, begins to infest the fruit before it is picked. The large yellowish caterpillars one finds in his fruit are the moth larvae. The larvae do more than ordinary damage by spinning a sticky web wherever they crawl. The adult moth does not feed, but is merely around on the walls and screens of the packing house to get a chance to deposit her eggs upon the fruit.

This is the only serious pest of the date palm that appears to hibernate. It passes most of the winter largely in the larval state.

All three of the above-discussed pests of the ripe fruit are at present controlled in the larger packing houses by fumigation with carbon bisulphide. The growers could aid very greatly in preventing access of these insects if they would have some way of screening their lug boxes immediately after picking the fruit, and putting finer-meshed screens (36 or more meshes to the inch) on their packing house doors and windows. Double doors should certainly be used.

In contrast to the insects attacking the growing tissue, those attacking the ripe fruit are world-wide distributed and cosmopolitan feeders, old offenders, for a long time known to entomologists.

Growing and Handling Date Offshoots

By C. E. Cook, Indio, California

THERE is perhaps no feature of the date industry more replete with interest than the subject of Growing and Handling Date Offshoots; but even a summary of the history of the development of methods with their attendant failures and successes would consume more time than can be allotted for the subject.

There is very little literature for reference and those who have experimented have had little to guide them except the superstitious legends of the Arabs and theories of their own creation. It has been stated by good authority that when date growers in foreign countries get together and discuss the propagation of date offshoots that usually as many ideas are expressed as there are individuals present. The fact that during at least 4,000 years of date culture in foreign lands no uniform method of propagating offshoots has been developed is a true indication of the difficulties involved and which have had to be solved in America by ingenuity, modern science, and hard work.

The early importations of offshoots brought from Egypt, Algeria, and Persia were usually propagated in nursery rows or in the open orchard. The average percent of loss was quite high but yet enough were saved to get the industry well started.

When home-grown offshoots were available for propagation it was found that the methods previously used were not as satisfactory as had been expected when applied to the local product. About the year 1914 canvas propagation houses were used and a little later this was modified by making the side walls of boards covered tightly with building paper. Various degrees of success were experienced with this arrangement, sometimes extremely satisfactory results were reported and again almost a total loss would occur without any satisfactory explanation having ever been offered.

This uncertainty led to a continuation of experiments until the year 1920 at which time four or five growers independently made the experiment of carefully removing offshoots that had been rooted on the parent palm and planting direct to

orchard form. The success of these experiments was so marked that the method has been followed since that time with few exceptions.

The next step in advance was the method of rooting high offshoots that is described under another topic of the present program. By high offshoots is meant the class of offshoots that grow on the parent palm too high to be rooted without artificial means of keeping the soil or other medium in place against the base of the offshoot while it is still attached.

The producing of offshoots on the parent palm has never presented any difficult problems in this country since nature governs that matter in a satisfactory manner provided the palm has good growing conditions. It is good practice, however, to keep the soil moist around the base of palms while they are producing offshoots in order to establish roots that naturally start from the offshoots. Offshoots should not be pruned until they are ready to be removed from the palm unless it is unavoidable; but pruning is sometimes necessary when the leaves are greatly in the way of cultivating and sometimes it is necessary to prune one offshoot in order to help another that is being too much crowded but it is a safe rule to assume that every green leaf is a help to an offshoot or palm.

The age at which offshoots can be safely cut is not as important as the size; often at three years an offshoot will be ready to cut but usually four years is needed for proper maturity. Offshoots weighing fifteen pounds and less have been successfully propagated but at present the tendency is toward larger and more mature offshoots so that forty pounds is not an unusual weight.

The age at which palms cease to bear offshoots varies greatly with the variety; with the Deglet Noor it is about ten years, while with the Saidy and Hayana it may reach twenty years. The total number of offshoots that may reasonably be expected from one palm also varies with the variety in much the same proportions. With Deglet Noor palms an average of ten offshoots can safely be figured but with Saidy and

Hayana palms the total number of ten reaches twenty or twenty-five.

The time of year for transplanting offshoots has quite a wide range—from February to September—but the middle of this period of time is to be preferred to the extremes. By May the Spring winds have usually quieted down and hot weather just getting established and these conditions seem most favorable for quickly establishing new growth.

In pruning offshoots for transplanting the side leaves should first be trimmed off then the remaining leaves bound tightly together with a strong cord and cut squarely off about 18 inches above the crown or the point where the bases of the leaves separate. The soil should then be dug from around the base of the offshoot leaving a ball averaging approximately one foot in diameter. The roots should be cut even with the outside of the ball using a sharp chisel and avoiding cutting with a dull shovel. The offshoot is then ready to be severed from the parent palm, the necessary tools for this operation being described under a separate topic.

In preparing the orchard for planting the rooted offshoots, it is good practice to have holes dug of ample size and have them surrounded by a basin. This insures a depth of planting that will later be valuable in rooting the daughter offshoots and also in firmly anchoring the mature tree. The holes should be filled with water at least once before the offshoots are planted giving time for the water to soak into the soil before planting is begun.

After offshoots are transplanted to the orchard frequent irrigation is necessary especially during the first thirty days. Some authorities recommend watering every day but three times per week is more common practice. After thirty days two irrigations per week is sufficient unless the weather is extremely hot; and after roots are well established one irrigation per week will suffice.

In handling an importation of offshoots from Egypt in 1922 the writer prepared two large propagating houses with canvas roof and sides boarded up and down. These boards shrunk until there were cracks of

considerable width and in addition to these openings two large doors were provided at each end of each house. These doors were kept wide open all summer and together with the cracks in the walls provided excellent ventilation and allowed good light.

Considering the fact that many of the offshoots were quite dry as a result of the long journey and voyage the results in these two houses were very satisfactory. The new growth maintained a healthy green color and the leaves were more sturdy than in more closely confined houses.

At Yuma, Arizona, the writer is using another method of propagating date offshoots that was originated by Mr. Bernard Johnson of Yuma in the year 1917. The parent palm is allowed to reach a height of about ten feet then one of the large well-rooted offshoots is selected for propagating purposes. A trench is then dug on all sides of the palm except the side on which the selected offshoot is located. A large chisel is then driven in between the offshoot and the parent palm and as they are separated from each other the palm falls away leaving the offshoot in place and its roots undisturbed. The trench is then filled, water is applied and in a few months the offshoot is well established. About four years later the offshoot has be-

come a tree and the operation is repeated. In this manner the nursery is permanently maintained and large palms with a family of offshoots attached are each year put on the market. This arrangement is strictly a nursery proposition as the palms are sold before the bearing age is reached.

The question is sometimes asked whether or not there is danger of damaging the parent palm in removing the offshoots. In considering this question one important fact should be kept in mind, namely, that an injury to the parent palm is permanent and will never be healed over as in trees that grow from the outside instead of from the center. Palms have without doubt sometimes been injured by making deep cuts in removing offshoots, as in this way the trunk is permanently weakened near the surface of the ground where it needs most strength. It is better practice to shield the parent palm than to cut a liberal portion away in order to obtain a few extra roots with the offshoot that is being removed. No doubt the trunk of a palm would be more sturdy and of better form if all its offshoots were removed as soon as they make their appearance but no one will probably care to make the experiment while present prices of offshoots continue.

The following data are given not because they are unusual but to indicate what can now reasonably be expected in transplanting offshoots in commercial quantities:

In 1920 the writer transplanted 15 well-rooted Deglet Noor offshoots direct from the palms to the orchard; all lived and are now flourishing palms. In 1921, 130 were similarly planted; about 98 percent lived and are doing well. In 1922, 171 similar offshoots were planted under his supervision. In 1923, out of 264 transplanted, indications are that 98 percent will survive. Many other growers have had similar results and it is certainly gratifying to now be able to see numerous plantings of young palms throughout the valley.

If choice varieties of date palms could be propagated or multiplied as readily as grape-vines, fig trees, apples or peaches, the importance of handling offshoots would rapidly diminish but when it is considered that the increase in acreage is necessarily slow and is dependent on saving the limited number of offshoots that develop, it can readily be understood that the date growers feel that a great step in advance has been taken since they can now estimate with confidence on offshoot propagation and on acreage expansion.

The Faries Method of Rooting High Offshoots

By Thomas E. Allen, Foreman of M. H. Whittier Ranch, Indio, California

THE rooting of high offshoots on the palm was originated by Dr. W. R. Faries. The writer is using his method of rooting offshoots, in a modified form.

Earthen pots, cut in two, vertically, are used, number twelve pots being the best size. A half pot is used for each shoot.

The tools necessary are a wooden mallet, one and a half inch short wood chisel, tin snips, pruners, and a knife.

Tie the offshoot to the palm with a stout cord. Cut off the supporting frond and other tissue, leaving a smooth surface. Be extremely careful not to cut the connection, or break it by bending the shoot in any direction. Have a piece of light galvanized tin about one foot square, for each shoot. Cut a "U" shaped hole in one edge, about three inches deep, and as wide as the offshoot connection. If the hole is too small,

cut out a little at a time until it fits. Push the tin up from underneath, until it fits snugly against the connection. Place the bottom of the pot under the tin, and about five inches from the shoot. This space will leave room to examine rooting surface. Pack soil firmly inside of pot. A heavy soil is better for this purpose than sandy. Also pack soil firmly on outside of pot. If the shoot is too high, use whatever material is available to hold pot in place. The tin will serve as a guide when cutting the shoot. If heavy soil is used in pot, and same is wet, no difficulty will be experienced in removing pot when shoot is transplanted. Extreme care must be used in cutting, moving, and transplanting of shoots, because if a root is bent, kinked, twisted or bruised, it will cease to function. If the tin injures the roots, such injury has not made itself apparent.

Several hundred shoots were potted in the Whittier Gardens, during the early spring of 1923. The exact number that have rooted, has not been ascertained. The writer found some spike roots in less than ninety days, however, a few shoots most favorably located, have not rooted after one year.

The percentage of shoots not rooting after one year is not available, because all of the shoots have not been examined. The number planted has been few, on account of determining the size and number of roots best suited for transplanting. Definite data will be available later.

If shoots are too high for irrigation water to reach, a five gallon vessel, with a small nail hole in the bottom, or a petcock soldered on the bottom, may be filled with water, and set to slowly drip in the pot. This will lessen the frequency of watering high shoots.

The Rooting of High Offshoots on the Palm

By Dr. W. R. Faries, Coachella, California

THE possibility of rooting high offshoots first came to my mind in the fall of 1920 in this way: in the summer of that year a Deglet Noor tree from which ten offshoots had been cut had to be guyed to hold it upright on account of the loss of roots from cutting the offshoots. This tree still had two high offshoots attached to it. In order to favor the growth of roots on the tree, dry barnyard manure was placed around it and held in place with building paper, strengthened with chicken-fence wire. In November or December, when this covering was removed, not only was the tree found to be well rooted, but the two high offshoots had developed abundant roots also. These offshoots were removed and potted in the offshoot-rooting house, and grew. In this way I got the idea of the possibility of rooting high offshoots, and in the spring of 1921 I boxed for the first time offshoots for the purpose of rooting them, and developed the entire method of cutting off the basal leaf, tying the offshoot to the mother palm, using tin to separate the trunk from the roots of the offshoots, etc.

Offshoots boxed in this way in the spring and summer of 1921 were successfully rooted, and the method was worked out in its entirety during this summer. In the following spring—1922—this method was given to various neighbors, including Mr. Henry Middleton, who used it with success that year.

The method of rooting high shoots is a development of the gardeners' method of layering and side-potting, which most of us have used on vines and shrubs. The term "high offshoot" is a relative one. It expresses the idea that an offshoot is too high to root itself in the ground. This may be above the soil only the thickness of the supporting leaf, or it may be 15 feet up like a palm with several shoots near its crown, now growing in Los Angeles. The palms we deal with have a terminal bud and many auxiliary buds. These last are of two kinds, leaf buds which lengthen into offshoots, and the fruit buds. In the case of the Deglet Noor palm there may be a combination of the two which is of no use to us but only a disappointment. The term "high shoot" is also

relative to the depth to which the palm is planted. One palm that was planted very shallowly developed a circle of shoots, but the wind twisted it off just above the ground. It was replanted with its encircling shoots in the ground but it failed to live. Another planted deeper in my ground, but still too shallow, has five large offshoots all high above ground, and it has not enough rooting surface in the ground for its own good.

A study of the buds on the offshoot is of value to us as we wish to grow as many shoots as possible. There are few, if any, buds behind the first leaves. The first buds that do develop are often too feeble to push out, or are in the case of the Deglet Noor the disappointing mixed buds.

When the shoot increases in size and large leaves develop, then behind them offshoot buds are likely to develop. Cutting off these leaves stunts the shoot, and in the opinion of some of us, blights the buds that might have developed. The zone of offshoot bearing is a limited area in the Deglet Noor palm. Higher on the palm in some cases nearly every leaf axil will have a fruit bud, whether it develops or not. In the case of low shoots in the ground the bases of the cut leaves do not dry out and there is more hope for the development of the buds. As the shoot develops the base of the parent supporting leaf broadens and thickens, and the leaves on either side also enlarge to help support the shoot. These leaves should be left as long as they are functioning and feeding the shoot. When they rise from below the surface of the ground their bases rot and the roots of the shoot penetrate them and enter the ground. This is not the case with the high shoot. In the case of the high offshoot if the supporting leaf is cut or dies early the shoot is likely to be retarded in its development and will not make a palm of rapid growth. Side potting a shoot for a year increases its size very noticeably.

In preparing to root the high offshoot it is necessary to remove from the parent palm, the hard, dry leaf bases that support the shoot, to enable the roots to develop and escape

into the potting soil. The best way to remove these leaves is with a broad chisel and a mallet. The first step in the process is to use No. 12 or 14 gauge galvanized wire and take a couple of turns around the shoot and include the bases of two leaves above the shoot, and twist the wire until it will just support the shoot. Care must be taken in using the chisel and bill-hook knife, not to injure the short, smooth, tapering stem that connects the shoot with the palm, nor to cut roots that may be trying to push out. Space must be made about the short stem so that the potting soil may come in contact with the root-producing surface at the base of the shoot.

The third step is to build up a box or pot to enclose the soil to receive the expected roots. This box or pot should reach high enough to bring the potting soil up several inches on the base of the shoot. Gardener's potting soil consists of leaf mould earth and sand. We can use any sand and rotting vegetable matter which will retain moisture. Water should be applied often enough to keep the soil moist until the roots enter the area which is moistened by the irrigation water.

May I add a little more in regard to injury done by extensive destruction of leaves, particularly to Deglet Noor palms. Some years ago we had a severe frost which killed the leaves of some young shoots. The central bud lived and pushed out but was not able to burst the encircling tubes of dead fibre, and these frosted shoots are no larger now than they were when frozen, and consequently are of no value. The same condition can be produced by cutting off many contiguous leaves. Also, if a shoot is set out and the outer leaves are allowed to dry, the growing central leaves are confined by the surrounding dead tissue and the shoot is at a standstill for a long time. It is probable that if this dead tissue is planted deeply enough it will rot and soon cease to confine the growing center. In setting out a shoot if the outer leaves are left on with enough of their pinnae to keep them functioning, and the whole be wrapped with palm leaves or burlap to keep the sun from killing the leaves, that the shoot will not be set back by being transplanted and so come into bearing shoots and fruit sooner than it otherwise would.

Rooting of High Offshoots

By Henry Middleton, Thermal, California

THE method of rooting high offshoots by side-potting has proven very successful as far as my experience has gone.

By the term "high offshoots" we mean those offshoots that come out on the palm, say ten inches or more above the surface of the ground, and which therefore, cannot be rooted as ordinary base rooted offshoots.

During a discussion of rooting offshoots with Dr. W. R. Faries in the spring of 1922, he told me of the side potting method for high offshoots and carefully explained how it was done. The more I thought of what he had said the more convinced I became. Therefore in April, 1922, I carefully prepared and side potted sixteen high offshoots. This preparation is done by using a large carpenter's chisel and mallet to cut away the base leaf that supports the offshoot. This exposes the root area of the offshoot so it readily starts roots in the pot. I filled the pots with pure manure and watered freely and regularly, at first twice a week so the manure would not heat, thereafter about once a week, by dipping the water from irrigation furrow with a pail, and sometimes between irrigations we used a tank on a stone boat pulled by a team from palm to palm.

About the first of October, 1922, or between five and six months after potting I found upon examination that the offshoots were well rooted. Although realizing that October was not the best time to plant to orchard, I decided to take the chance rather than have to keep those offshoots watered all winter by hand.

Right here I would like to say that I decided that January would be the best time to do the potting, then they would be ready to move to orchard by June. Regarding this I was cautioned not to "count my eggs before they hatched," that I would find that the shoots would not root as readily during the winter months as they did in summer. However, Dr. Faries has since demonstrated that a shoot potted in December was well rooted by March. The point is that the material in the pot is warmer than the earth during winter.

In October I moved the first two shoots but before planting we used water to wash away all foreign matter from the ball, giving a clear

view of the system of roots made by the shoots during the time they were potted. Then I took several snapshots of same. I have these pictures with me if any one should care to see them.

I believe it a big mistake to expose the roots as I did in the case of these two offshoots, as one of them died and the other did not make much headway, while the other four-

teen offshoots that were taken off and planted carefully without disturbing the ball all did well. At the same time I took off seven base rooted offshoots for two reasons: first, for comparison; second, because it required just seven to complete the row I had started.

In a comparison of the two types of rooted offshoots planted in October the side potted shoots made a much better showing.

The potted offshoots during the time they were being rooted in the pots almost doubled in size while offshoots of the same size on the same palm did not increase in size nearly so rapidly.

Cost of Starting a Date Garden

By Chester A. Sparey, Indio, California

THIS is a topic that the experienced date grower is wont to approach with a good deal of respect. It might even be intimated that the more experienced he is, the more respectful he is apt to be. However, no prospective date grower would be likely to start a plantation without having become fairly well satisfied in his own mind as to what would be the probable cost. Everyone is more or less interested in the "price," and prices vary. To bring a date plantation from nursery stock to ultimate fruition requires about eight to ten years. Conditions are bound to fluctuate during such a lapse of time. Then, too, the personal equation is bound to be a very determining factor. It should be held in mind that several different men, starting out with simultaneous and equal plantings, would almost invariably meet with continually divergent results; probably ranging all the way from early failure to early success. This divergence, as in any other line of endeavor, would be largely determined by the individual business ability, adaptability, skill, diligence and perseverance. All of the attributes just listed are quite essential, but, above all, the prospective date grower must have access to sufficient funds, good hard "coin of the realm," to carry him through the known necessary period of unproductive years before the book entries commence showing on the proper side of the ledger.

In approximating what the cost will be of initiating and maturing a date planting we can reap large benefit from the experiences of others who have passed through all or

part of the initial period. We cannot, however, take the costs incurred or the results obtained by any of them as a criterion. The date industry has been brought to its present status through a period of vastly fluctuating conditions. Because of the war we have faced a most variable market both as regards labor and material. Labor conditions and trade values now appear to be more steady and settled. Date growers during the last few years have been laboring up stream through several stages of experimentation. The scope of these experiments has been quite multifarious. Many sad losses have been endured through the effort to develop commercial date gardens by the direct planting and propagation of seed. The losses from early cutting of offshoots of standard varieties and experimental attempts at rooting them have at times been tremendous. Even the handling of the fruit itself when finally produced has been erratic and further losses have been sustained as a result of inexperience or carelessness in the methods of curing, packing and marketing.

It is now felt that most of these drawbacks have been or are under process of being overcome. Practically all men familiar with dates will concede the wisdom and advisability of planting nothing but standard varieties. By a study of definite knowledge which is now available as a result of the experience of others, the prospective date grower can determine which particular variety or varieties will be best to plant in the locality that he has selected. It is to be assumed, of course, that he will

have selected an approved or proven locality in which to grow dates. The methods of propagating well developed offshoots now being practiced seem to be fairly safe, and the chances of losing nursery stock comparatively negligible if proper precautions are taken. With good soil and proper varieties of nursery stock to begin with, fairly definite data available as to the moisture, tillage and fertilization requirements, coupled with a quite definite understanding of how much time is to be required, the cost of the undertaking should be entirely within the ability of the interested individual to approximate.

Under the topic of cost in starting a date garden the size of the planting will be a largely determining factor. If an individual is to put his whole time and thought to the work he should have a place large enough to keep himself well occupied in order to obtain the most efficient results. For the man who wants to start in a small way it appears that the syndicate idea would be the most desirable and economical. Here again operating and maintenance costs could be kept as low as in the larger individual planting. We will discuss a planting of about twenty acres.

Dates should be planted on good land. That is, the soil should be fairly rich, well drained, open enough to allow of deep water penetration, and should be carefully graded so as to lie fairly level in at least one direction. There must be a bounteous supply of water available; not less than the equivalent of one miner's inch continuous flow for each acre during the season of heaviest demand. It is highly desirable to have this water distributed through underground cement pipe lines. Having obtained these conditions, such land is variously quoted in the Coachella Valley at prices ranging from \$250.00 to \$500.00 per acre, governed largely by location. Raw land can be had for very low figures in many cases, but by the time it has been put in the shape mentioned above, water developed and pipe lines laid, the cost is apt to be about the same. Here is one of the first of many instances where the business or trading acumen of the individual is likely to become apparent.

The prices at which nursery stock is quoted at the present time seem to be quite well established. Rooted offshoots of the most desirable Persian varieties may be had at prices ranging around \$12.00 each. The

price of well developed rooted Deglet Noor stock appears to average about \$20.00 per plant. If we may use these figures we find the nursery stock costing in the vicinity of \$1,000.00 per acre in the case of a Deglet Noor planting. It must again be emphasized, however, that figures set down in this manner are necessarily quite arbitrary. Here again, as all the way through the enterprise, the purchasing shrewdness of the individual will come largely into play.

Having secured the land, the matter of domestic improvements, running equipment, tillage implements and stock or tractor power must be considered. Each one must determine for himself how much he cares or is able to invest in dwelling comforts. It seems safe to say that one good team and \$500.00 worth of implements will take care of all the ordinary requirements of at least twenty acres. This would be a poor place to attempt a discussion of the relative merits of mechanical power as compared to stock. Maybe both cost about the same in the end. Hay may be grown between the rows in a date planting for the betterment of the soil and as an economy for feeding a team. We might allow a meager minimum of \$2,000.00 for domestic improvements, stock and implements on the twenty acres we are discussing.

One energetic man should be able to handle the operating requirements of up to twenty acres of date palms for the first three years after they

have been set out on a well planned place, with possibly a little extra seasonal help. From that time on most of the efforts of one additional man might be required. A common laborer will not do for the man in charge of the place. Whether it is to be the owner or a salaried man, proper compensation must be allowed for. With this idea in mind we might assume a figure of \$2,000.00 a year for labor during the first three years and an average of about \$3,000.00 per year thereafter on twenty acres.

Allowance must be made for cost of water. The optimum water demand for dates will without doubt be all of six acre feet per acre per annum. Several average figures for the cost of this amount of water in the Coachella Valley wherein reasonable allowance is made for pumping plant maintenance give us a probable cost of \$15.00 per acre each year. This cost will of course vary with the distance the water must be lifted as well as with the efficiency of the pumping equipment.

Another allowance must be made to cover taxes, insurance, running repairs, replacements of tools, implements, and unforeseen contingencies. It seems that \$50.00 per acre per year should be sufficiently generous for this.

Continuing our calculations with the foregoing assumptions for a basis, and assuming that the money has been carefully spent under efficient management, we would find the following cost at the end of three years:

Cost of land	per acre \$	300.00
Deglet Noor Nursery Stock	"	1,000.00
Domestic improvements, stock, implements	"	100.00
Labor and management (three years)	"	300.00
Water (three years)	"	45.00
Taxes, Repairs and Incidentals (three years)	"	150.00
<hr/>		
Total Cost at end of Three Years	per acre	\$1,895.00

During about the fourth and fifth years the cost of operation will begin to increase. It is at this point that many may begin to falter because of lack of capital. But it is also from this point forward that fruit begins to appear in steadily increasing quantities each season until the ultimate production is reached.

It is also at about this time that the first few offshoots will have become sufficiently developed for beginning new plantings. These may either be used for extending the planting or marketed to help defray the cost of maintaining the original acreage. What this fruit and these

offshoots will bring in cash at such a future date is a matter where the prediction of one person is just about as good as that of another.

In conclusion it might be said that the writer does not consider the foregoing figures to be in any way too low. They are also based on an assumption of entirely normal conditions and results, as well as the hypothesis that plants could be secured for starting twenty simultaneous acres. "Farming from the desk," and figuring results or profits for several years ahead, is at best a dangerous occupation, and this essay must be indulgently considered with that idea in mind.

Tools for Cutting Offshoots

By Leonhardt Swingle, Indio, California

WHEN tools are mentioned in connection with offshoot cutting, everyone thinks of the offshoot chisel; but the first tool used is not the chisel, but a good sharp shovel. Work with the chisel is the hardest and most particular, and all work possible should be done with the shovel to save the strength and time of the man with the chisel.

The shovel should be used to dig the dirt well away from the shoot, leaving a ball of dirt attached to the roots but exposing the connection on each side. It is important to use a straight shovel as a shovel with a "hook" or blade set at an angle to the handle, will throw the hands of the worker into the palm leaves and the work will not be done correctly.

Offshoot chisels are of various sizes for use with large or small offshoots, but all are of one type, a rectangular cutting blade having one side bevelled and the other side flat. This form of chisel has been developed in the Coachella Valley by Bruce Drummopd, formerly Superintendent of the Government Date Garden, Indio, Calif., and E. Sterescu, blacksmith, of Indio, Calif.

Chisels must be made of the very best tool steel. The edge must be sharp at all times. A good chisel will be so hard that a file will only polish it. The handle must be tough and strong, as it is subject to heavy blows and stresses from all sides while the shoot is being cut and the chisel removed. A hard season's work will wear about eighteen inches off the end of the handle as the sledge hammers the chisel in making the cut. The handle may be badly bent out of shape due to hitting on the side in removing the chisel after the cut is made. All this requires a very heavy handle

and gives too great a proportion of the weight of the chisel in the handle. A chisel with a light weight handle would be a great improvement.

The chisel is used primarily in cutting the connection of the offshoot to the parent palm. It is not advisable to make the cut until the connection is well located. All this preliminary work should have been done with the shovel. Sometimes fiber and old leaf bases will have to be cut away with the chisel before the connection is located and the chisel set for cutting. Always put the smooth side of the chisel to the offshoot and the bevelled side to the parent palm which will give a smooth cut on the offshoot and allow the bevelled side to press away from the palm. By noting the way the chisel jumps when hit by the sledge, the progress of the cut can be watched and the chisel removed, if necessary to reset, or stopped when the cut is made. Sometimes one cut will do the work and sometimes a great many are necessary. In removing the chisel, always press edgewise to avoid the danger of breaking the offshoot by prying it off the tree.

There is a great deal of difference between offshoots on the same tree, but a greater difference between offshoots of different varieties. The Deglet Noor is the easiest to cut. The connection is long and slender and the offshoots are very seldom crowded on the tree. The Iteema offshoots are very hard to cut, as a rule, because of their large, thick connection and their usual very crowded condition on the tree which makes it very hard to get a place to make the cut.

Theory offshoots have the connection shorter than Deglet Noor and the parent tree has a tendency to over-grow the shoot. Khadrawi offshoots have small, very short connections. They are usually surrounded by other offshoots and have numerous secondary offshoots, and the result is that the connection is easy to cut when located, but sometimes very hard to locate. Zahidi offshoots have large connections but are of good length.

The offshoot is best pruned after it is cut. It can be pruned first if desired, but some pruning is always necessary after cutting and there is no need to do the work twice. A "double-cut" pruner is best for this purpose. Prune off the lower stubs and leaves and then draw the top together with a rope or strong string, tie tightly, and cut square. A square cut will show growth at a glance by the pushing out of the center leaves.

No rule can be given as to how long a top to leave. There is a certain ratio between the body and top, easy to see, but very hard to formulate. Most tops are left too long. It is better to cut back a larger number of leaves to a moderate length rather than leave a few very long leaves in the center. Even though the outer leaves die, they furnish a support and protection to the young leaves of the center and can be easily cut off when the offshoot is established. The offshoot is usually wrapped with burlap after planting, but this is more properly a part of the planting and subsequent care rather than the cutting, and is discussed by others.

Marketing Dates

By C. E. Cook, Indio, California

AS a large portion of our dates are sold through co-operative associations that have a special sales department the marketing is not so much a problem for the individual grower as some other questions but nevertheless all growers are interested in the subject and a brief discussion may be profitable.

The problems of marketing are intimately connected with growing and packing dates but many questions of a purely commercial nature arise as well. These questions are perhaps older than Egypt's pyramids and are also among the newest problems connected with the date industry, for in this country the real problems of marketing have only just begun to develop with the last few years, and have not yet reached maturity.

The fact that increase of production has been necessarily slow on account of the conservative manner in which nature increases the number of palms has made marketing thus far comparatively easy; however palms are increasing by geometrical progression and marketing problems may increase in the same ratio. They should be anticipated as fully as possible for early decisions are of highest importance in a growing industry.

Whether the marketing is conducted by organized co-operative associations or by private individuals, co-operation of some sort is of highest importance and will ultimately be absolutely essential for complete success. This thought is by no means new and fortunately we have the extended experience of several well organized industries from which we can profit. It was sometimes dire necessity that brought the individuals together into a strong organization but no matter whether it was the cords of love or the fear of bankruptcy that bound them together they demonstrated what co-operative marketing could accomplish.

These advantages are too well

known to need reviewing and no doubt all of us are agreed that co-operation is the ideal arrangement for marketing our products and as experiments are made from time to time and the most practical methods are proven there is no doubt but that closer co-operation will naturally follow. At any rate it is gratifying to realize that so far there has been no really keen competition and by taking advantage of this situation there is the possibility of establishing a record for low selling cost that would not be possible if we were required to adopt selling plans found in other lines of business where existence is only made possible by out-selling strong competitors.

Very little expense for advertising has been incurred thus far as good dates advertise themselves so effectively that a national advertising campaign has not been necessary and local consumption has almost kept pace with the increase in production. It would be difficult to find another line of business where a market has been developed with as little advertising expense as the date industry and it is almost a certainty that a large percent of advertising costs and high commissions can be avoided if we continue to avoid competition and keep the quality of our product high.

High average quality is much to be preferred to extremes of grades for best marketing returns. Other associations have tried the system of a super-fine grade with corresponding prices but it has not always proven a success; and so far experience points toward a first grade that will include a comparatively large percent of the total output for best financial results. To illustrate the point, assume we have 100 pounds of average dates. If ten percent are selected as a super-fine grade possibly fifty cents per pound can be added to the selling price and this at first thought appears as profitable

business but the chances are that at least ten cents per pound has been subtracted from the selling price of the remaining ninety pounds so that nine dollars has been lost in gaining the five dollars apparent profit, to say nothing of the added cost and trouble of assorting and handling the extra grades; also there is the probability of a much larger number of satisfied customers if the super-fine dates are not segregated. This is by no means an exaggerated illustration as experience has demonstrated. Bearing on this same phase of the subject is the testimony of a lemon grower which was recently brought to the attention of the writer.

This grower stated that he had large quantities of lemons that for all practical purposes were as fine as any to be obtained but that he was not able to sell them at any price because in his locality the standard of perfection required a certain shaped tip that was not found on his fruit. This situation had been brought about by keen competition but the effect of selecting only a small percent of the very finest fruit into a grade by itself has a tendency toward the same results. A high standard of product should most certainly be our aim but it is poor business to sell the icing separated from the cake.

Closely connected with marketing problems is the necessity of a standardized pack and this will be brought about in time but it is a difficult matter until questions of processing, dehydrating and grading are well settled.

While careful energetic work in all departments is necessary, yet with production area and undue expansion rigidly limited by nature, and a boundless marketing territory before us, together with the fact that we have a wholesome food and a delightful connection in one natural product, the marketing problems seem capable of satisfactory solution.

Co-Operative Quarantine Date Nurseries

By Walter T. Swingle, Crop Physiology and Breeding Investigations, U. S. Department of Agriculture, Washington, D. C.

COMMERCIAL date culture in America may be said to have started about 1911 with the successful ripening of the Deglet Noor variety; and during the next few years large importations of this variety were made by the organized date growers of the Coachella Valley with the cooperation of the Department of Agriculture, and extensive importations of date offshoots from the Mesopotamian region were made by private nursery companies. During the war importations became impossible, through the increasing depredations of the German submarines; and by the time the war was over the Federal Horticultural Board, alarmed by the spread of the highly dangerous *Parlatoria* scale, forbade outright all further importations of date palms into the United States by private parties, making the importation of date palms a Government monopoly. It had been the policy of the Department of Agriculture, from the beginning of its studies of the date palm, to determine which of the varieties imported from the Old World were the best, and to determine, by actual experiment, in cooperation with the State Experiment Stations and private individuals, which varieties offered the most promise of success on a commercial scale in the hot irrigated valleys of the Southwest. Then, after such tests had demonstrated that such varieties were of promise, it was the policy to assist date growers to secure offshoots at reasonable prices.

The Deglet Noor was the first variety that could be considered by the Department of Agriculture as having succeeded in the Coachella Valley, and the offshoots imported by the date growers' organization with the cooperation of the Department of Agriculture were sold to the growers of this variety at remarkably low prices, sometimes under three dollars for offshoots delivered at Indio. As a result, however, of the new federal quarantine regulations, private importations became impossible after the world war came to a close, and if any further importations were needed they had to be made under the full control of the Department of Agriculture.

As early as 1901 Mr. David Fairchild found in Egypt a very promising date under the name of Wahi. Many expeditions were sent to Egypt and to the oases of the Libyan Desert in the attempt to locate this date, but it was not until October, 1913, that Professor S. C. Mason finally identified this date as the Saidy, the principal export date of the Libyan Desert. He also found that the Saidy was extremely like the Siwah variety, growing in large quantities in the Nile Valley near Cairo; and the offshoots sent from Egypt by him in 1914 and planted at Mecca, California, proved beyond question that the two varieties were identical.

In the meantime, observations in this country and in Egypt had shown that the Saidy date, in addition to being of excellent quality, exhibited the remarkable virtue of improving in storage instead of deteriorating, and was also able to ripen its fruit in spite of heavy dews occurring on two-thirds of the days in September and October in the Nile Valley, the ripening season of this variety. As the Deglet Noor had not succeeded in the Imperial Valley or Yuma Valley because of the interference of heavy dews with the ripening of the fruit, it seemed important to secure enough offshoots of the Saidy date to permit its culture being undertaken on a commercial scale in the valleys and elsewhere in the United States. The problem was how to secure such an importation, in view of the strict regulations of the Federal Horticultural Board governing all importations of scale-infested palms. It should be stated here parenthetically that practically all imported offshoots harbor some species of scale—either the *Parlatoria* or the Marlett, or both.

Finally, in 1920, funds were secured to make a direct importation by the Department of Agriculture of Saidy offshoots from Egypt. Professor Mason was sent to Egypt and secured about 2,000 Saidy offshoots and also about 1,000 Hayany offshoots.

The Saidy date having made a very good showing in America, and being highly esteemed by American date growers and date eaters, it soon

became evident that 2,000 offshoots of this variety were quite insufficient to furnish an adequate stock of this variety for commercial planting. Accordingly, in 1921 and 1922, contracts were entered into with Mr. King C. Gillette and T. H. Rosenberger, trading as the Gillette-Rosenberger Date Gardens, and the Calizona Date Nurseries, of which Mr. C. E. Cook of Indio is president and holds a controlling interest, whereby approximately 7,000 additional Saidy offshoots were imported, and also about 500 additional Hayany's, about 1,400 Deglet Noors and a few Thoorys (it proved impossible to buy Thoory offshoots in any considerable number). In all, nearly 9,000 offshoots were imported under these contracts. All expenses of the importation, including the salary and expenses of Professor Mason, who bought, packed and shipped the offshoots from Algeria and from Egypt, being paid by the contractors. These offshoots were to remain technically the property of the Department of Agriculture for twenty years after planting, the contractor being debarred from selling or even moving these trees without the express permission of the Department of Agriculture.

On the other hand, the contractor had the right to all the fruit produced by these trees and to one-fifth of the offshoots, the Department of Agriculture receiving one-fifth, and the remaining three-fifths to be sold to bona fide date growers for planting on their property, and not for sale by them, in lots of not less than 5 or more than 50, no one person being allowed to purchase more than one lot; preference being given to date growers in regions suitable for the variety being disposed of who shall be actually owning and residing on the property they propose to plant; and among such growers further preference shall be given to those who have hitherto grown date palms, but who do not have more than 100 trees of the variety they desire to purchase planted out in orchard form.

It was furthermore provided that such offshoots shall be offered for sale for the first ten years of the

contract at a price not to exceed \$3.00 each for the Saidu and Hayany varieties, and not to exceed \$4.00 each for the second ten years of the contract. The Deglet Noor and Thoory offshoots must be offered for sale at prices not to exceed \$7.50 each during the whole life of the contract.

In addition to the three principal contracts providing for the importation of the Saidu, Hayany, Deglet Noor and Thoory date offshoots, three additional contracts have been made to provide for the growing of the Saidu, Hayany and Amhat offshoots imported by Professor Mason in 1920. One of these contracts is with Messrs. Gillette and Rosenberger, and provides for growing between 500 and 1,200 Saidu offshoots. The second contract, with the Phoenix Date Company, Inc., of Phoenix, Arizona, of which Mr. Robert C. Metzler is president, provides for growing about 500 offshoots of the Hayany and Amhat varieties on a tract of land near Phoenix, Arizona. A third contract is with the Calizona Date Nursery, and provides for growing 100 Hayany and 300 Saidu offshoots at Yuma, Arizona. These contracts, including the Saidu variety, are for a 20-year period. The Hayany contract, with the Phoenix Date Company, is for a 15-year period only. All three contracts provide that one-fifth of the offshoots shall be the property of the Department of Agriculture, three-fifths must be sold to bona fide date growers, as outlined before, in lots of not less than 5 or more than fifty, at prices not to exceed \$3.00 each for the first ten years of the contract and \$4.00 each for the second ten years, or, in the case of the Phoenix Date Company, for the last five years of the contract, as this particular one expires in 15 years. Finally, one-fifth of the offshoots may, at the option of the contractor, either be sold as provided for the three-fifths already mentioned, or else planted by him on the same terms as the original importation. If the contractor elects to do this it will involve the making of contracts each year covering the one-fifth of the offshoots upon which he has this option. It should be remarked that as time goes on these successive contracts become more favorable to the contractor, since at the expiration of the twenty years (or 15, as the case may be) the entire planting, together with all subsidiary plantings made of the optional one-fifth, and all the date palms, whether young or old, shall become the property of the contractor in fee simple. For instance, suppose that in 1927 one of the contractors holding this type of contract should elect to plant his one-fifth, and suppose that his contract expires in 1941, the contract covering this optional one-fifth of the offshoots would have 14 years to run, and probably most of the offshoots would be cut from these trees before the contract expired. Let us suppose that the same contractor likewise elects to plant this one-fifth of the offshoots in 1937. In this case a special contract covering this special one-fifth would have only four years to run, and it might easily be that

no offshoots would reach a size to cut before the trees and the offshoots on them become the property of the contractor.

I am pleased to be able to announce to the date growers assembled here that within the past week a supplementary agreement has been signed by which two-fifths (or about 1,000 living offshoots) of the original importation of Saidu offshoots made by the Department in cooperation with the Calizona Date Company have been sold to Mr. C. O. Bullis of El Centro, California, who has entered into an exactly similar contract to that originally made between the Department of Agriculture and the Calizona Date Company, whereby he undertakes to maintain a quarantine nursery for Saidu offshoots on a tract of land lying between Brawley and El Centro, in the Imperial Valley. This tract is on the main road between Brawley and El Centro, about 1½ miles west of Grape Station, (formerly Keystone) on the Southern Pacific Railway. It is hoped that under this contract 1,000 Saidu trees, or enough to plant 20 acres, can be set out next spring.

The effect of all these contracts is to provide a liberal supply of offshoots of the Saidu date in the Coachella Valley, Imperial Valley and Yuma Valley, and a large supply of Hayany offshoots in the Salt River and Yuma Valleys. It also provides for a small supply of Deglet Noor and Thoory offshoots in the Coachella Valley, and a very small supply of Amhat offshoots in the Salt River Valley. However, the supply of offshoots of the Deglet Noor, Thoory and Amhat is so small that it will play no important part in the development of the date industry in the Southwest. On the other hand, the supply of Saidu offshoots that will be sold to the public at very reasonable rates bids fair to be enormous. It is no uncommon thing for a Saidu tree to carry 20 or 30 offshoots at one time, and it is possible that the average cut will be something like 25 offshoots per tree. As it is estimated that there are between 2,000 and 3,000 Saidu offshoots that will be put out in the initial plantings under these contracts, and as at least two of the Saidu contracts practically force the contractor to plant his one-fifth on the same terms as the original planting, there is every reason to expect that the public will benefit by a very considerable block of Saidu offshoots. Even supposing that the average is only 20 per tree instead of 25, and that only 2,000 offshoots live of the initial plants, nevertheless these 2,000 trees would yield 40,000 offshoots, of which no fewer than 24,000 offshoots would have to be sold to date growers at \$3.00 or \$4.00 an offshoot. The supplementary contracts would provide an added stock so that it is not improbable that 30,000 or 50,000 offshoots of the Saidu variety will be sold soon to date growers at the special introductory price. In the case of the Hayany offshoots it is probable that the initial plantings under the contracts will amount to between 400 and 600 offshoots; but as this variety yields

an enormous number of offshoots, this will provide a very large supply of offshoots of this variety.

To summarize and conclude this discussion it should be stated that the effect of these contracts is to place at the disposal of the date growers of the Southwest an abundant supply of date offshoots of the Saidu and Hayany varieties and a smaller number of offshoots of several other varieties, all to be sold at a very low introductory price to enable bona fide date growers to get a start from which they themselves can propagate offshoots to plant a much larger acreage.

A second beneficial result of these contracts just as important as securing the cheap offshoots is thoroughly and efficiently to safeguard our date industry from the danger of scale insect pests. The terms of the contract are explicit on this point, and there can be no question of the full authority of the Federal Horticultural Board to insist upon the thorough inspection of these imported trees and the complete clean-up of the offshoots before any offshoots can be placed on sale. As an indication of how important this is, it might be mentioned that the federal government has spent more money in fighting the Parlatoria scale, introduced by the large private importations of 1912-15, than was spent by the farmers and nurserymen themselves in buying these imported offshoots. Furthermore, this heavy expense is not yet over, but is still continuing, and is likely to continue for several years more. Because of this disastrous experience it is the intention of the Federal Horticultural Board and other Bureaus of the Department of Agriculture to make sure that no future importations shall be permitted that would in any way endanger the safety of the date offshoots already established in this country.

Finally, just a word as to when the offshoots will be placed on sale at these five quarantine nurseries. Because of the necessity for a thorough clean-up of any Parlatoria scale infestation, it will be necessary to keep the young offshoots under observation for several years before they are put on sale.

Many of the original imported offshoots are still in the offshoot-rooting houses or else have not yet started, if placed directly in the field. Many growing offshoots will be planted in the field this coming spring, and many already set in the field should start into vigorous growth this year; but there will be a few offshoots that will not be planted out or will not start until the spring and summer of 1925.

Probably the first small cut of offshoots will be made in 1926 or 1927, but only a few can be placed on sale before 1928 or 1929.

The contractors are required by the terms of the agreements to advertise any sale of offshoots at least twice in at least five newspapers published or circulated largely in the date growing sections of the United States. Each sale of offshoots must be held for thirty days under such regulations as many be prescribed by the Secretary of Agriculture.

Artificial Maturation of Dates and Utilization of Cull Dates by Methods of Semi-Maturation

By Bruce Drummond, Indio, California

THE maturation of dates does not necessarily mean that all varieties or all dates should go into a room or a container, be sealed up and exposed to temperatures ranging from 80 to 160 degrees Fahrenheit to make them a marketable product. In fact the methods of artificial maturation that are being used by the different date growers in this country today are in many instances doing more injury to the date as a market product than all the pests found in connection with the handling of the dates in the packing house. It is not the intention in presenting this paper to try to cover all the important phases in connection with the artificial maturation of the different varieties of dates that are grown in the Southwest at this time, but to discuss those of the most importance in the artificial work of maturation of such dates as are unfit for the markets when harvested.

It would be impossible to treat this subject fully in all of its different phases without giving a description of practically all of the varieties grown in the United States, for the treatment given to one variety to bring out the best features very often differs so much from that given to another that to use the same treatment would inflict a lasting injury in causing the dates to deteriorate very rapidly when changed from one climatic condition to another.

The artificial maturation of dates was first used in this country by Professor George Freeman and Dr. A. E. Vinson at the University of Arizona, with unripe dates from the Co-operative Date Garden at Tempe. A number of varieties tested responded readily to the process and made a good marketable fruit, which otherwise would no doubt have been worthless. Thus was inaugurated the principle of ripening dates by artificial methods which is now being universally used by nearly every date grower with one or more modifications, the wisdom or unwisdom of which only the future will reveal.

In the ripening and curing by artificial methods of such varieties as the Deglet Noor, it has been found that a much greater percentage of fancy fruit can be produced than by leaving the crop exposed to the varying climatic conditions that usually prevail during the ripening season. Many growers of this variety pick the dates before they are in a proper condition for the best results to be obtained by artificial methods of ripening. A common mistake is that of picking the dates too green, then placing them in the maturation room with high temperatures, which not only causes a general breaking down of texture, but matures and toughens the crude fibre in the dates instead of ripening them. This variety should be left on the mother palm until practically all the sugars have developed; then the entire bunch can be cut and the dates separated into two or three grades; i. e., green, ripe and mummified—the latter term referring to dates that have not fully developed, owing to various causes. It has been found by the writer in experiments conducted over a period of years that Deglet Noor dates picked when half-ripe can be made to respond to artificial maturation much better by placing them in a separate room, where the temperature can be kept at a uniform ratio of 80 deg. F., with a variation of not over ten degrees. This process may take from three to five days, depending on the condition of the dates when picked; but a much higher percentage of fancy dates can be obtained by using time instead of forcing the sugars to invert with high temperatures. No artificial moisture need be used when the temperature is kept between the degrees mentioned, as the fruit itself will furnish enough to ripen it thoroughly.

Dates that are two-thirds ripe or with a shade of pink in them should be placed in a separate room from the green fruit, in temperatures ranging from 90 to 105 deg. F., and

left until they are translucent and soft. Ripe dates of this kind can then be very quickly cured for packing by chilling them in a temperature of not below 50 or above 60 deg. F. High temperatures for curing dates of this kind tend to harden instead of soften the skin and to close all the air passages to the inner cells, which beyond doubt control the keeping quality of the dates after ripening. Storage for such dates should be in a room where no abrupt changes of temperature can occur.

The mummified or dry Deglet Noors must again be handled by themselves, which can best be done after the first two grades mentioned are still packed and stored. In fact, from present indications this grade can be stored in tight sacks or boxes until after the fancy grades are all sold, and can then be placed on the market, making a much better product than the common grades of foreign dates usually found in our stores the entire year.

To reclaim the mummified or dry date separate equipment must be used, with all temperatures fully under control. The equipment consists of a container with saturated air wherein the temperature can be maintained at from 160 to 200 deg. F. for from five to eighteen hours.

The inversion of sugar should be slow for the best results, as when freed too rapidly the dates become very soft and mushy and cannot be cured to a solid consistency by any method so far used. After coming from this phase of the process a temperature not higher than 60 deg. F. should be used until full absorption of all excess moisture has taken place and all crude fibre in the date has been eliminated. Slow incubation can then be used for the last phase of the curing, at a temperature not higher than 120 deg. F., thus preserving all the original color of the fruit and retaining the soft, silky skin without stickiness. These dates, if stored, should be kept like

the former grades mentioned in this paper, in a room where no abrupt changes in temperature can occur. Under these conditions the dates can be kept indefinitely and placed on the market at any time of the year.

The increase in the production of dates in this country in the future will no doubt bring sharp competition for the supremacy of the market; and for this reason alone the grower should be able to utilize and market all grades of his dates to such an extent as to meet any and all competition and furnish the dealer with fresh dates every month in the year. The fact must be considered that we cannot grow dates for the markets at a profit when the market period only extends over two or three months of the year. To meet this phase of date culture means careful work in the ripening and curing of the fruit, in order that when stored in tonnage it will keep. A few hundred pounds or a few boxes can be easily kept where tonnage would rot and be a total

loss. In the future curing of dates in this country there must be no low grade or culls in the standardized pack, and in order to accomplish this successfully our packing plants must be arranged to meet this demand by having enough storage capacity to set aside all low grade fruit until after the fancy or high grades are all packed. This can be accomplished very easily, as a moderately tight warehouse will keep the low-grade dates for an indefinite length of time without injurious deterioration, which will enable the operator to work his fruit as the market demands and dispatch the dates in a fresh condition to the dealer every month of the year. The room where the low-grade dates are cured should be especially made and equipped for this work, which can be done with very little extra expense, the main factors being that of temperature and humidity, with means at command to change or reverse the controls in a very short time when necessary.

Equipment to do this work should not exceed in cost one thousand dollars installed, which in turn would handle one ton of dates every twenty-four hours, and enable the grower to meet the demands of the market at any time of the year.

The fancy grades, to be maintained, must have the support of the lower grades in order to reduce the overhead cost of packing the fancy, and to get this support the semi-maturation of these grades seems to be the solution of this problem at the present time, as they can be handled through the process at not to exceed six cents per pound, with an increase in weight of about 21 per cent, which should give a fair profit to both grower and retailer.

Minute details of this process cannot be published yet, but extreme tests show that this fruit can be stored in bulk ready for packing with moisture at saturation point with perfect safety.

Some Comments On Date Packing

By Robbins Russel, President Valley Packing Association, Monrovia, California

THE recent and serious accident happening to R. H. Postlethwaite, General Manager of the Valley Packing Association's plant at Monrovia, California, provides my sole excuse for undertaking the presentation of a subject on which he is so well qualified to speak. But inasmuch as he has been unable to collaborate in the preparation of these comments I put them in the form of a brief description of my experiences in the field of date packing, to date—such technical descriptions as are included being drawn from his notes.

My initial active interest in the Coachella Valley was aroused by some bulk packs of Khadrawi dates received from the Narbonne Ranch in the fall of 1919. The impression made by this fruit,—so different from and superior to the best of the Mesopotamian, Egyptian or African dates I had ever seen,—remain a clear memory to this day. I recall too the interest (one might accurately speak of it as "consuming" interest) taken in this fruit by the waiters in certain Arabian restaurants in the Washington Street district of New York,—where these dates would have

disappeared in no time, had not a careful watch been kept on them. It is noteworthy in this connection that these same natives of date producing and consuming countries, display a notable lack of interest in most if not all of the fruit exported from the old world to the American continent.

The date packing situation in the fall of 1920, at which time I came to the Coachella Valley to stay, was briefly as follows: The Deglet Noor Association,—very new and handling to all intents and purposes only that one variety. The Narbonne Ranch, Risher, and other independents, handling in a way varying from quite efficiently to very poorly, the crops from their own properties. The California Date Association owning an expensive building and some equipment, but practically closed down.

Not only was there no established and standardized outlet for the new producer of fruit other than Deglet Noor,—but to add to his general cheerfulness, the idea was widely held, and expressed, that the general class of dates usually described as

soft, could be marketed as "fresh fruit" only, and was therefore merely available to a limited market.

As our own properties happened to be in the class having a majority of varieties producing soft dates, this so-called accurate information was to say the least interesting.

It seemed to make no difference that the producers of other fruits of high commercial standing,—the character of which so far as the underlying problem of proper curing was concerned, was strikingly like the date, seemed to be able to pack and market their product successfully over the larger part of the world. There was something peculiar about the date,—some mysterious, mystical attribute, which rendered it incapable of profiting by the researches and experiences in other similar fruit industries.

Perhaps fortunately we had little time to speculate on this condition of things for our first crop was on the palms when I reached the valley. There was but little time in which to formulate experiments,—but in conjunction with Mr. Postlethwaite, and profiting by the observations

and experiences which he had had in previous seasons, considerable data was accumulated during this season, when the total pack amounted to very few thousand pounds.

It is sufficient for the purposes of this brief comment to state that as a direct result of our joint experiences in the fall of 1920, the Valley Packing Association was organized with the avowed intent of handling merchantable dates of all varieties,—for its first season leasing the plant at Coachella, formerly used by the California Date Association.

Since then our production has increased by leaps and bounds. As our data accumulated, new machinery has been built, and different climates and working conditions experimented with until we finally decided upon our present location and plant, which we feel to be almost ideal to our purposes.

In general the plant and processes now employed may be summarized as follows:

The building is located on the Southern Pacific tracks and possesses some 10,000 square feet of floor space without a single obstructing post or partition. It is of brick and hollow tile and conforms to the best ideas of commercial building structures today. It is to all intents and purposes insect proof.

The fruit is delivered in its picking trays by night express from the plantations, being received in an outer room screened off from the main grading and packing building. Here it is checked in. It is then put through a large and most efficient vacuum fumigator constructed along the latest and most approved lines, and so passes into the main building with no live insects in or on it. From here on its treatment is different for the two principal classes, the soft fruit and the firm fruit (such as the Deglet Noor). The soft fruit will be considered first.

This fruit is taken directly from the fumigator to the cleaning and grading tables. The belts on these tables are of link steel construction, very easy to keep clean, and durable.

On this table the fruit is washed and dried by exposure first to water sprays striking the berries simultaneously from all sides, and second to a continuous blast of warmed, dry air. The machinery for this labor saving and effective treatment is the product of Mr. Postlethwaite's brain. It functions beautifully. From here on the dates are carried on the same belting past a battery of graders who separate the fruit into the

various classes, placing each on a separate belt conveyor, which carries and delivers it into separate receptacles at the table end.

By the simple expedient of handling only one variety at a time over this table, we have been able to pack and pack with no extra costs of note, the many different varieties produced by our member plantations.

From the grading table just described, the fruit is transported either to the glass packing section, or if it is designed for packing in bulk or cartons, to the dehydrator. The glass will be commented upon first.

This pack, the direct suggestion of Mr. Postlethwaite, is designed to bring the luscious soft date to the ultimate consumer in the same general form and consistency as when it left the palms. Our experiences with it to date have in general been very satisfactory and there seems no doubt but that it has a specific and important place in the industry. The fruit is packed in steam-cleaned and sterilized glass jars of standard commercial patterns, capped under a high vacuum and sterilized in a carefully controlled live steam box, thus enabling the operator to subject the pack to the exact temperature desired, and for the exact period desired. The sterilizer employed is another of Mr. Postlethwaite's inventions, and is so efficient that the cost of sterilizing per pound is to all intents and purposes totally negligible.

From this sterilizer the jars pass to the packers and labelers and shippers.

The soft dates not designed for the glass pack,—and it is to be noted that they are no different in either variety or quality from those going into glass,—the relative proportions packed being determined entirely by orders received or anticipated,—are taken to a dehydrator of approved commercial pattern. Here they are subjected to controlled curing in accordance with the most effective practices in the general fruit industry today,—which not only cures, but also sterilizes them. The exact treatment to be accorded each size and kind of date is a matter of research, and has been one of the General Manager's most engrossing tasks the past seasons. The different problems in this connection are by no means all solved as yet, but we have collected a series of data which is of immense practical value to us,—and which refutes once and for all the contention that soft dates cannot be cured so that they will keep

unless sealed in glass or other airtight containers.

From this dehydrator, which because of its size and the efficiency of its design, is most inexpensive to operate, the cured soft dates are taken to the packing tables, and placed in cartons of different sizes and designs, depending on their grade,—or in bulk packages. From this table they pass to the shippers.

Our data on processing and curing has not progressed to the stage as yet permitting of positive statements on most points. We do know beyond all doubt, however, based on our past seasons' experiences, that properly processed and packed, the soft date may be shipped to any section, and will keep certainly as well if not better than most fruit of other sorts, such as prunes, etc., everywhere distributed and handled.

As the processing of firm dates, of which the Deglet Noor may be taken as the outstanding example, has already been extensively dealt with in this Institute, a few words will suffice to outline our treatment.

From the fumigator the fruit goes direct to a dry cleaner invented by Mr. Postlethwaite to replace the patented and therefore not generally accessible Northrup cleaner, originally devised for this purpose. This machine, like all others which he has devised, has proven an immense success, cleaning the fruit in a most thorough manner, and through an ingenious adaption of an air blast, separating out all chaff and other light refuse which sometimes comes in with the fruit. As in the case of all his machines, Mr. Postlethwaite, with the backing of the association, has felt that patenting was the wrong course to pursue. Full details of all of them have been published, however, so as to prevent any others from at any time placing patents on them.

From this cleaner the fruit passes directly on to grading belts of the usual kind, where it is subjected to a preliminary grading.

From here it is taken to a series of process rooms, in which depending on its condition and variety, different treatments may be accorded it. These rooms not only have adequate temperature controls, but also means whereby the humidity may be raised or lowered,—all in a very inexpensive and efficient manner.

Up to the present time it has been believed that processing, if properly carried out, was sufficient treatment to insure the keeping qualities of firm fruit. An extended series of

observations of our own as well as the packs of most of the leading organizations in the industry, has pretty thoroughly overthrown this belief however, especially if the fruit is packed in the softer condition which seemingly is so much desired by the trade. We have therefore adopted the policy of heat sterilization for this type of fruit, as well as the soft fruit, and have adapted our process rooms accordingly.

When properly cured,—thus becoming to all intents and purposes invert sugar dates,—the fruit is removed from the process rooms, graded again and sent direct to the packing tables, from where it goes to the shippers, and out.

The small tonnage of dry or bread dates which we handle has so far

been entirely on a bulk basis. It has become evident however, that this type of fruit, just as much as the firm, is subject to infestation of certain kinds, and requires treatment, if risks of spoilage in the hands of the trade are not to be run. Our data on this point is merely preliminary so far, but it will receive more attention in the seasons to come.

In conclusion, may I state that the outstanding impression on my mind in connection with the whole subject of curing, processing and marketing is that it is a highly specialized business, far different from that of growing fruit,—demanding exact processes and most careful attention to the business aspects, to assure success. The date industry is certain to go ahead by leaps and bounds

when the day comes permitting of the organization of one comprehensive centralized marketing agency, handling strictly standardized nationally and internationally known commercial packs of dates—soft, firm and dry. Perhaps we shall have to pass through the same bitter, cut-throat phases of competition which have accompanied the birth of other of the now major fruit industries of this country. I sincerely hope not, but that instead we may profit by their history, recognize the inevitable, and so pass speedily to that day when the growers will grow, and the packers and sellers will attend to their own specialized duties, with no cross interference from either group, all functioning through grower-owned organizations.

Processing Dry Dates

By C. E. Cook, Indio, California

IT has usually been customary to leave dry dates, such as the Thoory variety, to ripen completely on the tree since there is no danger of over-ripening or souring; however, there are certain advantages in artificially ripening that more than compensate for the slight expense of a simple method of processing or maturation.

The system of artificially ripening dry dates is so simple that it can hardly be properly called processing, but simple as it is, it is nevertheless important as it lowers cost of labor and improves the quality of the product.

The difficulty of attempting to leave dry dates on the tree until the whole cluster is thoroughly ripe is that the fruit that ripens early becomes too dry for best results while often the later fruit is not completely ripened and a crop harvested at one picking almost invariably will include both extremes.

These difficulties can largely be avoided by frequent picking but a considerable amount of time is required to select the fruit if each date has to be examined separately to avoid mistakes, and if mistakes

are not avoided the customer who gets an occasional astringent date soon loses interest.

About three years ago the writer had a few lug boxes of Thoory dates which were not all completely ripe. At that time he was processing some Deglet Noor dates at a temperature of about 100 degrees F. and made the experiment of placing the Thoorys in with the Deglet Noors. At the end of three days no astringency could be detected in any of the Thoorys and no assorting was necessary. Since that time no attempt has been made to limit picking to the thoroughly ripe fruit, but all dates are picked that have a general appearance of being ripe, leaving it to the so-called processing to complete the ripening, and a much more satisfactory product has been the result.

A few Thoorys ripened in this manner were recently exhibited in competition with other dry dates and after the awards had been made the judge in charge stated that they were the best dry dates he had ever tasted, since there was no trace of tannic acid in any of them.

If picked too green Thoory dates

will darken in processing and for this reason they should not be picked when the calyx end is moist and brittle, but if there is only a small amount of tannic acid due to incomplete ripening then an evenly warm temperature of approximately 100 degrees F. continued from three to five days will be sufficient for its removal, the duration of time depending on the amount of acid to be eliminated.

Briefly stated the advantage of processing dry dates is to facilitate early picking and to render a product uniformly ripe and free from astringency.

The significance of the word "processing" is somewhat misleading as applied to all American dates but particularly so when applied to the simple method of maturing dry dates. The word suggests the application of heat and the addition of sugar or syrup and after using the word an explanation is often necessary to correct an erroneous impression. The word "maturation" has been used as a substitute for "processing," and no doubt it is more accurate and its general adoption would be a step in advance.

Low Temperature Dehydration of Cane Sugar Dates

By Walter T. Swingle, Crop Physiology and Breeding Investigations, U. S. Department of Agriculture, Washington, D. C.

THE University of Arizona early inaugurated the chemical study of dates, and about twenty years ago Mr. H. B. Slade discovered that dates could be classified roughly into cane sugar dates and invert sugar dates, the Deglet Noor and certain dry dates being typical cane sugar dates and most other varieties being invert sugar dates. This discovery was first published in December, 1906, in the sixteenth annual report of the Arizona Agricultural Experiment Station. Mr. Slade's sudden and untimely death cut short the important researches he had so auspiciously begun, but the work was taken up by Dr. A. E. Vinson, who has done much to elucidate the chemistry of dates. All dates are cane sugar dates before ripening, but invert sugar dates contain an enzyme, called invertase, which as the date approaches maturity converts the cane sugar into approximately equal amounts of glucose and fructose. These two sugars are also known as dextrose and laevulose, and together constitute the so-called invert sugar.

If the invert sugar dates are too moist when picked or processed, as they frequently are, they can be sterilized or Pasteurized at from 160 to 170 deg. F. until the dates are dry enough to pack. It was soon found, however, that the Deglet Noor dates could not be handled in this way. If Pasteurized at such a high temperature they darken in color and lose their characteristic flavor, at the same time becoming soft and sticky through slow inversion of the cane sugar.

The artificial ripening of the Deglet Noor date, therefore, is now almost universally carried out at sufficiently low temperatures so that the dates are not discolored, the characteristic flavor is not lost, and the cane sugar is not inverted on a large scale. Instead of sterilizing Deglet Noor dates by Pasteurizing, they are generally freed from insect pests by fumigation, which operation is usually repeated at an interval of at least five days. On a small scale there is no difficulty in handling

Deglet Noor dates in this way, but on a large scale serious trouble arises through the fact that freshly-processed Deglet Noor dates contain roughly from 25 to 35 per cent, or from one-quarter to one-third their weight of water. Dates as moist as this cannot be packed without danger of spoiling very rapidly. Deglet Noor dates suitable for packing contain roughly from 18 to 22 per cent of moisture. In the early days, when only small amounts of dates were processed, it was an easy matter to dry out the freshly-processed dates by placing them in thin layers on trays which would be set out to dry, protected from dust and insects. However, in commercial packing houses, where large amounts of dates are handled, it was soon found that during cloudy or rainy weather it was impossible to dry out dates fast enough to prevent spoiling.

Some of the packers and packing associations, realizing the danger of spoilage, allow the dates to dry on the trees, so that when they reach the packing house they are in a semi-dry condition. Such semi-dry dates when ready for shipment contain about 14 to 17 per cent of moisture, averaging about 15 to 16 per cent, and although excellent in flavor are not well enough known in the Eastern cities to sell readily; and furthermore, they do not bring nearly as much money as fancy Deglet Noors with a higher water content. As an extreme case, let us suppose that a grower brings to the packing house enough dates to make 100 pounds of fancy Deglet Noors. Assuming that they contain 25 per cent of moisture when processed, and that the finished product contains 20 per cent, this would mean that he would deliver about 105 pounds of fresh dates for every 100 pounds ready for packing. This 100 pounds of fancy dates would contain about 80 pounds of dry matter. Such dates sell at wholesale at about \$1.00 a pound. If, on the other hand, these dates were allowed to dry until they reached a semi-dry condition, he would deliver at the packing house

only about 101 pounds of dates, which would dry down to say 100 pounds before they were packed. These 100 pounds of semi-dry dates would contain about 85 pounds of dry matter, and would bring about 35c a pound wholesale. It should be noted that although the semi-dry dates weigh less as he delivers them to the packing house, he has to deliver a larger proportion of dry matter—in fact, the equivalent of about 113½ pounds of fresh dates of the best quality, which would make 107 pounds more or less of fancy Deglet Noors. In other words, the 101 pounds of dates picked in a semi-dry condition would sell for \$35 when packed; while if these dates had been picked a few days sooner, when they weighed 113 pounds, they would have made about 107 pounds of fancy dates, worth \$107 wholesale, or a difference of \$72 in the selling price through the retention of about 12 pounds more water when the dates were picked. Of course this is an extreme statement, as no dates can be found that will all grade as fancy dates. Nevertheless there is food for reflection in the enormous difference in the wholesale price of fancy soft dates and semi-dry dates—a difference sufficient to permit of a very large amount of care being given to the soft dates and still yield a handsome profit over what the semi-dry Deglet Noors would bring.

Fortunately the autumn weather in the date-growing regions of America, specifically in the Coachella and Imperial Valleys of California and the Yuma and Salt River Valleys of Arizona, is distinctly drier than the same season in the Old World. This interferes with the proper ripening of the Deglet Noor dates on the tree, but at the same time facilitates the drying of the dates processed off the tree; and it should be stated that there is every advantage in ripening dates off the tree, since they are cleaner and more attractive in appearance than dates naturally ripened on the tree, where they are exposed to dust and insect injury. However, even in the date-growing

valleys of California and Arizona there are occasional spells of rainy or cloudy weather, when the freshly-processed dates dry with extreme slowness.

The investigations of Dr. E. M. Chace and his associates of the Fruit and Vegetable laboratory of the Bureau of Chemistry of the U. S. Department of Agriculture at Los Angeles have brought to light many important and interesting points on the dehydration of fruits and vegetables. As a result of an examination of their special laboratory drying apparatus and their commercial-scale plant it is, I think, obvious that it would be easily possible to arrange a dehydration plant that would dry freshly-processed Deglet Noor dates rapidly and easily by insuring a proper circulation of dry air. If operating in the Coachella Valley, the hottest and driest of the date-growing valleys, such a plant would usually be able to function without any preliminary treatment of the air, which would be heated to the proper point after entering the drying apparatus. If, however, the air were too moist to dry the fruit properly,

then it could be easily dried artificially by cooling it to 40 degrees or lower by using a refrigerating machine. This cool, dry air could then be heated to the proper temperature, say 85 or 90 degrees, and allowed to circulate over the freshly-processed dates. Dr. Chace and his associates have pointed out the important fact that the moisture-carrying capacity of air doubles, roughly, for every 27 degrees raise in temperature. Let us suppose that the moist air was cooled to 40 degrees. This would cause moisture in the form of dew to be deposited and leave the air saturated with moisture at this temperature. If heated 27 degrees higher in temperature—to 67 deg. F.—this air would be only 50 per cent saturated, and if heated to 85 degrees, which is perhaps a suitable temperature for dehydrating freshly-processed Deglet Noor dates, this air would be about 33 per cent saturated. If air at 33 degrees relative humidity is not dry enough to handle the dates properly, it would be easy to cool the incoming air as low as 20 degrees F. Such air would contain only about 20 per cent of moisture

at 85 degrees F., and would undoubtedly dry the dates very rapidly.

It seems reasonable to expect that the larger packing houses in the date-growing valleys will in the near future be so equipped as to take advantage of the peculiarly dry air of these valleys in the date-ripening season, and at the same time have as a part of their equipment an auxiliary refrigerating plant enabling them to obtain a supply of dry air, no matter what the humidity is outside. Such an installation would undoubtedly take the form of some kind of a dehydrating plant, either one of the many forms now on the market or some modification especially designed for handling Deglet Noor dates. It must be remembered that such a dehydrating plant would be able most of the time to use ordinary dry air from the desert valleys where dates thrive. Only occasionally would the air be too moist to be used, and on such rare occasions the refrigerating plant would soon cool the air so that it would dry the dates as rapidly as might be desired.

Curing and Selection of Seedling Dates

By E. S. Reeves, Thermal, California

THE subject of curing seedling dates is very broad, because no two palms produce exactly the same fruit. The curing and handling of a date will vary according to its degree of ripeness.

Dates of the semi-dry type should be processed the same as a Deglet Noor, with the possible exception of the length of time heat is applied. Many of the soft types of dates can be cured on the palms, with proper protection. Under some conditions they can be better handled by processing.

However, the problem of curing seedling dates is not nearly so important to the date grower as is the selection of good palms. At the present time very few seedling date gardens in the Coachella Valley can be spoken of as successful commercial gardens. I attribute this to the fact that proper selection has not been carried out, and that very few seedling gardens have had proper care.

In the selection of seedling dates I have outlined seven of the most important points to be considered:

I. Selection of fruit that will stand climatic conditions:

1. The skin of the date must not check when subjected to too much moisture.

II. Selection for size and shape:

1. The fruit must not be too small.
2. The fruit should be uniform.

III. Selection for packing qualities:

1. The skin should be soft and pliable.
2. The skin should dry down with the date.

IV. Selection of heavy-bearing palms:

1. Long and heavy fruit stems are desirable.
2. Long strands well spaced are best.
3. Fruit should be well spaced on strands.
4. Easily picked fruit cuts down picking expenses.

V. Selection of palms producing easily-propagated offshoots:

1. The number of shoots should also be considered.

VI. Selection for color of fruit:

1. Dates contrasting in color can be packed in fancy designs.

VII. Selection of dates having high sugar content:

1. Dates with low sugar content sour easily.

In the selection and handling of dates the few points I have briefly outlined are probably the most important. Many problems that confront us will have to be worked out in the future.

The people of the date-growing countries have been hundreds of years making their selection of dates from seedling palms, and we have been fortunate in securing offshoots from their choice varieties.

With our careful pollination and selection of seed it will be only a question of time when we shall be producing dates that will surpass imported varieties and be better suited to our varying climatic conditions.

Curing Seedling Dates

By L. G. Goar, Superintendent Meloland Experiment Station, Meloland, California

INASMUCH as the term Seedling Dates includes thousands of varieties and numerous types of dates, varying from the extremely dry, or bread-date sorts, to the very thin-skinned soft and juicy kinds, no single process of curing can be successfully adopted that will be applicable to all seedling dates. It is almost invariably necessary for the grower of seedling dates to do a certain amount of experimentation in order to arrive at the proper method to be employed in curing the several varieties and classes of dates he may be growing.

Probably the first essential thing to be done with any date in the curing process is to clean the fruit. The method of doing this varies considerably according to the class of date being used. The dry and semi-dry kinds are usually dry-cleaned by the use of revolving brushes, or a drum padded and lined with Turkish toweling. Other softer varieties must be washed with water. When washing is done the fruit is usually placed on screen-bottomed trays in order that the water can be drained off as soon as possible. In order to hasten drying the fruit should be

placed in a vault, the trays being stacked several inches apart to allow a free circulation of air, and a fan placed underneath in such a position as to force the air through rapidly and thus cause quick and thorough drying. Very soft dates containing an excessive amount of moisture are sometimes dipped in boiling lye water (1 oz. lye per gallon of water) before being placed on the trays. The purpose of this lye water process is to hasten drying.

Grading or sorting the fruit is often done as the fruit comes from the cleaner. After being graded, the dates are again placed on shallow trays and thoroughly fumigated in order to destroy any and all of the several species of insects that cause damage to dates.

The vacuum method of fumigation is no doubt the best in use at the present time. Carbon bisulphide is the chemical used. If a vacuum tank is not available, then an airtight vault or box can be used. The trays of fruit should be stacked from the bottom upward, leaving at least a two-inch space between each tray, and the carbon bisulphide poured in a cup or some other open container.

and placed a few inches above the top tray of fruit. About three hours of fumigation is usually necessary.

Next in order is the conditioning or heating process: This is done by putting the fruit in shallow trays and placing them in an oven or vault which is heated—preferably by electricity—to a temperature of from 120 to 150 degrees F. The temperature and length of time required vary greatly with the class of date being processed. Not many varieties of dates can withstand a temperature higher than 130 degrees F. for more than thirty minutes without breaking the tissues down and caramelizing the fruit. Lower temperatures for a greater length of time are generally more satisfactory than a very high temperature for even a short time.

After the heating has been completed, the fruit should be passed immediately into an insect-proof room where the dates are ready to be packed in cardboard, wooden, tin or glass containers, as soon as cooled. When packed the containers should be sealed bug-proof. The fruit is then ready for immediate use, or can be placed in storage and kept indefinitely.

Curing and Packing Seedling Dates

By Geo. Swann, El Centro, California

WE have been listening to papers dealing with the curing and packing of dates by men who handle large quantities and who do so with elaborate and expensive machinery. I think Mr. E. L. Garthwaite, when he asked me to prepare a paper on this subject, wanted to have this subject presented from the standpoint of the small grower who must perforce make the most of more or less makeshift appliances and from lack of capital probably make them himself. This is what I had to do.

The handling of seedling dates presents many problems that are absent from the handling of dates of the standard varieties. Practically each tree is a new variety. In picking some have to be picked when the first soft spot appears and some when fully ripe and one tree I have

left till half the fruit was ripe. I have none that I can pick by the bunch. That would be the ideal way. When picked the dates are brought to the sorting bench. Here they are sorted into shallow, wire-bottomed trays into ripe and unripe. Next they are washed in water in a galvanized iron tank made just large enough to allow of easy manipulation of a tray of dates. If I had running water under pressure I would prefer to use it.

The trays of ripe dates are placed after washing on the drying bench. This bench is made from strips of 1x3's twelve or fourteen feet long placed just far enough apart to catch the edges of the trays and with a strip of wire mosquito netting stretched over the frame thus made. This is supported with legs of 1x3

placed every four or five feet apart and properly braced. The top is divided by strips of lath into compartments the size of the trays so that each tray has a space to itself and bees, flies and other insects cannot get at the fruit from underneath. A strip of cheese-cloth is stretched over the top to protect the top. The unripe ones are placed, after washing, in what I call a sun-cupboard. It is made of a framework of 2x3's with a floor of matched lumber about two feet from the ground. Thin muslin is stretched over this to form the sides and glass hot-bed sash form the roof. Two muslin covered drops at the back afford access. The shelves are made of 2x3's placed three inches apart. There are three of these shelves in my present one and the dates are

placed on the one where the temperature is most suitable, the temperature at the top being of course the highest. Pans of water are kept on the floor during the ripening.

I have been thinking of a modification that I hope will tend to regulate the temperature, which gets pretty high on the top shelf.

The ripe dates are divided into two classes, those to be sold fresh and those to be dehydrated for packing. I sell all my dates on the ranch and a great many of my customers buy dates to send to friends as well as for immediate consumption by themselves. In the early part of the season we are particular to ascertain whether the customer is buying for immediate consumption or to send away and if the latter, how far. In case there is danger of their not being used in the course of a week we advise waiting till later in the season as the later dates keep better. Some of the early dates do not dehydrate well and this year we tried putting them up in glass jars, but owing to faulty technique they nearly all spoiled. (One of my skeletons). We will probably try again next season.

The dates to be dehydrated are put in the sun-cupboard, before mentioned, the pans of water being removed, and the dates kept there till of such consistency as we think will keep best. Those to be sold fresh are, as soon as dry, put in the fumigator. This is a cupboard 2x3x6 ft. divided into four compartments. It is built into the corner of the date house so that the trays of dates can be put into it from the outside. It also has doors opening on the inside of the house. When the trays of dates are placed in the fumigator a sufficient quantity of bisulphide of carbon to fill the compartment with its fumes is put in a saucer and

placed on a shelf above the trays. The doors are closed tight and they are left there for two hours. At the end of that time they are taken out from the inside of the date house and placed in the Pasteurizer. This is a cupboard the same size as the fumigator, but divided differently. The lower compartment contains a blue flame kerosene heater and the upper part has two doors and two sets of racks to hold the trays of dates. It holds ten trays on each side. The dates are slowly brought to a temperature of from 150 to 160 degrees and kept at this temperature for a half hour. They are then taken out and stacked on a table in the packing room in large muslin sacks tied securely. The dehydrated dates after dehydrating are put through the same process of fumigation and Pasteurization. They are kept in the sacks till sold or packed and even after packing the packed boxes are kept in sacks to make sure that no weevil or other insect has a chance to get into them. Our great aim in the whole process is to clean the dates, drive out and destroy weevil or other insects, kill any spores of fermentation and keep them as far as possible, protected from any further infestation.

The packing house has large wire-screen openings for light and air, but covered with cheese-cloth to exclude weevils. Year before last the doors opened directly into the selling room and the packing room. However, we found that oftentimes one of a party of customers would stand and hold the door open, letting in flies. So I built a screened porch in front of each outside door, which considerably lessens the fly nuisance.

To give an idea of how successful we have been in curing and handling dates by our crude methods

I would say that we have sent dates to England, Scotland, Germany and New Zealand as well as almost every state in the Union and have had reports from a great many of these places telling of their arrival in perfect condition. In fact, just the other day we heard of one customer who had sent a package of our dates to a friend in England and due to some mistake in the address they were returned to him and they got back to him in perfect condition.

Of course we realize that when we have a larger acreage we will have to have more improved methods and equipment. It is only by the most careful attention to every detail that we succeed as we do.

In packing we use only the dehydrated dates except in isolated cases where the customer specially requests the fresh dates and where we know the dates are sure to be used before they would have a chance to spoil. Of course, if I were selling through wholesale channels I would have to use only thoroughly dehydrated and Pasteurized dates.

In packing we make considerable use of the two colors, yellow and black, to make pleasing patterns in the boxes. So far we have only packed in one and two pound containers of different sorts. There is a little demand for a five pound package. Each one would have to decide on the style of package that would best suit his trade. I also sell a great many in bulk in one and two pound Climax cartons. They are inexpensive and look neat and attractive. The culls we sell in paper sacks as cooking dates. By grading into several grades at different prices we meet a wider range of customers and encourage a greater use of dates for food as well as in place of other forms of confectionery.

Short History of Date Planting in California

By W. L. Paul, Coachella, California

A SHORT history of the importation and planting of dates in the Coachella Valley, by W. L. Paul, who bought land in Coachella Valley in the year 1902 with a view to growing dates.

I believe that Bernard G. Johnson has a good right to the title of being the Grandfather of the Date Industry in this country, and sometimes referred to as the "American Arab." Under his direction as superintendent of the Mecca Co-operative Date Garden some of the first palms that were imported by the U. S. Department of Agriculture in the years 1904 to 1908 for experimental purposes were planted and brought into bearing. In that early day he also imported and planted about ten acres at the U. S. Government Experimental Station near Mecca, as a private garden. No further individual planting was done, with the exception of Fred N. Johnson, near Indio, who gave the Department of Agriculture ten acres of land for its use as an experimental station, in exchange for which Mr. Johnson received a few offshoots which he planted. Mr. Johnson has the honor and distinction of growing, packing and selling the first fancy dates sold in the United States commercially.

In the years 1909 to 1913 inclusive, the Department of Agriculture is said to have distributed for planting three million, eight hundred ten thousand date seeds. In 1912 Bernard G. Johnson imported about 2,000 offshoots, mostly Deglet Noor variety, a few of which were sold in Coa-

chella Valley at \$6.50 each. The balance were shipped to Yuma, Arizona, and planted there by himself. In 1913 the American Date Company imported and planted about 1,700 privately. The same year F. O. Popenoe and associates imported about five thousand from Algiers and nine thousand of the Persian varieties. It was claimed that they imported 106 varieties, of which many were standardized varieties, other experimental. Some of them were sent to Imperial Valley and some were sold to growers in Coachella Valley at \$6.00 each in lots of 100 or over, and at \$6.50 if less than 100. Exceedingly few of the desert ranchers were financially able to buy shoots at that price. Consequently a large percentage of this importation was planted by Mr. Popenoe and associates.

The writer was anxious to plant dates but believed shoots could be landed at a much lower figure, and therefore, set out with determined efforts to that end, the idea being to form a valley association of growers. Very little money available amongst ranchers and no knowledge of the value of the industry, consequently the efforts fell by the wayside until April, 1913, when the writer, the only rancher interested, succeeded in inducing six valley business men of Coachella to join him in forming the Coachella Valley Date Growers Association, dues \$1.00 each, making a grand total of \$7.00 in the treasury. Two out of the seven men were newspaper men of the valley and gave us free adver-

tising. Meetings were called at school houses, meager information given, interest aroused to such an extent that inside of thirty days after the forming of this Association the Association had many members. Employed Bernard G. Johnson to go to North Africa after offshoots. The writer hustled orders for shoots, collected \$2.00 per shoot in advance, balance whatever the net cost would be, to be paid for on delivery of shoots. The Association imported about 14,000 offshoots in the years 1913, 1914 and 1915, mostly Deglet Noor variety, and laid them down to the growers, and a few to the Department of Agriculture for experimental purposes, at a net cost of \$2.78 per shoot, thus saving the growers about \$45,000 on these importations. Some of these shoots were carried 300 miles on camels' backs before arriving at a point where they could be transported by more modern methods. No shoots of choice varieties, either before or since, could be had at less than \$6.00. All of these were planted in Coachella Valley excepting three sent to Arizona and twenty-five to Imperial Valley.

In 1916 further exportation of shoots was prohibited by the French colonies. The writer made a special trip to Washington in 1916 to try to induce the proper authorities to allow further importation but failed in the effort.

This closes the early history of importing and planting of dates now bearing fruit.

The Date Industry In Egypt--Past and Present

By S. C. Mason, Bureau Plant Industry, Washington, D. C.

THIS was shown on Friday evening, February 29th, 1924, by Prof. S. C. Mason in one hundred lantern slides from original photographs taken by him in the Nile Valley and in the oases of the Libyan Desert. Views of the temples at Karnak and Thebes and of the giant statues found on the site of ancient Memphis all overgrown with modern date palms, served to call attention to the fact that date culture in Egypt was highly developed in the time of Queen Hatsu, 1450 B. C.

The plantations of the three great

commercial varieties of Egypt at the present time were illustrated—the Hayany and Amhat, consumed in great quantities in the "rutab" or hard ripe stage, and the Saidy, Egypt's great packing date for more than two hundred years.

The tree climbers at work pollinating or gathering fruit from trees sixty to eighty feet high served to remind California date growers that their palms are rapidly passing the ladder stage of operating and that the tree climber's art will be one of the athletic accomplishments of our date industry in the near future.

The crude Egyptian methods of packing choice fruit into great palm leaf baskets were shown in contrast to the dainty and sanitary methods of handling the California and Arizona crops.

Lastly the utilization of all date tree by-products, crates of great variety from the great mid-ribs of the leaves, baskets braided from the pinnae and rope from the fruit stalks and sheath fiber or "leef" suggested how our waste products of today may become profitable commodities in the future.

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