REPORT OF

EIGHTH ANNUAL Date Grower's Institute

HELD IN

COACHELLA VALLEY

CALIFORNIA M

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APRIL 3-4, 1931



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Care of the Deglet Noor Date Bunches from Pollination to Picking

By Leonhardt Swingle, Indio, California

 $T^{\rm HIS}$ paper, dealing with the care for the Deglet Noor variety alone. by cutting the threads off and using of dates from pollination on to Each variety differs in its proper the threads to pollinate. picking, is in no sense a record of handling in many important details, the valley. This paper is written riety. with the hope that a compilation of ent and future growers.

the dates as they are harvested, is male bloom as soon after it splits the the growers. benefit to the date growers.

The first criticism that may be ofgood dates than poor ones?"

man comes to buy dates with the will not describe. money in his hand and will take all failure. Quality is the best salesman change all this time. Some people the crop is worth while.

original work or a report of new and the care of other varieties will len during the season is in having practices. A great many of the be discussed by Mr. Russel in an- it exposed enough to the air so that practices given have been reported other paper. Many people have it will not mold. Ordinarily there in previous papers at the Date Insti- worked with the Deglet Noor for is little trouble in this respect, but tute. Practically all of them are in many years, and the practices are this past season during our week of use by different date growers over fairly well worked out for that va- rainy, humid weather at the start of

these practices and putting them in of the pollen. While we must first moisture. Once in a while an early one place will be of benefit to pres- have a good male, it is not the bloom will be caught by a frost, province of this paper to discuss that and part or all of the bloom will be It would seem offhand that there part. Let us assume that we already black and useless when it opens. is little need of such a paper, but have a good male with flowers ready Later blooms on the palm are not anyone who works with, and observes to open. It is advisable to cut the so affected. most forceably struck by the need sheath as possible. We have found of mixing the pollen from different of better practices on the part of it advisable to look at our male trees trees in order to insure better pol-People overlook or twice a day, as a bloom that is open lination. This is not necessary in neglect some details, and the result and exposed on a warm windy day a variety so easily pollinated as the is a poor size or quality of the crop. for as much as twelve hours will Deglet Noor. In some varieties this Hence the idea of the bringing to- lose much of its pollen. Perhaps probably has a good deal of merit. gether of these practices in one pa- with experience we can cut the male The Deglet Noor takes the pollen per with the hope that it will be of bloom just before it cracks, which very easily, and any good pollen will will be better yet.

Some growers then take the bloom it is far better to pollinate from one fered to this is, "Why go to any and allow it to dry and the pollen good male rather than mix different expense in growing better dates to shed, collect the pollen and use it males on the same bunch or even in when we can't get any more for on cotton or other materials. In such the same garden. The writer uses case, the bunches are hung up in a just one male in pollinating the For three years the writer has tight room or closet, and the pollen whole garden, except occasionally been a seller as well as a grower of caught and kept in a cardboard box when it is necessary to help out dates, and in my position there is no or bottle. The pollen must be kept with another. argument as to the benefit of quali- dry, exposed to air, and not allowed ty. It may mean the difference be- to mold. There are various arrange- it is best to do so as soon as the tween a sale or no sale. When a ments for doing this work, which I bloom cracks the sheath. The Deg-

you have and wants more of a good taking the male bloom, and, as soon not necessary to go over the garden grade; and when you cannot get as cut, cutting the threads off the every day. An experienced person more than a tentative and half- blossom and spreading them out on could probably gauge the maturity hearted offer on poor stuff and only a newspaper, about one bunch to a of the bloom and be able to open at a part of the price of the good lug box, and allowing them to dry. the sheaf and pollinate the bloom dates; then you appreciate quality. These threads turn dark but keep just before it naturally opens; but Good fruit moves readily at a profit, the pollen in perfect shape. Two or the ordinary person doing the pollinand poor fruit goes at a loss. When three threads are then used in poll- ating had best allow the bloom to this happens not once but again and inating each female bloom. I may open naturally, as I feel there would again, you then know above all ar- say that this is exactly the method be some danger to the flowers in gument that quality is the all im- shown me eleven years ago by Fred opening them several days before portant point between success and Johnson, and I have used it without they were ready. of California dates we can get. Any prefer to use the threads, and some quarter to one-third off the end of practice that improves the grade of the cotton. I do not know that there the bunch when pollinated. To cut is much difference, but it seems to more than one-third may result in It must be stated right now that the writer that the pollen will go too severe pruning on some bunches, the practices given in this paper are further and is less trouble to handle which will be hard to remedy at the

The only difficulty in storing polpollinating, several blooms on my Let us start briefly with the care ranch molded because of excessive

> There is some talk of the benefit serve. To secure uniformity of fruit,

In pollinating the female bloom, let Noor will remain receptive for The writer has used the method of several days, or a week, and it is

The best practice is to cut one-

regular thinning time later on and will mean overgrown fruit. Practi- string at pollinating time, we can, practice is to lay it around the stem cally every bloom is better with at therefore, forget the dates until their where it is ready to use in tieing the least one-quarter cut off. One-third weight brings them down about six bag or cover applied when the dates to one-quarter is the best practice weeks or two months later. They ripen. to cut off when pollinating, and the are now within reach, and the final adjustment is made from this bunches are far enough along so that to leave to the tree comes back to start.

The sprigs of pollen, or cotton, that we have spoken of previously, are inserted in the bunch which is then tied with a string. Various kinds of strings are used. They should be about three feet long, strong enough so the bunch will not break them, and tied with some form of slip knot so that they will hold the bunch together, but slip out enough so the bunch is not choked. Several forms of knots are used, and there is a patent tie now that is in use by some growers. The writer uses a No. 36 hard, twisted, cotton seine cord. This is uniform enough to slip easily and strong enough to hold the bunches so they do not break and become tangled in the leaves. The idea of using string of the right strength and quality is to keep the bunch tied in without further care or attention on the part of the grower from the time of pollination until the bunch has grown out and the dates are heavy enough to bring it down, at which time the second thinning can be done. If the bunch grows out in the top of the tree and then the string breaks, the dates will be tangled in the leaves in about as difficult a position to care for as can be imagined. The threads will be broken, dates badly scarred, and, unless they are brought down at considerable trouble and expense, they cannot be thinned or even picked. It is, therefore, extremely important that the string and tie we use hold these bunches under control so they do not become tangled in the leaves and will come down of their own weight when the young dates are heavy enough.

tail, which is usually mismanaged by form of bunch. This is what we that they help. the inexperienced person, and this is: mean by cutting the center out of The thread used in tieing the bunch the bunch. The other form of bunch 16 inches long. Some were made of should be put far enough down on has the threads all coming out from galvanized wire by a blacksmith. the bloom so that there is no danger very nearly the same point. There some were made on the place from of it slipping over the end. The in- is no long center axis. The center heavy copper wire. At the present experienced person is very apt to of this bunch, so to speak, has never price of copper, probably the cheapleave this tie only an inch or so from developed. While it is equally im- est and most satisfactory rings can the end of the bunch; in which case portant to reduce the number of be made of about No. 8 copper wire. a considerable percentage of the threads on this bunch, it is not so They are strong enough so there is blooms will slip out of the strings- important as to just which threads no danger of them collapsing with just push the string off the end, so are cut. We cut them off in the the weight of the fruit and pliable to speak. The tie should be placed center to open up the bunch, or cut onough so that they can be bent inwell down on the bloom, six inches off the bruised or injured threads to a ring by the fingers. Naturally or more,

If we have used a good tie and ing is now taken off, and a good we can do a real job of thinning, the size and vigor of the tree, and We have already cut back one-quar- this is something for the individual ter to one-third of the ends of the growers to determine themselves. It threads in pollinating. We now look will, of course, depend somewhat on at the bunches and see that some will the size of the bunch we have left need more cut off. The best prac- in our thinning, but, nevertheless, tice seems to be to leave from 25 to this question is something that only 35 dates on a thread at this time. the grower can determine in his own This number seems to depend large-garden. In my case, I leave 12 to ly on the number of threads that are 15 bunches. My bunches run beleft on the bunch.

If we left, say 25 dates, then apparently we can leave 40 to 50 sults and different ways of deterthreads. If we leave 35 dates, then mining the amount of fruit on the we should leave 30 to 40 threads. tree. It depends on the vigor of the Observation shows that if more than tree and the food, water and care 35 dates are left, a proportion of it gets. This is where the owner's them are apt to shrivel or dry up, judgment comes in. Our yield is deor never make good size. It does termined by the number of bunches not seem possible to draw enough the tree can carry; our quality largenourishment through one thread to ly by the method of thinning and properly nourish all the dates nature care of the individual bunches. puts on that thread. Nature will grow the seed and then give us a ticed that on a great many bunches shrivelled, small date. These figures black nose, or rather "sugar tip," show approximately a thousand to was much more severe in the center twelve hundred dates to the bunch. of the bunch than on the strands ex-Leaving all of the threads and all posed to the outer air. This obserof the dates will give us some 2500 vation with some experimentation dates to the bunch (counting 50 led the writer the past season to put threads and 50 dates to the thread), a metal ring in the center of the but I do not believe there will be bunch so that an open channel for any more pounds of fruit in these air circulation is left in each bunch. 2500 dates than in a thousand good Some people will say that by properdates.

is to cut the center out of the bunch. is needed. At the time the center The size of the bunch has something is cut out in May or June there is to do with the number of threads a very obvious hole left in the bunch, left. As I have indicated, this will but as the dates increase in size and be somewhere around 40 threads.

bunches. One has a long axis run- be all pressed together with no sign ning out through the center of the of an opening. For this reason the bunch with threads of dates given ring is used, and while the writer off from this axis. It is very im- certainly does not recommend them There is one very important de- portant to cut the end off of this as a cure for this trouble, he believes outside. The string used in pollinat- they can be used many years.

The question of how many bunches tween 20 and 25 pounds to the bunch.

The people will have different re-

Several years ago the writer noly cutting out the center, such a Another thing we do at this time channel is left natually, and no ring weight, this center closes up, and in There are two forms of date August and September the dates will

The rings used were made of wire

thought and attention was given to better and will be noticeable all sum- show the difference between that vathe propping or support of the mer, but most sulphuring is done on riety and the Deglet Noor. The bunches, but as the trees have become older and stronger and the bunches have been carried up away from the ground, most of this propping has been found unnecessary. Sometimes a bunch will become twisted over a leaf or comes out of the tree at such an angle that it is necessary to prop it even on an old tree, but the great majority of bunches on mature trees will support themselves, and there is less danger of breaking when they are allowed to do so than when they are supported. On younger trees in which the fruit will hang on the ground, it is absolutely necessary to support the bunch. This is done by using an inch square date prop about 6 feet long and usually attaching to this the common metal hook so widely used. It is possible to replace the hook by a string tied in two places on the date bunch and supported by the same wooden prop, but the hook is most widely used. It is absolutely necessary where the bunch will lie on the ground that it be supported by a prop. But as I said before, not nearly so much propping is done now as was the case several years ago.

About the only other care needed by the fruit during the summer is to sulphur once or twice for the date mite. Once is usually enough, but if there is any doubt, it should be done twice.

Common practice is to use flowers of sulphur in a small knapsack or hand duster. A few puffs to the bunch is all that is necessary. If the

the dry dates and perfectly satisfactory results are obtained.

There is, however, one very important point in sulphuring. If you wait until the mite is apparent on the dates it is too late, and you have already suffered a loss in grade by the mite. You absolutely must put the sulphur on in plenty of timeat least once whether they need it or not. It does not cost much, and if you are busy on something else and let it go for a few weeks, the miles make culls out of your crop.

A good deal of criticism against sulphuring arises from the fact that it is applied to dates already ruined by the mite, in which case it clings to the surface of the date even when the date is ripe, and it is almost impossible to remove by our cleaning methods, and the statement is made that the sulphur has ruined the dates. As a matter of fact, the dates were already ruined by the mite before the sulphur was put on. When the sulphur is applied in time, it will completely control the mite, and no sulphur will be left when the dates ripen.

The only remaining practice in caring for the growing dates is bagging or covering, but this is too big a subject, with no very satisfactory details or methods worked out, to be discussed in this paper.

Let me state again that the details given in this paper are applicable to the Deglet Noor variety alone. Mr. Russel will discuss other varieties.

I will, however, give an illustra- California dates.

Several years ago a great deal of date bunch is wet, sulphur will cling tion in the case of the Ashrasi to Ashnasi is notoriously hard to pollinate, and as I have a tree and have worked with it for several years, I believe that this arises from three things.

We need to observe three conditions to pollinate the Ashrasi. First, we must have a suitable male. Most males will not pollinate the Ashrasi. Here let me remark that most males will pollimate the Deglet Noor. Having found the male, it seems that the most susceptible flowers on the Ashrasi bloom are at the tips of the bunch. If we cut off our third or quarter, as we do in the Deglet Noor, we will cut off three-quarters of our crop. It is, therefore, absolutely necessary that this variety be not cut back at pollinating time.

Again, exactly contrary to our practice with the Deglet Noor. Our third condition is that these blooms be pollinated just as soon after they open as possible. If they are exposed for even a day before pollinating, it is too long. It would probably be better to cut open the spath just before it naturally opens if we can so judge that time. Here again the Deglet Noor will probably go a week as easily as the Ashrasi 12 hours.

I mention this to impress upon you that each variety requires a different technique in the handling of the growing bunch. It is necessary that this be worked out in each case if we should grow a maximum crop of the best quality possible, and let me repeat again: Quality is the best salesman we can get to sell our

Bunch Management of Date Varieties Other Than Deglet Noor

By Robbins Russel, Manager Russel Brothers, Inc., Thermal, California

Supplementing the remarks of Mr. Leonhardt Swingle

lent discussion, I present the follow- orchard. ing observations based particularly

ARGELY in the nature of a "post- entirely on my personal experiences expense. Therefore, practices which LARGELY in the nature of a post- entirely on my personal experiences experiences experiences experiences and the sense might ap-script" to Mr. Swingle's excel- with these varieties in a single in a more technical sense might ap-

on the varieties Khadhrawi, Halawi that the objective of all our effort cil program. and Barhi, - with due apology for is the production of the maximum of their preliminary character and fruit of the most profitable com- blooms of the various varieties I brevity, — they being based almost mercial quality, at the minimum of have had opportunity to check,

pear to be ideal, may prove to be It is perhaps unnecessary to state incompatable with such a commer-

Speaking generally, female date

would appear to group themselves into three classes so far as their sense,---the one general rule which to my knowledge. pollination is concerned. These may it seems to me is definitely estabbe described as:

amples most generally known are more fruit than it will bear without crew of more responsible and there-Deglet Noor, Halawi and Zahidi.

set" may usually be obtained, but ries borne on from 40 to 70 fruit which are distinctly more unreliable strands. in this regard than the varieties of the first class. Examples are Kha- on the varieties mentioned as chardhrawi and Barhi.

Third, Those having a high degree of selectivity as regards particular regularly dethorned every winter, pollens and which would appear to after harvesting and when work is be very difficult to pollinate for slack,-before blooming begins. other causes also. The outstanding example is Ashrasi.

eties of the first class need occasion even the amateur grower no real ly bloom, beginning before the first anxiety as to the securing of a heavy female opens in the spring and con-"set" of fruit. If there are many tinuing throughout the season until males in the neighborhood and any late into April. As a result we are wind blows during the flowering able to use fresh pollen almost experiod, my experience indicates it is clusively. Our method is to cut the difficult to avoid such a result.

riety Ashrasi conform to my obser- If not required at once, the bloom following changes from the figures vations with one apparent variation is removed from the spathe and hung mentioned formerly for un-thinned to be commented on under my re- upside down from the rafters in our fruit heads of the same varieties: marks on Khadhrawi and Barhi.

At this point may I call to your imum of mould or other trouble. attention purely as information of interest and only possible commer- istics used in selecting these males cial value, one rather striking simi- was absence of "shatter" and anlarity noted on our property as re- other, "retentability" of pollen (if I gards the varieties under observa- may employ the terms to illustrate tion. This is the likeness in the my meaning), these male blooms retotal number of fruit strands in the main in usable condition for weeks fruiting heads of the different va- at the least,-though as a rule being rieties, as well as in the number of used but seldom by us, as mentioned individual flowers borne on the in- above. dividual strands. In illustration I mention the following actual counts that one of these very males has on of average, heads:

Halawi-80 to 100 strands, 11 to 21 female blooms. inches long: each carries 30 to 50 flowers.

Khadhrawi-80 to 100 strands, 11 to 21 inches long: each carries 30 to 50 flowers.

Barhi-80 to 100 strands, 13 to 28 inches long: each carries 30 to 50 flowers.

This would seem to indicate that the palms of many of the different time of pollination. Though unable dhrawi and Halawi palms, when mavarieties at least, supply about the to offer a satisfactory explanation ture, will readily carry all the sound same number of blooms per fruiting why, experience here has indicated bunches they produce in a normal head. Therefore the difference in that if blooms of the Khadhrawi and year, - averaging in number from yield which undoubtedly exists as Barhi type are cut at the time of ten to fourteen. Barhi has been between varieties, would appear to pollination, either because of some more variable with us and it is be a function of the size of the in- shock, or for other reason, -- a very rather indicated that later experidividual berries,-the density of the poor fruit "set" is apt to be ob- ence may bring about the limiting fruit "set" obtained, and the num- tained. The possibility of this being of the number of bunches, more as ber of sobata which the individual a factor in the pollination of Ash- is the custom with Deglet Noor,variety is capable of maturing.

Speaking strictly in the practical gated either by me, or anyone else lished, is that on a mature palm, no factor) is that if all our pollinators First, Those readily pollinated. Ex- sobata should be allowed to carry thin at the same time, a much larger propping. This load figure would fore more expensive men, has to be Second, Those on which a "good appear to be from 800 to 1,200 ber-

acteristic, follows:

First: The palms of both sexes are

Second: From a larger number of males, nine have at present been se-As Mr. Swingle has stated, vari- lected, representative of four or five different "varieties." These regularmale bloom just as soon after the Mr. Swingle's remarks on the va- spathe begins to open as is possible. tool shed, where it dries with a min-

Inasmuch as one of the character-

It is perhaps interesting to observe un-thinned fruiting occasion furnished ample material for the pollination of over 15,000

> pollinators cover the orchard three running, cord loop, much as detimes per week. Since in practice, scribed by Mr. Swingle. we pollinate all blooms which are open, or have definitely started to ing the completion of pollination, all open, this results in the female excess blooms are cut off. It seems spathes being open at most only a to be rather definitely established few hours before being pollinated. that under the environmental condi-

> rasi has not been thoroughly investi- thus assuring an even year by year

Another reason (strictly a cost used.

It is also true that on the varieties mentioned, proper thinning at Our technic for attaining this load pollination time is rather difficult on many of the blooms,-due to their habit of opening before full emergence from behind the leaf base.

> For these reasons, our men doing the pollination do nothing else during this time,-using one or two strands of the male blooms for each female, with a rubber band around the whole to assure the male flowers remaining in place for a period of at least ten days or so.

> The instructions to these men are to pollinate all good blooms, irrespective of the number on the palm.

Fifth: Following this, - when the female blooms are from two weeks to a month old, our first thinning is given,-generally approximating the

Thinned Halawi (center cut out and ends removed)-40 to 60 strands, each from 13 to 17 inches long and carrying upwards of 20 flowers:

Thinned Khadhrawi (center cut out and ends removed) -40 to 60 strands, each from 13 to 16 inches long and carrying upwards of 20 flowers:

Thinned Barhi (center cut out and ends removed) - 40 to 60 strands, each from 16 to 22 inches long and carrying upwards of 20 flowers.

Note: By "flowers" is meant properly pollinated individual blooms, capable of maturing perfect berries.

At this time each fruit head, af-Third: Generally speaking, our ter thinning, is tied with a loose

Sixth: As soon as possible, follow-Fourth: We do not thin at the tions of our property, at least, Khaproduction. our practice is as with the other va- custom is to cut the center strands thing of a factor, even on our unrieties, - to leave all sound, well- which hang from the fruit stalk. so formed bunches,--which may num- that as much freedom for the growth ber as high as twenty per palm, of the inside fruit as is possible, will though sixteen per palm would be be allowed. nearer a yearly average.

ten so long in the case of varieties give only the proper load of fruit. like the Barhi as to make it diffi- If so, the result is almost ideal. If cult to reach the fruit heads readi- it is not, additional strands in the where necessary.

frequently is enough shatter to re- heads become heavier they gradual- dividual properties. Even in our appears to be the best possible thin- mechanical aid on our part. ning. If there are still many more

In the case of the Khadhrawi and Seventh: On or before this time, the Barhi, the "set" may be (and before the fruit stalks have got- many times is) sparse enough to

Ninth: Mite damage, especially the as yet.

At present, however, than this number of berries, our last four years, has not been anysulphured Deglet Noor. The technic described by Mr. Swingle is undoubtedly advisable as a general rule, however, and may be adopted as standard even on our varieties,-as it is cheap insurance at the least.

Tenth: So far as the soft dates of the varieties mentioned go, bagging is almost exclusively a question ly,---a secondary thinning is given, center are cut much like the Halawi. of bird damage, versus darker dates, Eighth: Following the completion which can only be determined in the In the case of the Halawi there of these operations, as the fruit light of actual conditions on the induce the number of berries approxi-ly work themselves down through own case, while much experimental mately to the 1,000 ideal. If so, this the leaves, with a certain amount of work has been done, I do not feel that I have any conclusions to offer

The Commercial Utilization of Differences in Time of Ripening of Dates Due to Pollen

By Roy W. Nixon, Associate Horticulturist, U. S. Department of Agriculture

 $T_{ation}^{\rm HE}$ results of the series of pollination experiments begun in 1925 at the U.S. Experimental Date Garden have been reported from time to time in the past. They have afforded ample proof that the time of ripening of dates, as well as the size of the fruit and seed, may be influenced directly by pollen. In nearly all of these experiments the pollens tested were applied to different made.

been tested.

With the cooperation of Mr. T. J. ferent pollens.

Gridley and Mr. William Cook similar tests were made in commercial palm was picked and weighed sepgardens. At the Narbonne Ranch arately. From time to time repretwo Deglet Noor palms were pollin- sentative samples of the dates proated with Fard and two with Nar- duced by these pollens were carefulbonne No. 1, a pollen comparable ly compared. No consistent differto Mosque. At the Cook Date Gar- ences were found'in appearance, texdens in the Coachella Valley, at In- ture, or flavor. While the dates from dian Wells, California, two Deglet the Fard pollen tended to be slight-Noor palms were pollinated with ly smaller than the others, this did strands on the same bunch. In none Fard and two with Cook's No. 1, not hold true with all of the samples of them were the pollens used on a another pollen comparable to examined and the difference in size large scale in such a way as to pro- Mosque. In addition, on one palm could hardly be regarded as of any vide a demonstration of the possible the blooms during the first half commercial significance. In expericommercial utilization of the differ- of the season were pollinated with ments in which these same pollens ences in time of ripening which they Fard and the remainder with Cook's were applied to different strands on produce. In 1930 such an experi- No. 1, while on another palm the the same bunch there have been very ment on a commercial scale was application of the pollens was re- significant differences in the size of versed. This was done for the pur- the fruit. It appears that such dif-At the U.S. Experiment Date Gar- pose of spreading out the ripening ferences tend to disappear when the den five Deglet Noor palms were on the one hand and contracting it pollens are applied on a large scale pollinated with dactylifera pollen on the other. All of the blooms were to entire palms, due probably to the (Fard seedling males) already known bagged when pollinated and the bags effects of the rigorous thinning now to produce early ripening of the left on from two to three weeks. generally practiced with the Deglet fruit and five other comparable Otherwise they were handled in the Noor variety. However, there were palms with dactylifera pollen ("Mos- same way as the other palms in the still striking differences in the seeds, que seedling male) known to pro- gardens in question. It has been ob- those from the Fard pollen being duce late ripening. These two pol- served in past experiments that the noticeably smaller in every case, allens in numerous experiments in bags themselves cause a slight ac- though the difference on a percentprevious years have produced as celeration of ripening, but as the age basis was less than when the much variation in the time of ripen- pollinated bunches compared were same pollens were applied to differing as has yet been found among the all bagged in the same way this ent strands on the same bunch. many dactylifera males that have would not affect the differences The accompanying table summarwhich resulted from the use of dif- izes month by month the total yield

In harvesting, the fruit from each

from each group of palms;

DIFFERENCES IN TIME OF RIPENING DUE TO POLLEN - 1930

Teest		SEPT.		OCT		NOV.		DEC.		JAN.	
Location and Pollen Used U.S. Experiment Data Corden	Total Yield Pounds	Pounds Picked	% Crop	Pounds Picked	% Crop	Pounds Picked	% Crop	Pounds Pícked	% Crop	Pounds Picked	% Crop
'Fard" (5 palms) 'Mosque" (5 palms)	$1217.25 \\ 1270.00$	$744.25\ 347.75$	$\begin{array}{c} 61.14 \\ 27.38 \end{array}$	$\begin{array}{c} 449.5 \\ 674.25 \end{array}$	$36.92 \\ 53.09$	$\begin{array}{c} 23.5\\ 241.0\end{array}$	$\begin{array}{c} 1.94 \\ 18.98 \end{array}$	7.0	0.45		
Narbonne Ranch "Fard" (2 palms) "Narbonne No. 1 (2 palms)	$317.5 \\ 433.25$	$\begin{array}{r} 125.5\\90.25\end{array}$	39.52 20.83	$185.5 \\ 326.5$	$58.43 \\ 75.36$	$\begin{array}{c} 6.5\\ 16.5\end{array}$	$2.05 \\ 3.81$				
Cook's Gardens "Fard" (2 palms) "Cook's No. 1" (2 palms)	623.5 921.0	$199.75 \\ 86.75$	$\begin{array}{c} 32.04\\ 9.43\end{array}$	$367.25 \\ 327.00$	58.90 35.50	$\begin{array}{c} 54.5\\ 391.75\end{array}$	$\begin{array}{c} 8.74 \\ 42.53 \end{array}$	$\begin{array}{c} 2.0\\94.50\end{array}$	$\begin{array}{c} 0.32\\ 10.26 \end{array}$	21.0	2.28
"Fard"-"Cook's No. 1" (1 palm) "Cook's No. 1"-"Fard" (1 palm)	$408.5 \\ 329.0$	92.0 33.5	$\begin{array}{c} 22.52\\ 10.18 \end{array}$	$\begin{array}{c} 131.0\\ 168.75\end{array}$	$32.07 \\ 51.29$	$147.0 \\ 116.25$	$35.99 \\ 35.34$	$\begin{array}{c} 33.5\\10.5\end{array}$	$8.20 \\ 3.19$	5.0	1.22

len on the time of ripening of the fruit is not reduced by its application on a commercial scale. At the U. S. Experiment Date Garden the Fard pollinations ripened 61% of the fruit in September and the harvest was practically over by the first of November. On the other hand, the Mosque pollinations ripened 33% less of the crop in September and 17% more after November 1st.

At the Narbonne Ranch the Fard pollinations ripened 18% more of the crop in September than Narbonne's No. 1 with about an equal increase of the latter over the former in October, although the differences there were not so striking because of the short ripening season. The fact that the palms in question were in a row with a southern exposure may have had something to do with this, although the entire harvest at this ranch was completed earlier than in past seasons.

The Cook Date Gardens afforded the most striking contrast of all; 22% more of the crop from the Fard pollinations ripened in September and only 9% remained on November 1st, whereas 55% of the crop from Cook's No. 1 was harvested after November 1st and over 12% in December and January.

At the U.S. Experiment Date Garden and the Cook Date Gardens the tard the ripening processes to such pollen.

It is evident that the effect of pol- fruit was picked regularly every week and from this data the differences in time of ripening were calculated. At the Indio station the actual difference in the time of ripening was 15 days at the beginning of the season, increasing to 20 days at 98% of the crop, whereas at the Cook Date Gardens there was a difference of 21 days at the beginning of the season, increasing to 37 days at 98%. This demonstrates on a commercial scale the fact already known from previous tests, that the differences in time of ripening due to pollen are less when the fruit ripens early and tend to increase when the season is late.

> It is evident that for most locations in the Coachella Valley pollen which produces early ripening is not desirable for Deglet Noor dates. The fruit of this variety that matures there prior to about October 1st is generally characterized by poorer keeping quality and less distinctive flavor than fruit that matures during October and November. On the long the time during which protecother hand the very late dates, that is fruit which ripens after about December 1st, are apt to be inferior to dates that ripen during October and November. The danger of dam- the time of ripening of his crop one age from rain and humidity increases or two weeks will be of benefit. This later in the season and low tempera- can be accomplished at no extra extures in December and January re- pense by using properly selected

an extent that the fruit frequently does not mature properly.

The treatment at the Cook Date Gardens where late ripening pollen was applied to the early blooms and early ripening pollen to the late blooms on the same palm suggests a procedure that would be of value in such localities under conditions such as obtained in 1930. This Method resulted in speeding up the maturation of the fruit that would ordinarily have ripened after December 1st. Early ripening pollen on early flowering bunches inthe creased the percentage of dates ripening in September, which is undesirable, while late ripening pollen on late flowering bunches retarded the ripening of many dates into winter, which is also disadvantageous.

However, with varieties other than Deglet Noor or under diffferent climatic conditions an expansion of the ripening might be desirable. - Tt. would tend to decrease the amount of damage that a rain at any one time would produce, but would protion from rain might be necessary. The grower, if in close touch with his packing house, can determine whether contracting or expanding

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New Investigations on the Correlation Between Root and Leaf Growth and the Water Requirements of the Date Palm

By Walter T. Swingle, Principal Physiologist in Charge, Crop Physiology and Breeding Investigations, Horticultural Crops and Diseases, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.

kingdom of Monocotyledonous plants or the orange tree! with a single seed leaf to which belong the grasses, lilies, orchids and Coachella Valley from Indio west many other plants.

found outside of the palm family, serve for themselves the surprising The most striking examples of true amount of water this tree demands. monocotyledonous trees other than As the water table lies too low in palms are the tree yuccas, typified most of this region to be reached by the Joshua tree of the Mohave effectively by the roots of the date desert, and the Dragon tree, said to Palm the date grower here is in a live a thousand years and attain a position to know exactly how much height of seventy feet and a cir- water he gives his palms. The recumference of thrirty-five feet in sults of this first-hand experience in the Canary Islands, both belonging growing the date palm have been to the lily family; a relative of the most surprising and many of the grove and other swamp plants, have centuary plant known to botanists as best date growers in the Coachella special structural adaptations to fa-Fourcroya longaeva, native to Mexi- Valley have come to use amounts of cilitate the entrance of air through co and said to live four hundred water in irrigation that seem out of porous tissues formed near the tips. years and attain a height of sixty all reason when compared with the feet before it blooms and dies (this water requirements of citrus trees "The date palm grows best with its plant belongs to the amaryllis fami- in Orange or San Diego counties for feet in running water and its head ly); and finally the screw-pines or example. In some cases as many in the fires of heaven." pandanus of which numerous species acre feet of water are used on date grow in the tropical regions of the palms in the western end of Coa- Date Palm and Its Cultivation in the Old World, some of them reaching chella Valley as acre inches are used Punjab" (2 ed., Calcutta, 1918), gives a height of fifty or even sixty feet, for citrus in northern San Diego a full-page plate showing two date these belong to a special family, county. Pandanaceae. The other large mon- Taylor, Bull. 489, Cal. Ag. Exp. Sta., in spite of the fact that their bases ocotyledons, like bananas and plan- 1930). In Orange county 16-18 acre had been covered continuously with tains, the aroids and the bamboos inches was found ample, "and the water for the preceding six years. are not true trees. Monocotyledon- use of twenty acre inches had a de- The crowns had suffered and the ous trees such as the date palm are pressing effect on the yield." (An. roots were considerably decayed but not only very distantly related to Rep. Cal. Ag. Exp. Sta. 1929, p. 81- one of the palms still had a dozen our common forest and orchard 82). trees but are very different in an-

The date growers of the upper have had excellent opportunity dur-Very few tree monocotyledons are ing the last twenty-five years to ob-

atomy, morphology and even in their duty of water has not failed to at- down against the trunk. physiology. Profoundly impressed tract widespread attention and there? In connection with studies that likely to have many opportunities to Bulletin 489 of the California Agri- | Severely pruned Deglet

 $T^{\rm HE}$ date palm is the only fruit of Mr. Cook's before the date palm by such experts in cooperation with tree cultivated in the United and its peculiarities become as well the leading date growers cannot fail States that belongs to the great sub- known to us as, say, the apple tree to yield important results of great value to the young and rapidly growing date industry.

> Paradoxical as it may seem the date palm is in many ways like a swamp plant-the germinating seedlings are plainly adapted to grow in very wet situations and even have special organs to excrete superfluous moisture. Special aerating roots, commonly called breather roots by the date growers, grow directly upward out of the ground around the base of the trunk especially in the Deglet Noor variety and these roots, like the aerating roots of the man-An expressive Arab proverb says,

Milne in his beautiful book, "The (See Beckett, Blaney & palms still living in a pool of water or more green leaves besides about Such a striking contrast in the as many that had died and bent

with these many differences the late is every reason to hope for the help have been under way for some years Mr. C. E. Cook, a great leader in of Mr. S. H. Beckett and other ex-past looking to the working out of the date industry of this country, perts of the Citrus Experiment Sta- a cheap and practicable system of attributed some of the difficulties tion at Riverside and let us hope of replacement of date palms when date growers encountered in propa- the experts of the newly established they get too tall to handle easily or gating and growing the date palm Bureau of Agricultural Engineering too old to bear full crops it has be-to the fact that the North European of the U. S. Department of Agricul- come very apparent that the water people had never had any experi- ture who cooperated with Mr. Beck-requirement of the date palm can ence with monocotyledonous trees. ett in the study of the water re- be modified greatly by removing The date growers of this country are quirements of citrus reported on in leaves from the crown.

Noor learn the truth of this observation cultural Experiment Station. Work palms at the U.S. Experiment Date Garden have for four years continued water is suddenly applied in much to bear large crops of fruit though larger amounts at much longer in- ers in getting ample and convincing of a somewhat smaller quantity and tervals. If the soil is light such a evidence as to the water needs of of a somewhat lower grade than system of irrigation tends to flood the leading date varieties at all that produced on check palms near- the soil at every irrigation and then stages of their growth a series of by which retained the full crown of to permit it to become dangerously experiments is now being initiated at leaves. In date-growing countries dry before the next irrigation. the tops of the palms are often severely pruned as can be seen clearly fers primarily to date palms grown ments it is hoped that some things in photographs taken in Old World on land having the water table too the date growers would not willingdate oases.

to the very different character of conditions are changed and often half or quarter-acre plots of date the root system of the date palm aeration becomes even more import-from that of any other fruit tree ant than irrigation. grown in temperate or sub-tropical regions. The main roots show no have very different reactions to wasecondary growth and in consequence ter at the ripening period. The crop are never larger than the finger- of Deglet Noor, Saidy and many no matter how long they may grow. other varieties is easily injured by Because of this structure, fundament- excessive irrigation just as the fruit ally different from the roots of ordin- begins to ripen while the Halawy ary dicotyledonous trees, the roots and probably many other varieties of the date palm are exposed to dan- do not ripen their fruit properly ungers that do not threaten those of less the soil is kept wet and the air ordinary fruit trees. If the subsoil humid during the ripening season. should remain dry for a few months This fact makes it difficult, if not or possibly even for a few weeks it impossible, to test different date vais highly probable that some or all rieties fairly unless they are planted of the very long main roots are in separate borders and each varicaused to die back clear to the bulb ety given the treatment best suited at the base of the trunk where new to it. roots arise. It must be remembered that it takes a long time, a number date varieties are robbed by others of years in fact, for new roots to if planted close to them. This is grow to the length of the old ones rendered possible by the widespreadthat have been killed by temporary ing habits of the date roots. Cerfailure to get sufficient irrigation tainly date varieties differ greatly in water so that if the palm retains its vigor, rate of growth, and fruitfulfull crown of leaves it usually can-ness as well as in the types of soil not secure enough water through its to which they are adapted, and the diminished root system even if amount of fertilizer they require. abundantly irrigated and soon shows distress by the sudden death and lief among the Arab date growers of drying up of the older leaves.

Many facts observed in recent ter and more likely to grow when years make it highly probable that cut from palms that have been only date palms have, in fact, often suf- moderately or even scantily irrigated. fered acute water shortage for longer Many facts indicate that this belief or shorter periods in date gardens of the Arabs is well founded and that were supposed to be receiving that if good viable offshoots are dethe best possible care. As can be sired the irrigation must be moderseen from what has been stated ate in order to prevent the growth above it is likely that a water short- of soft and sappy offshoots that fall age, even a temporary one, may an easy prey to the Diplodia fungus cause injuries to the date palm much studied by Drs. Fawcett and Klotz more severe than would be caused and possibly to other organisms causto any ordinary fruit tree, the thick ing decay and death. roots of which, even if the tips die, can regenerate innumerable new ad- date varieties need to be studied at grower would hesitate to make, and ventive roots as soon as water is available again.

in this country is so sensitive to sud- period into the heaviest fruiting den changes in the method of irri- period and finally into and through gating. If a widely extended root the replacement period. Each of ably been grown longer than any system is encouraged to develop by these periods doubtless requires some- other fruit tree-at least five thoufrequent light irrigations it runs what different watering to get the sand years-the scientific study of it grave risk of injury if the irrigation best results.

Naturally the discussion above relow to furnish an adequate supply Evidence has also accumulated as of water. With a high water table,

Finally the different date varieties

It also appears probable that some

There is a well nigh universal bethe Old World that offshoots are bet-

The water needs of the leading all stages of development from the planting out of offshoots or young Probably no other fruit tree grown palms through the offshoot-bearing

In order to assist the date growthe U.S. Experiment Date Garden at Indio, California. In these experily do himself can be done.

For instance, an attempt to grow palms with what is now considered far too little water, and other plots with what is now believed to be too much water, both in comparison with what is now generally considered to be a proper amount of water. As a staff is on the station grounds the year around and very full meteorological records are kept it is hoped that some plots can be irrigated by formulas based on the water content and the temperature of the soil and air. Finally, it is hoped to make deliberately sudden changes in the water regime and even in some cases to withhold water for some months in order to learn how best to bring date palms injured by such treatment back to normal. Although some date growers by accident or oversight have doubtless occasionally injured palms by such treatment no private date grower would willingly permit a quarter or half-acre block of his palms to be ill treated just to see how much damage would be done and how best to repair it.

These irrigation experiments fit in very well with acreage plantings that are necessary to make proper tests of different systems of renewal, a matter now often considered to be of merely theoretical interest but which will, not many years hence, be an acutely practical and pressing one to the owners of the older date plantings in this country. Very special conditions apply to the water requirements of a date garden during the renewal period when both old and young palms are being grown on the same tract at the same time. Here again the U.S. Experiment Date Garden can and should undertake experiments that the date test not only what now seem to be the best renewal systems but all that have any reasonable hope of succeeding.

Although the date palm has probwas begun only recently and albeen made by expert American date Discoveries of great scientific and of the date palm and its cultural growers and by state and federal practical importance are still being requirements on a par with that research men we must not forget made about these fundamentally im- existing for the orange and the apple that an enormous amount of work portant fruit trees and will doubtless tree. Here is work for scores of exremains to be done before the date continue to be made for many dec- perts for many decades and here is palm is as well understood as the ades to come. orange tree or the apple tree. In spite of centuries of experience and are dealing with a monocotyledonous growers who have already in two of scientific study, numerous skilled tree of radically different structure decades equalled in many fields and research men are still at work in and habits from our familiar orchard surpassed in some the attainment many countries on these two fruit trees. We should all of us do every- made by the Arabs-the masters of trees which are grown by hundreds thing in our power to encourage desert agriculture-during the past of thousands if not millions of in- scientific research and expert demon- two thousand years.

though very gratifying progress has telligent and observant orchardists. stration work to put our knowledge

a fascinating field for the ingenuity In the case of the date palm we and resourcefulness of our date

Sterilization of Soils With Formalin

By Frank A. Thackery, Senior Agriculturist, U. S. Department of Agriculture

of an attempt to eradicate a fungus, olive, jujube, pistache, apricot, peach, twenty-two days after treatment. Phymatotrichum omnivorum, com- athel, etc. In addition to this, four monly known as Texas root rot, from permanent buildings and a cement approximately five acres of land by tennis court were located on the the injection of formalin under high tract and it was necessary to treat pressure into the soil.

I wish first to acknowledge the cordial and effective cooperation in this campaign of the State officials and the Farm Bureau of this Valley.

The pictures which I am passing around will make it easier for you to understand the story I am trying to tell you.

an aqueous solution of formaldehyde, usually having in its commercial out by Mr. C. J. King of the U. S. form a strength of about 40%. Formaldehyde is a gaseous compound, zona, which tests indicated the ef-H-CHO, with a very penetrating fectiveness of the formalin treatodor and is most commonly formed ment. by the partial combustion of Methyl or wood alcohol. Aldehyde is an abbreviation from alcohol dehydrogenatum and, as the latter name indicates, it is alcohol deprived of its hydrogen. It may be any one of a class of compounds of which common or acetic aldehyde is the type. They are usually named from the acid which they yield on oxadation. Thus formaldehyde yields formic this two-foot strip of treated ground. acid.

differ from the alcohols in having the rate of approximately one galtwo less hydrogen atoms in the mole- lon per cubic foot of soil. Between cule.

tive to a wide range of plants and inches in diameter by four feet in their large roots seriously interferred in our case was made much more depth, through which little or none with an even injection of the soludifficult of eradication from the fact of the solution would be expected tion, besides greatly retarding the that the entire infested area had to penetrate. The treatment of this work. The treatment, therefore, was

give you only a brief description plantings such as fig, almond, date, seedling date palm within about the soil to a depth of six feet under these structures. Therefore, our expenses were much higher than would usually be the case.

After careful consideration of various possible methods of eradication the formalin treatment was decided upon by Dr. K. F. Kellerman, Associate Chief of the Bureau of Plant As most of you know, formalin is Industry. Laboratory and field tests on a small scale had been worked Experiment Station at Sacaton, Ari-

In addition to this, many more or less preliminary tests were made at our station, among which may be mentioned the treatment of a twofoot strip of soil along our north boundary for the purpose of checking any spread of the fungus onto neighboring lands. A seedling date palm, some eight or ten years old, was located about eight feet from This treatment was to a depth of The aldehydes are intermediate be- six feet with a 1¼ per cent formatween the alcohols and acids and lin solution which was injected at the seedling date palm and the The Texas root rot is very destruc- treated strip was a tar barrier four eter and it was soon found that

SHALL attempt in this paper to been used for experimental tree two-foot strip, however, killed the

The soil underneath and about three feet beyond the spread of the branches of an apparently healthy pistache tree, which was seemingly resistant to root rot, was treated experimentally. The same 1¼ per cent solution was used and the injections were to a depth of six feet but only one injection each two feet instead of every foot as was the case with the regular field treatment. This experimental treatment amounted to only one-fourth gallon of formalin solution per cubic foot of soil, whereas, the regular field treatment was one gallon per cubic foot. This tree wilted and died the fifth day after treatment and on examination that day the cambium layer was found to have turned black.

The soil under a citrus tree, an olive tree, and another species of pistache tree was given the regular field treatment and in each case the tree died within four or five days thereafter. A Chinese umbrella tree given 1-9 of the regular field treatment showed little if any distress, from which it would appear that most plants would have been killed with a much weaker formalin solution.

We first attempted the injection of formalin into the soil prior to the removal of the trees from the infested area. Many of these trees were from one to two feet in diamsuspended until all trees were re- an exact cubic foot of soil. By soil to a depth of six feet and back. moved through the use of a caterpil- weighing the empty box and later Each injection required approxilar tractor and by hand labor. the box filled with dry soil, then mately one minute, the treatment Where the trees were too firmly with soil of various degrees of mois- covering the soil for six inches in established to be pulled by the trac- ture content up to complete satura- all directions from the injecting pipe, tor enough of the large roots were tion, we were able to determine the thus treating approximately six cucut to enable the tractor to pull the amount of solution per cubic foot bic feet of soil per injection or trees, and later the large roots were required for thorough penetration. pulled one at a time by the tractor. By this method it was intended to leveled and a line made about two remove from the soil every possible inches from the top of the tank, up portion of the host root constituting to which line the tank was each time the principal food supply of the filled with water. Knowing the exact fungus.

there might have been some bene- was being filled so that the water fits in treating the soil, in spite of running into the tank from the large the difficulties mentioned, while the three-inch supply pipe gave it a trees were still alive. The infested thorough mixing. As the solution soil had not been irrigated for about was conveyed by pipe from the mixthree years and consequently was ing tank into the spray rig tanks it very dry. The treatment was ac- passed through a very fine copper complished in April, May, and June, wire screen to prevent any obstacles and the roots of a few trees left for from clogging the nozzles at the experimental treatment and observa- lower end of the injecting pipes. tion appeared to rapidly absorb the poisonous formalin solution and it rigs, the mixing tanks, and the large may be that a better penetration of water supply pipe, we connected the the poison into the roots would have discharge pipes of the two spray resulted from the live roots.

each square foot of the entire five sired location, and from the end of acres to a depth of six feet under the pipe the formalin was conveyed a pressure of about two hundred through high pressure rubber hose pounds per square inch and at the to the place of operation. rate of one gallon per cubic foot of soil. through the use of ordinary orchard thirty-six gallons per minute. We spray rigs equipped with a special had three high pressure hose conpipe and nozzle. Two of these spray nections on each spray rig with two rigs were located within a few feet injectors on each hose, - one man of each other and made stationary being required for each pair of inat a convenient place on the area jectors. These injectors consisted of to be treated. A mixing tank, with two %-inch common pipe six feet a capacity of approximately one in length, the same being connected charge pipes of the spray rigs but thousand gallons, was placed be- one foot apart at the top with ordin- they were not satisfactory because tween the two spray rigs on a tem- ary pipe connections consisting of we had three men, with two injectporary tower made of empty barrels, two %-inch ells, two nipples, and a ois each, working from each spray the height being only sufficient to tee in the center, to which the high rig and one of the men was frequentrun the formalin by gravity from pressure hose was connected, a quick ly delayed by the injecting pipes the mixing tank to the spray rigs or lever shut-off valve being installed striking a root or other similar obclose by.

was installed to convey the neces- to the operator so that he could shut market suitable for attachment to sary large amount of water from our off the flow of the formalin solution each injector. We were able, howdomestic supply tank to the mixing while changing from one injection ever, to keep a very close check on tank. This very greatly facilitated to the next. the delivery of water since it required 251.360 gallons per acre for ing pipes were attached especially ing ninety-six injecting holes, made this treatment.

consisted of 1¼ per cent commercial at one end, the other end tapering Each mixing tank contained an exformalin and 98% per cent water. to a point like a sharpened pencil. act number of gallons of formalin We made many preliminary tests to About one-half inch from the small so we could check any time on the ascertain the amount of solution re- or sharp end of the nozzle were amount of formalin per injection. quired per cubic foot of soil to se- eight 1-32 inch holes through which To be safe, we kept slightly above cure complete penetration. This was the formalin solution was forced in one gallon per cubic foot of soil or accomplished by constructing a num- a horizontal direction as the injec- six gallons per injection. ber of boxes containing, when full, tors went perpendicularly into the For a part of the time we kept

The mixing tank was properly capacity of the tank, the 11/4 per Later experiments indicated that cent formalin was added as the tank

In order to avoid moving the spray rigs with a single pipe of proper The formalin was injected into size, running this pipe to any de-

One of the large spray rigs will The pressure was procured pump under high pressure about between the tee and the high pres- stacle hidden in the soil. We were A temporary three-inch pipe-line sure hose where it would be handy not able to find any meter on the

made steel nozzles about two inches it easy to keep an exact count of The solution injected into the soil in length with %-inch pipe thread the injections per hour or per day.

twelve cubic feet per man with his pair of injectors. In the end of the injecting nozzle were two additional 1-16 inch holes pointing at a slight outward angle rather than straight down. The formalin forced through these two holes aided materially in cutting the way through the soil for the injecting pipes. In fact, with the weight of the two six foot pipes and the connections mentioned, the injectors moved downward at about the right speed and without other aid. It should be noted here that our soil is of a loose sandy type.

In order to have the injections uniform and regular, one injection for each square foot of surface, we constructed several platforms using common 2x4 dimensions for the cross pieces and common 34-inch 1x12 boards for the platform. We bored one-inch holes exactly one foot apart over this entire platform, the platforms used by us having six holes across by sixteen in length or a total of ninety-six injecting holes per platform. The surface of the soil was smoothed off before placing the platform and then the soil was banked up slightly around the entire outer edge of the platform to prevent the solution forced up around the outside of the injecting pipes from leaving the soil actually under treatment.

We tried water meters on the disthe amount of formalin per injec-On the lower ends of these inject- tion. Each platform, as stated, hav-

the formalin solution.

Our injections proper started on stems. March 14th and the five-acre tract was finished June 5th with the ex- the treated area appears to have strip of land on the Barker place, ception of a small amount of soil been killed by the treatment. Pure the treatment extending about fifunder the cement tennis court for cultures of the root rot fungus were teen feet beyond any known infeswhich it was necessary to construct planted in the soil of the infested tation. special equipment. Treatment of the area ahead of the treatment by Mr. soil under the houses and the ten- C. J. King. These were taken up for kept dry and free of plants of every nis court was accomplished by bor- examination at various intervals af- description. In digging for roots ing or drilling holes in each square ter treatment and some of them, on and sclerotia in the treated soil some foot of the entire floor space through the largest roots, had not yet been ten months after treatment we found which to make the injections. In killed. The soil where these pure the soil still very moist, due largely the case of the cement tennis court cultures were planted was later giv- no doubt to the fact that there had we were able to inject the solution en double strength treatment. Many been no plant roots in the area to for some distance under the cement roots showing old infection have draw the moisture out. from around the outside by holding been taken from the treated area at injecting pipes of extra length at various intervals but so far no live most of it purchased in carload lots, various angles to cover the depth of fungus has been found. soil treatment desired.

soil within about ten feet, but only form of the fungus in the treated half lived. The dead portion of the plenty of life. tree being always the side nearest the treated soil.

palms showed wilt about the fifth grown the entire season and were palms and consequently received yard each. In each of these three Coachella Valley.

two large and two small spray rigs less of the formalin. It was noted cases there was four to five feet of going and when all went well we that all palms seriously hurt by the clean uninfested soil on untreated could make about 5,300 injections treatment first showed the formation ground between the infestations and per day, requiring 31,800 gallons of of many drops of a sticky sweet the treated soil, indicating clearly substance on the base of the leaf that the treatment had been effective

On one portion of the infested and Mr. H. F. Loomis found a con- trees and buildings on the tract, the area it was necessary to treat the siderable number of the sclerotial cost per acre was close to \$3,500.00. on one side, of a row of citrus trees. area but after careful tests these prohibitive under ordinary circum-Most of the trees showed wilting and proved to be dead. At the same stances it becomes entirely practical heavy shedding of the foliage from time they also found this form of if you keep a very close watch for about the fourth or fifth day after the fungus at the Indian Wells in- the appearance of the fungus and treatment. In many cases about one- festation and under the same tests eradicate it while you have but a half of the tree died and the other those from Indian Wells showed small spot. Formalin can now be

rows of cotton around the treated rel. Twenty-one gallons properly ap-It was necessary on another part area, but just outside of it, to de- plied will thoroughly sterilize one of the infested area to treat within termine if we had treated all of the square rod of soil to a depth of six about ten feet, also on one side only, infested area. Cotton is one of the feet and you should be able to deof seven twenty-year old and three most susceptible plants to this fun- tect the fungus before it has spread ten-year old date palms. All of the gus. After these cotton plants had over a square rod. day after treatment. Six of the sev- about to be killed by frost we had spots of dead plants of any kind en large palms were killed outright each plant pulled separately by hand they should be promptly examined and the seventh, while still living, and the roots carefully examined. to determine the source of the was seriously damaged by the treat- They all showed clean roots with the trouble. This fungus is native in ment. The three young palms, how- exception of three spots on the Texas, New Mexico and Arizona and ever, were not seriously hurt due Robert Barker land north of the Ex- most likely along the Colorado river most likely to the fact that the root periment Station and on untreated in California. It is possible that it system of the young palms had much land. These three infestations con- may be native in some of the moist less spread than that of the old tained approximately one square shaded canyons emptying into the

about four feet beyond the treat-Practically all weed seed within ment. We have since treated another

The treated soil has thus far been

The cost of the formalin alone, for our job was \$14,103.18 and with About thirty days ago Mr. King our high labor cost incident to the

Although such cost per acre is purchased by the barrel for about Last season we planted several 70 cents per gallon or \$45.00 per bar-

Should you notice any circular

Report of Progress---Date Scale Eradication

By B. L. Boyden, Senior Entomologist, Plant Quarantine and Control, U. S. Experiment Station, Indio, California

MOST of you are familiar with the spect properly. Several infestations, venience in inspection, report-filing, Scale eradication and know the ters of spread, were found at vari- The plantings were also classified scale, if not personally, by reputa- ous points in the Valley from Mecca for either scout or routine inspection, so I will deal briefly with this to Indio. phase of the question and more at length on the methods used and palms were in small ornamental or tween the small plantings, which are progress which has been made since neglected plantings, although there inspected by men working in pairs, 1927.

small insect which infests the foli- generally distributed over the southage and fruit of the date palm. ern part of the county but none was When first hatched the young have found in the northern part. In Ari- due to limited funds only 12 inlegs but no wings and crawl around zona conditions were similar to those spectors were available. One man for a short time, probably not more in Imperial county but there was a was detailed to continue the survey than two or three days. Finally they much larger percentage of commerinsert their beaks into the palm, and cial palms and much less scale. Very ley, and the remaining 10 confined the females remain stationary for few palms of standard varieties were the remainder of their lives, the found in Texas and no Parlatoria properties in the Coachella Valley. males until they mature. Upon reach- scale. ing maturity the males emerge from their old skins, mate, and die. The soft body of the female has a protective covering which is developed as the insect grows. When the female is fertilized it lays eggs which hatch under the protective covering and then the young emerge for their brief active period.

This insect was introduced on offshoot importations from the Old World and was early recognized in this country as a serious pest. Attempts were made to control, and later to eradicate the insect in Arizona and later in California and considerable progress was made.

Late in 1927 a number of new infestations, involving a large number lied palms, the ordinary fan palm times. The number of inspections of commercial palms, were found not included. and an appeal to Congress by those interested in the date industry re- program was laid out and the cost gard to infestations and the condisulted in an emergency appropria- estimated. This was submitted to tions within the planting. Also all tion of \$25,000. With the additional the Date Growers' Pest Control Com- the plantings outside the infested funds a hasty survey was made of mittee and the Federal and State area, except those in the High School the entire date growing area. It Agricultural authorities. The pro-district, were inspected. was found that there were approxi- gram was approved and the needed mately 140,000 date palms in the funds were promptly obtained. Coachella Valley; 42,000 in the Salt River Valley; 32,000 in the Imperial ing the survey of the Coachella Val- inspection to locate the infested Valley; 20,000 in the vicinity of ley the date plantings were all map- palms, and treatment to eradicate Yuma; a few thousand in the Rio ped. Each planting, whether it con- the scale on palms found infested. Grande Valley in Texas, also small sisted of 1 palm or 1,000 palms, was The first survey located most of the non-commercial plantings at various listed and located on a large map of palms in the Valley but the inspectplaces in the Southwest outside the the Coachella Valley. An infested ors, especially the scout inspectors, areas mentioned above.

numerous commercial plantings and be within the range of natural report any found. The list of comalso a large number of abandoned spread from known centers of infes- mercial gardens was, of course, soon seedling plantings, many of them tation. This infested area was di- complete but small plantings and difficult, and some impossible to in- vided into seven districts for con- single palms, usually on abandoned

early history of Parlatoria Date severe enough to be classed as cen- and charting.

In Imperial county most of the were a few commercial gardens. and the larger plantings which are The Parlatoria Scale is a very The scale was found to be rather inspected by larger groups of in-

> past work and field observations the following points seemed evident:

> (1) That the Parlatoria scale was a serious pest of the date palm in the date growing area of the United States.

(2) That control would be difficult and expensive.

(3) That the scale could be eradicated from individual palms.

locate infested palms before the in- new infestations were found during festation had reached a point where this inspection but none outside the spread was liable.

(5) That the known hosts of the Parlatoria scale in the date growing fested districts were inspected at areas were the date and closely al- least twice, some as many as six

area was established, including all were instructed to keep continually In the Coachella Valley there were plantings which were considered to on the alert for unlisted palms and

tion. The terms scout and routine are here used to differentiate bespectors.

During the last six months of 1928, in Arizona, one in the Imperial Valtheir efforts to the known infested

With additional funds available in From a study of the reports of January, 1929, the inspection force was increased and more work was done outside the infested gardens. It was not until July 1, 1929, when the increased Federal and State funds were available, that we had an adequate force in the field. At that time a careful leaf-by-leaf inspection of the Valley, with the exception of the Indian Wells district, was begun and was completed about (4) That careful inspection would the end of the year. A number of infested area.

In 1930 all plantings in the ingiven a garden was determined by With this information at hand a the location of the planting in re-

The three fundamental operations in the Parlatoria eradication work From the reports turned in dur- are: scouting to locate all date palms, palms within the city limits in 1928 and at each inspection the inspectors had to go from lot to lot, up and down each street and alley. Naturally some palms were missed. As soon as time permitted after the first er's name. On each following inspection the reports were checked with the list so that none would be missed and newly found palms added. New lists were made after each inspection.

In the eradication work the indipalms, is taken as a unit. This is found on the previous inspection. due to a number of reasons, the area more accurately, many of the out and destroyed. palms difficult to inspect had been destroyed, the number of trained in- ary fan palm was not considered a spectors had increased, and our host of the Parlatoria scale. Parlamethods were more efficient, due to toria scale has been found on fan increased information.

each district. On this chart each indications were that the natural

farms, were added to the lists from planting in the district is listed with mortality of the scale on the fan time to time. In 1930 inspectors were the number of palms classified as to palm was greater than the increase sent out to scout certain districts, age and whether seedling or stand- and, if the source of infestation were doing no inspection except when un- ard variety, the dates of inspections removed, the scale would eventually listed palms were found. Early this for the past two years, and, if in- die out. At the same time no year two men were started on a fested, the number of infested palms chances were taken and all palms in section-by-section survey of the Val- found at each inspection. At the the immediate vicinity of infested ley, beginning in the center of the first of each month the work is laid date palms were given casual ininfested area and working out. The out for that month and the squad spection. As the work progressed men locate the corners of a section leaders and scout inspectors are giv- and more time was available, more and walk over the entire area and en lists from time to time of the attention was given to fan palms turn in a report giving a description properties to be inspected. When and other possible hosts. In two inof the land, whether under cultiva- the inspection of a planting is com- stances in 1930 fan palms were tion now or in the past, and if not pleted the field man responsible turns found in Arizona heavily infested now under cultivation, the condition in a report on a regular form giving with Parlatoria scale and in both as to desert growth. Some sections the information required; number of cases it was evident that the scale are easily scouted and there is no palms inspected, number infested, had bred up on the fan palms alchance of missing abandoned palms, source of new planting, if any, type though the scale had come originalothers, because of the dense growth of inspection (tower work, ladder ly from date palms. of desert brush, are not easily scout- work, and ground work), and the small, young palms and the larger ed and will be rechecked. About 30 general condition of the garden as and older fan palms in the vicinity sections have been checked to date regards inspection (well pruned, showed no scale. In the Coachella and the work will be continued un- bushy with offshoots, etc.), weather Valley an inspection of fan palms til the entire area is covered. Lo- conditions, especially wind interfer- in the vicinity of date palm plantcating all ornamental date palms in ence, and the number of one-man- ings heavily infested in the past few the towns and cities is a phase of days required for the inspection, years was begun in September of this work which requires consider- The charts are kept up to date as last year; 2,543 fan palms were inable time. In the city of Indio, for the reports come in and inspection spected and 44 were found to be example, there were over 300 date is laid out on the basis of this in-slightly infested. The infested palms formation.

tioned, records are kept on the rou- which had been overlooked by the tine inspection of infested gardens, giving the rows inspected by the various men. The gardens are in- chella Valley thousands of seedling inspection, the palms were listed as spected frequently and never twice palms of no commercial value were to Block and Lot number and own- in succession by the same crew. located in the infested area. Some When an infested palm is found our of these were in orchard formation, records will show who inspected it others in unthinned nursery rows; previously and the information giv- many were overgrown with mesquite en to the inspectors. In checking and desert brush and weeds. Some over the inspection in infested gar- of these plantings had been found dens last year few infested palms infested and it was a certainty that were found which could reasonably others would be found infested later. vidual palm, rather than a block of have been expected to have been Using ordinary methods it would be

high value of the individual palm, is defoliation and torching. All the could not be inspected properly and, the drastic treatment used, and the leaves are cut off leaving only the if an infestation were present, it possibility of locating infested palms protected bud undisturbed, the fiber would probably develop to a point before there is any dissemination. is cut back to uncover all scale on where spread to commercial gardens Therefore, very careful inspection is the leaf bases and the flame of a would be almost certain before the necessary and this phase of the work gasoline torch is passed over the sur- infestation could be located. Theretakes most of the funds allotted to face to kill the scale. If the palm fore, as soon as money was available the project. In 1928 inspection was is in bearing, this causes the loss of in 1929 we began digging out and much faster than it is now as we fruit for about two and a half years, destroying these worthless plantings had to cover a large area in a short In many cases, however, the infesta- as soon as we could get the owner's time with fewer inspectors than we tion is so light that cutting off a consent. In some cases the entire have at present. As the work pro- round or two of leaves will clean plantings were dug out, in others a gressed, however, inspection became up the palm with no apparent loss few were left for ornamentals. This increasingly more intensive as we of fruit. If the palm is of no par- has continued to date and we still were able to delineate the infested ticular value to the owner, it is dug have a few palms of no value which

I have mentioned that the ordinpalms many times when located near We have in the office a chart of heavily infested date palms but the found infested.

These were were all within a radius of 300 feet In addition to the reports men- from a heavily infested date palm scout inspectors.

During the first survey of the Coaa long expensive task to clean up The standard method of treatment those infested. These plantings also we would like to remove and probably will later. During the past three years we have dug out and destroyed 17,924 valueless palms from infested plantings and 23,948 in the infested area from plantings not

The results obtained are indicated

by the number of infested palms and The number of fan palms found in- We must continue for some time the number of infested properties found fested are not included in the fig- search for palms which may have from year to year. In 1928, 1,592 ures given. infested palms were found on 22 properties, 6 new infestations; in able at present, we still have con- continued for some time in gardens 1929, 588 infested palms were found siderable work to do. We are not which have shown scale within reon 32 infested properties, 17 new in- yet sure that we have located all in- cent years. festations; in 1930, 186 infested palms festations resulting from past heavy were found on 20 infested properties, infestations and we will undoubted- will find many more infested palms 5 new infestations. Fourteen in-ly find more infested palms in the and eventually the scale will be fested palms have been found dur- gardens now considered infested. eradicated. ing the first quarter of this year as compared with 74 in 1930 for the N same period. Only one of the 14 was a commercial palm which had to be treated. One was in a commercial garden but only a single dead scale was located. The remaining 12 Π were palms of no commercial value which were dug out. Beginning Ñ with July 1, 1929, when we first put a full crew of experienced inspect-0 ors in the field the number of infested palms found by quarters reads Λ as follows: 104-266-74-50-36-26-14. No new infestation has been found since May, 1930. In the Imperial Valley and in Arizona the same procedure was followed. In those areas, how-Π ever, there is much less routine and considerably more scouting inspec-Π tion. In the Imperial Valley 1,064 palms were found infested during 1928, 165 in 1929, and 89 in 1930. In Arizona 41 infested palms were found in 1928, 50 in 1929, and 18 in 1930.

been overlooked. Inspection, especi-While conditions look very favor- ally leaf-base inspection, must be

However, I do not believe that we

SUMMARY OF DATE PLANTINGS IN THE	U								
COACHELL'A VALLEY APRIL 1931	0 0								
COAURELLA VALLEI — APRIL, 1931									
Commercial	Ô								
Standard variety, 5 yrs. or over34,090	Ŭ								
Seedlings, 5 yrs. or over6,663	ň								
Total palms 5 yrs. or over40,753	ປ								
Standard variety 1 to 4 yrs old in field 55.020	ň								
Seedlings, 1 to 4 yrs. old in field 4,087	U o								
Total palms 1 to 4 vrs. old in field59.107	N								
	0								
Standard variety offshoots in nursery19,878	Ŋ								
Seeding offshoots in nursery	0								
10tal offshoots in hursery20,069	IJ								
Total palms in field99,860	0								
Total offshoots in nursery20,069	IJ								
Total commercial palms119,929	0								
New Commonoid									
	0								
Ornamental date palms	U								
Date paims, abandoned	0								
Total non-commercial date palms28,264	U								
Total date palms in Valley148,193	c (

Investigations on Date Palm Diseases

By Dr. L. J. Klotz, Associate Plant Pathologist, Citrus Experiment Station, Riverside, California

A date palm diseases was reported acterized by a retardation and even- latter have a greater capacity for at the 1930 Institute. It seems de- tual cessation of growth, destruction fixing potash than do the former. sirable to present to this Institute a of roots, and a gradual reduction in Similar work is being continued with summarizing record of the results the quantity and quality of the fruit a large number of soil samples tak-Dr. Fawcett and I have obtained on produced until the palm is complete- en at one foot intervals to a depth date palm pathology during the past ly unfruitful. year. Dr. Haas of the Department of Plant Physiology has continued to ined and compared roots of healthy the pinnae and fruit from decline cooperate with us in the studies on and diseased palms. It is difficult diseased palms are very deficient in decline and blacknose. At this point to find healthy white roots under de- potash as compared with those from I wish to thank all connected with cline-diseased palms. Most of the healthy palms. Each harvest rethe industry who have cooperated roots are brown, soggy and disinte- moves vast amounts of this nutrient, and helped us so generously in this grating, and some of the rootlets a crop from a single palm of 200 work.

Decline Disease

erly begin with the so-called "decline effect of withholding potash and in- ing and removal of outer whorl of disease," probably the most serious creasing calcium is a shortened, old leaves must be considerable. It trouble found in the Valley. In the stubby root system having very short is evident that a palm in soil hav-Seventh Annual Report of the Date laterals with blackened tips. Paral- ing a great avidity for fixing pot-Growers' Institute, page 9, and in a leling this observation Professor Hib- ash must experience great difficulty current issue of Hilgardia, published bard of the University has shown in in securing potash sufficient for by the University of California, the a comparative study of soils bearing growth and crop production. From

On many occasions we have examhave blackened tips.

The discussion should most prop- as shown in the lantern slides, the wise the loss each year due to prun-

RESUME of our knowledge of malady is described as being char- healthy and diseased palms that the of five feet.

> As Dr. Haas pointed out last year, pounds of dates containing about In water cultures of date seedlings, 1½ pounds of potash (K2O). Like-

ady can be overcome by applying sium, phosphorus, etc., for successfertilizers containing large amounts ful date culture. of potash. However, extremely large the roots. In addition the condition significant differences in the acidity is made more serious by the deteri- of the two classes of soils. Thus far oration of much of the root system our results indicate that in any one under the conditions of decline, and, garden the soil of the third to the because a new growth of roots must fifth foot inclusive below the surface, be produced before rapid absorption which stratum contains the largest is possible, one must expect the re- number of roots, is in the declinecovery to be slow.

Experience with the decline disease of prunes in northern California indicates that commercially it may be economically impossible to add sufficient potash to overcome such a condition. Our experiments with various fertilizers, amendments and chemicals now under way should eventually throw light on the question whether or not it is thus possible to induce recovery from decline. Trials are being made in five different gardens in the Valley, and it is hoped that before the next Institute there may be some definite results to report.

Soil applications of copper sulfate continue to show promise. Quantities up to 75 pounds disked into the circular area (750 sq. ft.) surrounding each palm, then followed by basin irrigation have shown indications of beneficial effects. Each of two palms was given an application of 125 pounds of the compound which proved to be too much. the outer whorls of fronds being Likewise an injection of killed. 18 liters of a 0.2 per cent copper sulfate solution into the trunk of a 12-year-old palm was distinctly injurious. The centers of these particular palms, however, are green and it is believed that they will eventually overcome the initial toxic effect. As to the manner in which this chemical produces the surprising, beneficial results one can at this stage only speculate. Copper may be an element essential to the growth and health of the date palm. Being very toxic to some fungi the copper ion may be instrumental in the extermination of some root parasite, although our pathological work so far has not given us such an indicaprecipitation inhibit the action of in carbohydrates, total nitrogen, po-

this one might reason that the mal- sufficient of the elements, as potas- tal sulfur, and total chlorine of dis-

As already indicated, to supplequantities may be required to satis- ment our field trials we are studyfy this avaricious fixing power be- ing the physical and chemical propfore it is possible to increase the erties of a large number of soil amount of potassium in the soil so- samples from both healthy and delu ion and provide for absorption by cline-diseased areas. There were no diseased areas sandier and lighter than in the same zone under healthy trees. Roughly our method was to determine the volume of a given weight of soil, the samples having the greater volume being considered of the heavier type or more claylike. This determination was checked by measuring the air space in the soil, the air being displaced by a measurable amount of water; the more air space a soil contains, the nearer it approaches the heavier types or clays. This does not mean that date culture cannot be pursued successfully on the light soils, but indicates that, providing date palm decline is a nutritional trouble, it is necessary to fertilize such areas very heavily if the trouble is to be excluded. We are determining also the potash, phosphorus and nitrogen of water extracts of the soil samples. Details of some of our results have recently appeared in the University publication, Hilgardia, under the title Some Observations and Experiments on the Nutrition and Composition of the Deglet Noor Date Palm in Relation to the Decline Disease." While Hilgardia is available to any resident of the State and can be secured through the Farm Advisor, Mr. Winslow, a summary of that paper will nevertheless be included in this report.

Summary

(1) A serious malady, "decline disease," has appeared in the date gardens of the Southwest. It is characteried by retardation and eventual cessation of growth, destruction of roots, and gradual reduction in guality and quantity of fruit produced. The Diplodia disease is frequently associated with the decline.

(2) Comparative analyses show tion. The copper sulphate may by that the diseased pinnae are lower possible soil toxins. Likewise it is tassium, and phosphorus, but higher possible that the compound could by in calcium than the healthy pinnae. certain base exchange phenomena There were no appreciable differ- and Disease Survey, U. S. Dept. of liberate from an unavailable state ences in the sodium, magnesium, to- Agriculture, Bur. Pl. Ind.

eased and normal pinnae. Copper sulfale applied to the soil about one bally discaled palm has in three months effected a great improvement as shown by new growth and by the composition of the pinnae. Subsequent fruitfulness also indicated further improvement. No control palms have been known to recover.

(3) There is a great variation in the ash of the dry matter of date pinnae ranging from about 12 to 29 per cent. Date pinnae are highly siliceous, containing from 9 to 25 per cent of silica in the dry matter. About 80 per cent of the ash is silica. Seventy-four to 80 per cent of the total calcium and 87 to 99 per cent of the total potassium of the pinnae are water-soluble.

(4) The pulp of dates dried at 70° C. contained about 1.0 per cent of potassium and about 0.1 per cent of calcium. Over 90 per cent of the inorganic constituents of the dry matter of date pulp is water-soluble.

(5) The potassium content of the dry matter of the roots is three to four times as large as the calcium and is considerably higher than the potassium found in the pinnae or fruit.

(6) Date seedlings (Theory variety) in culture solutions were apparently uninjured by concentrations of odium chloride below 4,000 p.p.m. Certain elements such as beryllium may be extremely toxic to Deglet Noor date seedlings.

Effects Due to the Fungus Thielaviopsis

In addition to the fungus diseases reported last year we have found several new diseases due to definite paresites. The most important of thc.e is caused by a fungus, Thielaviopsis sp.* which thus far has been fou.d attacking all organs of the pal., except the roots and stem, and our inoculations indicate that it will attick these organs also. Dr. Fawcett has proposed the name "black score." for this disease, for it appropriately describes its most striking ultimate symptom, a dull charcoal-like darkening of the affected tissue.

The fungus Thielaviopsis paradoxa parasitizes a number of plants, including areca palms, oil palms, sugar cane, cocoanut and pineapple. On wounded citrus fruits it produces a firm, daik, smoky-colored, pleasantly

*Jdentifi d as Thielaviopsis paradoxa (De Seyn) v. Hohn by Dr. John A.

aromatic decay. been shown experimentally to be becoming dark. capable of attacking plantain, mango, Saccharum spontaneum, Rhapis on the fruit stalks is the effect of most enveloping the midrib and caussp., and the date palm. Excepting the disease on the palm bud and ing it to break. Extending a total our paper in Phytopathology 20:(10), 1930, it is believed that the organism has never been reported attacking the date palm naturally. Last spring the causal fungus was isolated from diseased spathes and inflorescences collected by Mr. Nixon of the Government Date Garden.

On preserved specimens of apparently the same disease sent by Dr. Fawcett from Egypt and Algeria, we have found conidia typically like those of the Thielaviopsis. The parasite attacks the young fruit stalks and fruit strands even before the spathe has ruptured, as shown in one of the slides. On the spathe circular to elongated lesions, sorghum brown (Ridgway) on the exterior surface and ranging from this color to a mahogany red or bay on the interior surface, marked the points of entrance of the disease. On removal of a portion of the infected spathe it was found that the fruit stalk bore depressed, brown (warm blackish) to black necrotic areas which were circular to oblong in outline. The twisted deformed fruit strands of this specimen, which were completely involved by the malady, were a blackish brown to black in color and were devoid of flowers. Microscopic examinations showed them to be covered by dark brown, unicellular, oval conidia. The strands of fruit bunches that were attacked later in their development had blackened, depressed lesions similar to those on the fruit stalk, and some were completely severed by the decay. The affected tissue was in all instances dry and firm, and each area bore the black powdery spores. A gray covering on some of the lesions was found to be due to conidia of Fusarium spp.

common with the Khamedj disease turn black owing to the presence in cal darkened, elongated lesions being of date palms in Northern Africa, the tissues of spores of the fungus. found on the frond midribs of 20 which has been described by Cavara, Infection spreads rapidly through different varieties. The organism Chabrolin and others, the black le- the pinnae and in severe cases the together with a Fusarium has recentsions do not have the white, tomen- heart leaves dry up. This is an ac- ly been found on several decaying tose covering of the fungus Maugin- curate description of the course of male inflorescences collected by Dr. iella scaettae Cav. to which they the disease we produced on the large Swingle. ascribe the cause of Khamedj. From seedling in the greenhouse. the interior tissue of the material collected at Indio a torulae-like Hy- ond whorl of fronds on a large seed- some experiments were made to dephomycete, Thielaviopsis sp., was in- ling offshoot were inoculated by termine the efficacy of dipping Divariably isolated. On culture media placing the fungus in a 1/2-inch hole plodia-diseased offshoots in various this organism produces a white, made with a cork borer. The wound disinfectants prior to planting in the aerial growth having chains of hya- was covered with adhesive tape un- nursery or field. One per cent so-

In India it has mature, the entire culture rapidly four weeks the fungus on one frond

Perhaps even more serious than inches wide and 6 inches long, alheart. Having gained entrance to of 18 inches up and down the surthe succulent tissue through a wound face of the midrib beyond the lesion or puncture, the progress of the pa- was a linear series of circular waterthogen in this vital region is very soaked areas each about 1/2-inch in rapid. The entire terminal bud and diameter. The surface of the canker adjacent leaf bases may succumb, was gray to brown to drab in color, eventually presenting a dried, dull, and the pinnae beyond turned gray blackened, charcoal-like appearance. as they dried. Internally the lesion

the entire bud was not killed, but toward the advancing edges with grew out laterally producing the so- smaller orange to reddish brown called "fool disease" effect described streaks extending far up and down at last year's Institute. It is be- the midrib. These streaks were dilieved that the Thielaviopsis is the rectly under the water-soaked areas principal organism responsible in that appeared on the surface. The this peculiar trouble. Eventually, pathogen was readily reisolated from the entire bud regenerates from the the affected tissue. Eventually the uninjured meristematic tissue and invaded tissue turns black due to the returns to its normal vertical posi- production of the black spores of the tion. High temperatures and rapid causal fungus. growth of the palm may be the factors operating to prevent the dis- ous economic importance if rainy or ease from terminating fatally in all humid periods occur during the time instances. On laboratory media the the spathes are opening. However, fungus makes very little growth at 32° C. (89.6° F.) or above. Its op-laboratory indicate timum temperature lies between 24° sprays or dusts may control the C. and 27.5° C. (75.2° F. and 81.5° F.). trouble. According to reports the Successful inoculations have been ob- disease on areca palms in India was tained on a large vigorous date seed- successfully treated by excision of ling in the greenhouse, the disease the infected parts, scorching the experimentally produced being sim- wound and applying hot tar. Some ilar in appearance to that found in success was had with sugar cane sets date gardens. The causal organism by dipping them in 4-5-40 Burgundy was easily reisolated from the exper- or Bordeaux mixtures. In Jamaica imentally diseased material.

fronds that usually accompanies bud and the wounds dressed with a mixscorch may frequently be due to the ture of equal parts of copper sulfate, same organism. The cross-cuts and salt, and lime. On the date palm it V-cuts so commonly found near the is highly probable that surgery folbase of a midrib present an ideal en- lowed by a disinfection with some trance for this and other fungi. copper spray or dust would be ef-Ashby has reported the fungus at- fective. tacking the pinnae of the freshly opened leaves of cocoanut palm. Pale yellow spots with a brown margin been continued. A survey revealed developed on the furled pinnae, later that a number of varieties of the While the malady has features in the lesions elongate, converge, and date palm are susceptible, the typi-

Several midrib bases of the sec- Cook, Cook Date Gardens, Indio, line conidia which darken as they til the organism was established. In lutions of Arrow carbolineum, po-

had produced an oval lesion 3½ In three of the four cases observed was a light drab to a wine color

This disease may become of serisome preliminary experiments in the that copper where the malady occurs on cocoa-The blackening of the midrib of nuts, the diseased tissues are excised

The Diplodia Disease

Work on the Diplodia disease has

In cooperation with Mr. William

tassium permanganate, copper sul- palms. In the early stages this tively to the vapors of carbon disulfate, 2 per cent solutions of formalin trouble appears often as extremely phide and carbon tetrachloride by and licresolis, a 10-10-50 wet Bor- elongated, grayish white, slightly tying open bottles of the chemicals deaux mixture, ammoniacal copper elevated areas with a reddish brown in the tops of the bunches. carbonate, and a Bordeaux dust were margin. These areas sometimes al- carbon disulphide-treated bunch had the disinfectants tried in a prelim- most completely envelop the midrib 30 per cent blacknose and abundant inary experiment. All the offshoots of the frond and extend out upon the decay due to Aspergillus niger, A. used showed evidence of Diplodia in- pinnae. Where the outer white layer flavus, and Penicillium, as contrasted fection. They were immersed in the is carefully removed, one finds that to a bagged check bunch which had solutions up to but not including the the reddish brown margin actually less than 1 per cent blacknose and bud. In the case of the Bordeaux marks the boundary of a lower dark very little rotting and spotting. The dust, a very thorough coating of the layer of the same color. Numerous bunch treated with carbon tetramaterial was given. None of these isolations have yielded principally a chloride showed intermediate effects, treatments seemed to injure the off- certain type of bacterium. Inocula- having 10 per cent blacknose and shoots and all eventually became es- tions with this bacterium are yield- slightly more of the Aspergillus and tablished in the nursery row. Those ing results which indicate that it Penicillium decay than the checks. dipped in the copper materials (am- may be the pathogen. moniacal copper carbonate and Bordeaux) were the first to put out new are frequently found to be associ- treated. Strands of dates enclosed leaves, suggesting a stimulating ef- ated with rubbings and other in- in bottles over water matured much fect.

bonate solution (5 oz. CuCO3 dissolved in 3 pints of ammonia in one gallon of water and then diluted to 50 Only 15 per cent of these offshoots failed to establish themselves, which, considering that they were diseased, was a good average last season when many growers were losing 25 per cent or more plantings. Quoting Mr. Cook: "There is very little more to add in connection with the dipping experiment last year. I am very much pleased with the results and will dip all shoots cut this year.

"The eleven first dipped all have done well, and are as healthy as one could expect a choice shoot to be, which they certainly were not when they were selected. At the present time I can see no difference in them ture gave some interesting indicathat can be attributed to the different treatments. All are growing as sufficiently extensive to justify the well, or better, than could be ex- recommendations of any commercial pected and no one type of fungicide practice. The materials were apwould appear to be especially bet- plied three times at month intervals ter. I hope to be able to make a beginning June 4, 1930. slightly more informative test with copper sulfate this spring, and see lime sulphur had no blacknose dates, if it will stimulate the newly planted but was less mature than the unshoots." It is of interest at this point treated check bunches. Those sprayto recall the beneficial effect of soil ed with Bordeaux mixture and amapplications of copper sulfate."

fected fronds one frequently en- had approximately the same amount counters a species of bracket fungus, of blacknose. The hydrocarbon sul-Poria sp., growing on the frond fi- phur dust had no apparent effect on ber that surrounds the trunk of the maturity and incidence of blacknose. palm. It is believed that this fungus The bunch dusted with Bordeaux had grows only saprophytically on the slightly less blacknose than the fiber and need occasion no alarm.

Dry Bone Disease

Dry bone, while in general of

juries; in other cases, especially on less rapidly than the other strands Five hundred offshoots were later the ends of younger fronds, it is of the same bunch. Seemingly madipped in ammoniacal copper car- impossible to connect the blotches terials and conditions that hasten with any mechanical injury.

Graphiola Smut

gallons) and planted in the field. been observed on date palms at El spire more rapidly than unsprayed Centro and at the Bard Station in plants. Also, it is likely that the Imperial county, California, and at vapors of carbon disulphide and Yuma and Tempe, Arizona. It ap- tetrachloride increase permeability peared in every case to be of minor and accelerate transpiration. importance.

Fruit Troubles

bles have been continued. In addi- sults in blacknose takes place under tion to those reported last year more certain drying atmospheric condiobservations have been made on tions when the date transpires wablacknose. of dates in the field respectively with tured in the leaves can be transloa hydrocarbon sulphur dust, a Bor- cated to the fruit. In addition we deaux dust, and sprays of 1 to 40 have collected and prepared for lime sulphur, ammoniacal copper chemical analysis a large number of carbonate, and 5-5-50 Bordeaux mixtions, although the work was not

The bunch sprayed with the 1-40 moniacal copper carbonate were While searching for Diplodia-af- more mature than the checks and checks and about the same degree of maturity.

Possibly of no commercial interest. minor importance in the commercial but interesting scientifically were gardens, has been found doing con- some bunches completely enclosed siderable damage on some seedling by paper bags and exposed respec-

The

The vapor-treated bunches also The typical symptoms of blotch matured more rapidly than the untranspiration and evaporation hasten ripening. It has been shown that The Graphiola smut of fronds has plants sprayed with Bordeaux tran-

Furthermore, the above experiment lends support to the theory Observations on date fruit trou- that the injury which ultimately re-Treatments of bunches ter faster than the sugar manufacfruit samples.

> Comparative chemical analyses of the basal and distal ends of blacknose dates and of whole dates of susceptible and insusceptible varieties may yield some clues as to the chemical composition responsible for, accompanying, and resulting from this important trouble.

> What may be a serious fungus pest on cured and packed dates has come to our attention. This organism, Catenularia fuliginea,* grows very rapidly on ripe dates, sporulating in reddish brown, monilia-like cushions and rendering the fruit unfit for sale. A steam bath of 95° C. to 100° C. for one minute was found sufficient to kill the organism.

> Strands of dates in the khalal and early rutab stages, some unwounded and some wounded by pricks of a needle, and half of the wounded and

*Identified by Dr. Charles Thom, Bureau of Chemistry and Soils, U. S. Dept. Agriculture, Bur. Pl. Ind.

with dry Bordeaux, were placed in ed that all the fungi, with the possi- that in the field it has been observed deep culture dishes (used as moist ble exception of Alternaria and Hel- that fruit from low hanging bunches, chambers) and inoculated respective- minthosporium, are wound parasites. ly by spraying on spore suspensions The Catenularia, however, apparent- quently of poor quality and breaks of nine species of fungi found asso- ly grows abundantly on the cuticle down more readily than the high ciated with date maladies.

tory effect of several fungicides on completely spore germination of several date growing in the syrup that forms on early rutab stages, a great deal of fungi had shown the copper sprays the surface of the wet-processed rot may develop. Some of this deand dust more effective than the dates. dusts and sprays of sulfur or lime sulfur. The organisms included Al- midities on Deglet Noor dates is due to condensation water and high ternaria, Helminthosporium, Diplo- shown in one of the lantern slides. dia, Phomopsis, Thielaviopsis, Asper- Dates in the khalal and early rutab gillus niger, a green Penicillium P stages immersed two to five hours rains and excessive humidity to roseum, and Catenularia. It will be in water developed many large spoilage is at once apparent. The recalled that in the field, Alternaria, cracks. Dates placed in a saturated Helminthosporium, Aspergillus and atmosphere would take up water probably present a very good medi-Penicillium are the most prevalent and develop very severe ruptures um to practically any wind-borne decayers of date fruit.

All cultures were incubated at room temperature (22°-25° C.). This spectively in atmospheres with rela- ant and diverse flora that developed experiment was a continuation of tive humidities of 0%, 10.5%, 21.5%, on the experimental dates. that recorded in the paper presented 38%, 49%, 60.7%, 70.4%, 80.5%, last year. Judging by the numbers 89.9%, and 100% to test the effect of decayed spots that formed, the of atmospheric moisture on the pro-Bordeaux-dusted fruit was less af- duction of cracks. These humidities able paper from a purely scientific fected than the untreated fruit, sug- were obtained by use of sulfuric standpoint but to the uninitiated it fungicide might be feasible and de- Stevens, N. E., Phytopathology 6:428- suffered from every known disease sirable during rainy seasons.

porium, Thielaviopsis.

unwounded being thoroughly dusted all the fungi. Again it was indicatof the date if sufficient moisture is hanging fruit on older palms. If the Previously a study of the inhibi- present. On stored dates it often younger palms are irrigated when enveloped the

usually near the tip end.

gesting that field treatment with that acid of various concentrations. (See might appear that the date palm 432, 1916). Only in chambers hav- from double meumonia to house-Under the conditions of the exper- ing 100%, 89.9%, and 80.5% humidi- maid's knee, whereas actually the iment the rate of decay by the fungi ties (only few cracks in the second industry has only suffered from two from highest to lowest stood: Cate- and third) did the cracks develop diseases which have commercial imnularia, Aspergillus, P. roseum, Pen- and the dates rapidly were covered portance, Parlatoria Scale which, unicillium sp., Phomopsis, Helminthos- by several species of Penicillium and der the able management of Mr. B. Alternaria, Diplodia, and Aspergillus. The fungi became less L. Boyden, representing the Federal in evidence as the lower humidities Horticultural Board, is almost eradi-The temperature of incubation was were approached, there being none cated, and a so-called Decline of considerably lower than the optimum in the chambers at 0%, 10.5%, and Palms, the cause of which is still for several of the fungi. Eventually, 21.5% humidity. At these three low- obscure but for which a remedy aphowever, all but the individual very er humidities there occurred a slight, pears to have been found by the immature dates became involved by but distinct shrinking of the fruit. Citrus Experiment Station, Riverside.

I shall conclude by pointing out especially on young palms, is fredates the fruit is in the late khalal and cay is undoubtedly due to the cracks The effect of water and high hu- that develop in low hanging fruit humidities.

From the above the relationship of exposed inner tissues, rich in food, fungus spores that chance to lodge Strands of dates were placed re- there, as was evinced by the abund-

DISCUSSION

R. H. Postlethwaite: A very valu-

Observations on the Culture and Diseases of Date Palms in North Africa

By H. S. Fawcett, Professor of Plant Pathology, Citrus Experiment Station, University of California

This was made possible in part by a joint arrangement between the Bu- have been imported from certain No blame is to be attached to those reau of Plant Industry of the United regions of North Africa before any importing the palms, however, since States Department of Agriculture serious study of date diseases was nothing was known of the diseases and the Citrus Experiment Station of made, we have probably imported at the beginning of importation.

WAS privileged to travel in Tu- the University of California. It was already most of the diseases of these nisia and Algeria during the considered to be desirable to make regions that are capable of being greater part of January and Febru- a careful observation of the diseases carried on young palms to this counary and in Egypt in March, 1930, to of these countries in relation to try. If the diseases had been thorstudy the date palm conditions, but those we already know to be pres- oughly studied before this time, especially the date palm diseases. ent in California and the southwest. most of them might have been pre-

Since many thousands of offshoots vented from entering this country.

The situation, however, furnishes for tricts where offshoots of commercial the delta region and at Fayum, but co. Fortunately, we have so far been spared this most destructive date palm disease yet known. Our escape from the Bayoud disease is probably due to the fact that no successful importations are known to have been made to California or Arizona from the oases now known to contain this disease. The only palms in this country from the general region, suffering from this disease, were those of the Medjhool variety sent from a disease-free garden in Morocco by Dr. W. T. Swingle to an isolated place in the desert in Nevada, as explained in detail by Dr. W. T. Swingle on page 18 of your annual report for 1929. These palms are still quite free from disease after a period of about four years, but are still being carefully watched under strict quarantine.

The region having the Bayoud disease in North Africa is confined to parts of Morocca below the high Atlas Mountains, and to a few oases just over the border in western Algeria. All the remainder of Algeria, all of Tunisia, Egypt and Mesopotamia, so far as known, are free from the disease. Further details of this disease will be found later in this paper.

According to Popence there are at least 90,000,000 producing date palms in Northern Africa. These are scattered in various cases, especially in the warm, dry regions of Morocco, Algeria and Tunis, and in various parts of Egypt from the Mediterranean coast to the Sudan.

During this date disease investigation I have received the greatest courtesy and help from many persons in these countries. I wish to mention especially Dr. Rene Maire and Dr. Charles Killian of the University of Algiers, Dr. Charles Chabrolin of the Agricultural School at Tunis, and Dr. Monir Bahgat of the Mycological Division of the Ministry of Agriculture, Cairo, Egypt.

EGYPT

In Egypt, as has been pointed out by Professor Mason,* there are two large districts where seedling dates are almost exclusively grown, and three other widely separated dis-

*Mason, S. C. Date culture in Egypt and the Sudan. U. S. Department of Agriculture Bull. 1457, pp. 1-71, 1927.

the future a good argument for a varieties are used. The northern- was absent in the dryer oases with thorough study of diseases of any most area extends to the Mediter- less humidity. The close trimming given crop in the country where it ranean and the southernmost to At- of the leaves was said to keep it is grown as a basis for intelligent bara in the Sudan, a north and south down to a point where little injury handling of its importation into new extension of about 1,000 miles. Low- to the trees would result. Near the locations. This now applies especi- er Egypt from the Mediterranean to Mediterranean Sea, however, along ally to the Bayoud disease in Moroc- about 15 miles above Cairo is the the Nile, I observed that the palms most important of the varietal date regions. Above this, along the Nile gus that I believe it must interfere to Aswan and including the Fayum district, is a region with seedling production of the palms. No treatdates. It was parts of these two ment was being used against this regions that I visited while in Egypt. disease. I could get no definite in-The principal varieties in lower formation as to whether or not the Egypt are: Hayany, Samani, Zagloul, pruning off of so many of the leaves Amhat and Saidy.

> One is especially impressed in Egypt with the wide use made of all parts of the date palm. Roofs of houses, arbors, and fences are made from the whole leaves; crates and boxes are made of date palm midribs; mats, rope, hats, baskets and handbags from the leaf pinnae; posts for houses from the trunks, and any left-over bits for fuel; in fact every part is carefully utilized for some purpose. Professor Mason has described these uses in detail. One finds the palms commonly trimmed very high and near to the fruit stalks, sometimes leaving only five or six leaves near the top at the time of trimming. Some pruning of leaves was being finished during the middle of March while I was there. A part of the pollination in the delta region near Cairo appeared to have Alexandria, Korashia and Fayum I been done by that time. At Fayum, found the Diplodia disease only in a forty miles southwest of Cairo, on very mild form. At Fayum I found March 18 some spathes were fully on leafstalks brown oval spots about open and pollinated, others just 10 to 15 mm. in longest diameter splitting and some not yet open.

> Egypt seemed very low. The grow- No organism was found either by ers were receiving not more than 1 microscopic or cultural methods. to 1½ cents per pound. At Damiet- Near Alexandria and Mamietta simta good trees were said to average ilar oval spots were found on leafabout 250 pounds per tree of the stalks. In addition, dark brown, Hayany variety (known locally as more irregular oval spots on the Ramli) for which was received about midrib portion of the leaves were one dollar to \$1.50 per tree, not far commonly seen, resembling what will from ½c per pound.

> found in Egypt was the Graphiola be known as dry bone, also to be or leaf smut, due to the fungus described later, was noted. Small Graphiola phoenicis, which occurs reddish brown spots 3 to 4 mm. in as numerous pustules on the pinnae diameter on leafstalks were probabof the leaves. These pustules are ly stigmanose. They were thought dark brown or black. They are by one of the Egyptian entomologists about 1/2 to 1 millimeter in diameter to be possibly due to some sucking and extend out from the surface of insect like the jassid. No sign of the leaf. The leaf tissue immediate- fungi could be found in the discolly surrounding the pustule is ofter ored tissue. On various minor spots yellowish in color. The disease ap on date palm midribs in Egypt varipeared to be most conspicuous on ous fungi were found, including the older lower leaves. It was con-species of Anthostomella, Phomopsis, spicuous and widely distributed in Phoma, Gloeosporium, Didymospor-

were so badly infected with this funconsiderably with the growth and would lessen the production of dates.

At Fayum I found specimens of the black scorch on leafstalks similar to the disease which I had previously noted in Coachella Valley on emerging buds and the cause of which Dr. L. J. Klotz has found to be the fungus Thielaviopsis paradoxa. The disease at Fayum, Egypt, was found in the form of a blackened, rough, irregular scorched condition along the side of a young leafstalk. The various phases of black scorch are being described by Dr. Klotz in another paper in this report. Specimens also containing spores similar to this Thielaviopsis were found in Tunisia and Algeria.

I found no other disease of date palms in Egypt that appeared to be more than of minor importance. At with pink tissue underneath extend-The price received for dates in ing inward for about 5 to 10 mm. be described later under Tunisia as The principal disease of date palms anthracnose. A superficial spot to um, and Mycosphaerella in addition were laid by tunneling immediately ia, Algeria, Morocco and Italy, and to those previously mentioned.

TUNISIA

In Tunisia the principal date growing districts were to the south and in the soil. The contrast between na may be due to the fact that it atinland in dry, hot oases with climates not unlike the Coachella Vallev.

Kearney* has published a fine account of date growing in this region. I visited the oasis of Tozeur and several other smaller oases nearby. At Tozeur about half of all the dates (400,000 trees) now grown is estimated to be Deglet Noor. Four other varieties of most importance there according to a leading Arab grower were: Bou fagousse, Ftimi, Kenteechy, and Kanta.

Most of the palm area there is planted irregularly at various distances apart and not in regular rows. Only in recent years have certain Frenchmen begun planting in regular rows and developing a system of irrigation and culture along much the same lines as that in California.

In one of these best developments by a French association of growers in the vicinity of Tozeur, 15,000 Deglet Noor palms had been planted in rows 25 feet apart. The offshoots had been brought from at least 15 different oases, those from each oasis planted in a separate block. The owner had expected to find different strains of the Deglet Noor, some of them superior to others, but when they came into bearing he could detect no differences even between those originating in widely separated oases.

Irrigation there was from deep wells and the water was run in squares about the trees. Deep, open drainage ditches between the rows were also employed to prevent salt accumulation. There were canals along the margins of the blocks of trees, fine buildings with a well furnished office and a club house and library for the employes. Parlatoria and Marlatt scale insects were present on a few trees in one corner of Two kinds of the development. maggots were said to be troublesome in the fruit, one pink in color, the other white.

older and not far from a salt marsh, vestigated and described in detail by a system of drainage ditches four to Dr. Charles Chabrolin** of Tunis. six feet deep leading into the marsh, (The very destructive Bayoud dissome of them open, others with tile, ease of Morocco, to be described latwere being used with much benefit er, had not yet appeared in Tunisia.) to the trees. Some of these drains The Khamedj is distributed in Tunis-

*Kearney, Thos. H. and date culture in Tunis. U. S. de L'inflorescence du Palmier-Dattier. leafstalk disease of date palms due Department of Agriculture Bureau Annales des Epiphyties 14:377-414, to Diplodia. Phytopathology 20:339-of Plant Industry Bulletin 92, 1906. 1928. 344, 1930.

under the younger palms. drains tended to keep the concen- in other countries of the Old World. tration of salt from getting too high Its absence in California and Arizothose with drainage and those without drains was very great in rate of would therefore , not be so likely to growth and production of fruit.

For fertilizing, animal manure, especially that of the camel, was thought to be the best, but sulphate of ammonia and calcium nitrate were also employed.

Deep wells are put down to get water for irrigation, some as deep as 90 feet, having been dug by hand before the modern use of machinery and metal pipes. The old method of digging deep wells was to line the sides with Palm trunks as the well was being dug down through the When the water began to sand. come in, digging was continued at the bottom of the water, employing Arabs who were good divers. Each Arab could stay under water for about three minutes while digging as much as possible in that time, then come up to the surface and another would take his turn, etc. By having a large number of such divers going in one after the other, taking their turns, the well was slowly deepened.

A matter of local importance is the juice of the palm used as a drink both fresh and fermented. A palm will yield several liters per day over a period of some weeks. Palms that do not bear well and become unproductive are used for obtaining juice. The leaves near the top are cut close up to the bud; the bud is cut into, but not enough to kill it, so that it will give forth juice through channels in the tissue into vessels hung below the bud. For a year or two after this treatment of the bud, no fruit is produced, but the tree recovers, leaving a pronounced and permanent ring around the trunk at the wounded portion.

Diseases in Tunisia. The most important disease of date palm in Tunisia appeared to be a disease of the inflorescence, known as Khamedj, due to a fungus Mauginiella scaet-At another development, somewhat tae Cav. This has recently been in-

Date varieties **Chabrolin, Charles. La pourriture

These Dr. Chabrolin believes it exists also tacks only the inflorescence and be brought in on offshoots to this country.

> In the Khamedj disease the inflor-escence is attacked before it comes out of the spathe. As described by Chabrolin, the first visible symptom is a spot showing on the surface of the spathe. This enlarges as the fungus spreads over a greater part of the inflorescence inside. In severe attacks the spathe does not open and the contents finally dry out. If the inflorescense gets free from the opened spathe, the brown tissues dry out. The brown tissues are covered by abundant white powder produced by the spores of the attacking fungus. Infection is thought to take place through the spathe from the exterior without injury. Dr. Klotz has found a similar effect of the black scorch fungus, Thielaviopsis paradoxa, butthe spores are black instead of white.

> Dr. Chabrolin has obtained in his experiments good control by means of powdered Bordeaux dust which was sifted in by hand between the sheath of the leaves in the region where future spathes would push up. Two applications are recommendedone after the dates are harvested, the other before flowering.

The Diplodia disease which I had previously investigated in California was found in a mild form near Tozeur, Tunisia. It was first definitely noted on some male palm leafstalks and later on leafstalks of Deglet Noor palms. On inquiry it was learned that offshoots from these same oases had been sent to the United States. I have already described this disease in Phytopathology.* The symptoms are briefly as follows: In severe cases the disease results in death of offshoots either while they are still attached to the mother palm or after they have been detached and planted out. The disease sometimes also causes a premature death of leaves in older palms.

In offshoots the disease manifests itself in two distinct types: one, in which the outside leaves die first and the younger shoots and bud remain

*Fawcett, H. S. An offshoot and

which the dying-back of the center the spot in North Africa. of offshoot or bud precedes the death of the older leaves.

In the leaves of older palms the ventral midportion of the stalks is the part most commonly affected, showing yellowish brown streaks ranning upward 6 inches to 3 or 4 feet from the base. The disease may spread laterally from one leaf base to others in close proximity. Frequently, these streaks extend upward on one of the lateral angles of the leafstalk.

The Graphiola or leaf smut referred to under "Egypt" was also common in northern Tunisia, but appeared to be absent in the dry, hot oases of southern Tunisia. It was, therefore, not of commercial importance. This same relation to atmospheric moisture, limits this disease also in other countries. In Egypt and Algeria it does not occur in the dryer oases. In California it is most in evidence near the coast, as at San Diego. It occurs not so abundantly at Yuma and the Salt River Valley, Arizona, and is absent in Coachella Valley.

Other diseases of minor importance seen in Tunisia were the Mejnoun or "fool" disease, anthracnose, and dry bone.

The Mejnoun or fool disease causes the bud of the palms to grow sidewise instead of straight upward. Only a small percentage, possibly 1 per cent, act in this way. No definite reason for this was known. The method of curing such trees was to cut off all leaves close to the trunk up to the bud, pulling away all the fiber. Usually after such treatment the bud will grow up straight and become normal. As Dr. L. J. Klotz has brought out, we think that this turning sidewise in California may be associated with an attack of the Thielaviopsis fungus, but whether this is the cause in North Africa is uncertain.

A minor disease known as anthracnose by one of the Frenchmen at Tozeur was characterized by deep reddish brown, chocolate or black spots on the leafstalks and midportion of the leaves. The spots were 1/4 to 2 inches in greatest diameter, with indefinite, irregular margins. ward from Algiers, the capital of

alive for some time; the other, in lated to Gloeosporium was found in Here we found gardens of oranges,

dry bone was also seen in Tunisia. It fruits at this first oasis were of poor was seen also in Egypt and Algeria quality for human consumption (exand is known in California. This is cept one variety with small fruit), characterized by whitish, irregular but were quite an important product blotches and streaks on the leaf- as a food for the camel and other stalks, midribs and pinnae. It also animals. This lack of quality was affects the epidermis and only a thin said to be due to the altitude of this layer of tissue. The spots, blotches oasis being too high, with insufficiand streaks are very variable in size, ent heat for the proper maturity of from 1/4 inch to several inches in most date fruits. The only disease largest diameter. With age they be- seen here was the anthracnose, precome definitely outlined and the sur- viously mentioned, producing a dark, face drys and presents a hard, irregular spot on midribs, like that smooth, white appearance suggestive seen in Tunisia and Egypt. On dead of the name dry bone given to it by specimens of leaf bases spores re-Professor Mason. Certain palms ap- sembling Thielaviopsis were found. pear to be much more susceptible The cases of Laghouat and Guardia than others. It is thought to be due were next visited in turn and here to a bacterium which is commonly I found only the anthracnose and found associated with the lesions in the Parlatoria scale on palms in each their early stages.

A fungus commonly found on stalks of old palm leaves was An- Guardia we began to get into the thostomella sp. Dr. Rene Maire real desert, with wind and dust and identified specimens from Tozeur and rough going. As we stopped to eat El Golea as Anthostomella affinis lunch, a caravan with large, white molleriana. What appears to be the graceful camels came up from the same or a similar species I have south and stopped to rest also. Befound since in Palestine, Arizona and fore leaving we were given an ex-California.

ALGERIA

into the oases where date palm cul- cause of the money earned in carryture was important; one about 1,000 ing produce and materials great diskilometers south of the city of Al- tances in a short time across the giers through the oases of Bou Saada, desert. And at another lunch time Laghouat, Guardia to El Golea; and we had inspected a set of nomadic the other south of Oran nearly the Arab tents by the roadside. Then, same distance to the Beni Ounif and while our backs were turned looking Figuig sections on the western bor- for specimens, they had gone in a der of Algeria and the eastern bor- remarkably short time. The force der of Morocco below the Atlas of Longfellow's lines was realized: Mountains.

Algiers to El Golea. On this first silently steal away." trip in Algeria, I was privileged to be invited as a foreign representa- stop south, in the evening our car tive to travel with a party of French was just behind the car carrying the delegates to the Congress of Roses governor of the province. We found and Oranges held at El Golea the the road lined with bon fires, showlatter part of February, 1930. We ing beside them groups of the blackwere about 50 in all, traveling in est of negroes in native costume, large, double-tired desert auto buses with guns in hand, making a rather and stopping at each of the import- frightful spectacles. Suddenly there ant cases along the way. This gave was a deafening roar as the guns an opportunity to observe the date were fired repeatedly in honor of the palm culture and conditions at these governor as the cars passed each various places.

Traveling inland and southeast- tives. These spots affected only a thin layer Algeria, we went first through a flat, portant. Some Deglet Noors were of tissue. These appeared to be the rolling country growing wheat as then being grown there, but the same type of spot as was seen in Al- the principal crop, but with small principal varieties for this region geria, Egypt and one garden near orchards of citrus, mostly of man-were said to be Nice in southern France, and a sim- darine oranges. Then we traveled Cheikh. ilar spot occurs in California and through the mountains and plateaus used locally were Tinnosser, Timjou-Arizona. A fungus apparently re- and came to the oasis of Bou Saada. ert, Tigaouin, Takarlouck, and Time-

mandarines and lemons in addition A minor disease which is known as to many date palms. The date palm place.

By the fourth day, on leaving hibition of the great speed of these racing camels whose owners are In Algeria two trips were taken among the richest of the Arabs be-"Fold their tents like the Arabs and

> Approaching El Golea, the farthest group along the endless line of na-

> At El Golea date palms were im-Ghars and Others not exported but

douel. Here in one part of the casis Morocco south of the Atlas Moun-gravest importance. we found date palms apparently be- tains. One of the first symptoms of spread into the other date regions ing stunted by too much salt, but the disease is a whitening of the of the world, including our Southsuch places were only where the salt leaf, usually a younger leaf near the west, with our present lack of knowlwas so concentrated that practically all other vegetation was killed. Palms were very vigorous in most parts of El Golea. At El Golea I found only minor diseases; a slight indication of large quantities of fruit die one af-Diplodia disease in a very mild form, the white, irregular spots of dry bone, and the Anthostomella fungus on brown streaks of the leafstalks. I also found one healthy palm with part of its leaves showing one side of midrib and pinnae white and the other a normal green color like the usual chimera effect. Parlatoria and Marlatt scale insects were also common there.

The Bayoud Disease. The second trip in Algeria was to the Beni Ounif and Figuig sections at the boundary line between Algeria and Morocco to see the Bayoud disease.

I left Algiers by train in company with two French pathologists, Dr. Charles Killian of the University of Algiers, Dr. Charles Chabrolin of the Agricultural School in Tunis, and an interpreter. After an all-night ride we were in the desert beyond the mountains. Within 40 or 50 miles of Figuig the train followed rocky valleys or depressions with dry stream beds, much as in the Mojave Desert. Date palms appeared to be commonly spontaneous along these dry beds in smaller or larger clumps, giving the impression that the date palm might be indigenous to this section much as is the Washingtonia in the rocky stream beds off from the Coachella Valley. Bare, purple mountains in the distance remind one distinctly of California and Arizona aspects. The Beni Ounif and Figuig sections are something like the Coachella Valley with its bare, rocky cliffs and low mountains in the distance. The soil is commonly less sandy. The elevation is 2,500 to 2,800 feet above sea level. In the seven distinct oases short distances apart there are, it is estimated, 200,000 palm trees, the fruit of which is an important part of the food for 15,000 inhabitants, mostly Arabs. The water for irrigation comes from springs in this region.

Here is where we concentrated on the investigation of the terrible Bayoud disease, the worst disease, I believe, I have even seen on any plant. It would be difficult to exaggerate its seriousness. It is destructive in at least four of the seven oases of this section as well as in a number of other sections farther west in

center of the palm. When this shows, edge regarding it, the results might it is a sign that the palm will usual- be very serious before we would ly be dead in six to twelve months. have time to find methods of dealing Palms 50 to 100 years old bearing with it. In my opinion it will be ter another and large areas are killed oughly investigate it before it gets out completely. The later symptoms here rather than afterwards. I have are faintly off-colored streaks on the been using every effort to stimulate leafstalk and midrib portions. In severe cases these streaks resemble somewhat the streaks due to Diplodia, but it is very different. The diseased leafstalks when cut into show light to dark brown discoloration of the interior tissues. One often finds a pink discoloration in the fibrous interior of the trunk. We found it difficult to trace the discoloration accurately and to arrive at a definite idea of where the disease first entered the palm. The roots in the beginning stages generally seem sound. The progress of the disease is quite often one-sided and gives the general impression of starting at or above the base on one side. We three pathologists spent considerable time cutting up and carefully examining palms in several different stages of the disease. We also made a series of isolation tests on culture media from various parts of diseased tissue. These were all left at the University of Algiers with Dr. Killian. He reported to me later by letter that he had found a certain fungus fairly generally distributed in these cultures, but it remains to be determined whether the fungus is the primary cause of the disease. Maire and Killian* have since described the fungus under the name of Cylindrophoro albedinis.

This disease is thought to have originated many years ago in parts of Morocco far below the Atlas Mountains where the native tribes are now in rebellion against the French, and in more recent years has spread to new oases. The Arabs say that these original areas have some date palms which are apparently resistant to the disease and this fact holds out the only hope for the replanting of the gardens now being killed out.

The investigation of this disease, to determine its cause and how to deal with it, appears to me to be of international interest and of the

If it should great economy and insurance to thorinterest in some kind of cooperation between certain institutions and the French authorities to get more investigation started on this disease for our own protection and the protection of date culture the world over in the future.

All other diseases of minor importance were as nothing at Figuig in comparison to the Bayoud and I almost forgot to look for them. I did find, however, a trace of Diplodia disease on leaf bases, some anthracnose spots on midribs, and some of the Anthostomella fungus on older leaf bases. Ye.

SUMMARY OF DISEASES

The Bayoud disease of unknown cause with which Maire and Killian have usually found associated a fungus, Cylindrophoro albedinis, is by far the most destructive of all date palm diseases. It occurs in Morocco south of the Atlas Mountains and has now spread over the border into western Algeria in the Beni Ounif section. Its seriousness calls for immediate investigation in which international interest should be stimulated.

The Khamedj disease of the inflorescence due to the fungus Mauginiella scaettae is known in Tunis, Algeria, Morocco, and in Italy as far north as San Remo, but has not been observed in Egypt, Arizona or California.

The Graphiola or smut disease of date palm leaves due to a smut-like fungus, Graphiola phoenicis, is widely distributed near the coast of the Mediterranean and inland where the humidity is sufficient. It is also present in most places in Southern California, except the Coachella Valley, and in a mild form in Arizona. Its absence in the dryer interior oases in Africa and its absence in the Coachella Valley is probably due to unsuitable humidity relations for its infection and development.

The Diplodia disease which was first found in the Coachella Valley in 1927 was found in oases in southern Tunisia in 1930 on Deglet Noor and other varieties, the same oases

^{*}Maire, Rene, and Charles Killian. Le Bayoud, Maladie du Dattier. Gouv. Gen. de l'Algerie Service Botanique Bul. 73, pp. 89-101, 1930.

from which offshoots had been brought to California. What appeared to be a mild form of the Diplodia disease was also seen at Bou Saada, El Golea and Figuig in Algeria, and at Fayum and Korashia of its presence were found in Tozeur mella affinis molleriana) in Algeria in Egypt.

Dry bone, the irregular white spotting of midrib and pinnae which we due to a fungus related to Gloeos- and is also present in Arizona and now think may be due to a bacterium porium is usually a minor spotting was found in nearly all the date sec- of the leaf, midrib and pinnae. It tions of North Africa. It is common was found widely distributed and season to see any diseases of the in California and Arizona.

ated with Thielaviopsis were found and California. at Fayum and Alexandria in Egypt. Specimens with Thielaviopsis - like streaks with which a fungus, Anthosspores which suggest the possibility tomella sp., is associated (Anthostoin Tunisia and Bou Saada in Algeria.

was noted in Algeria, Tunisia, and fruit.

Specimens of black scorch associ- Egypt, and has been seen in Arizona

A browning of old leafstalks in according to Dr. Maire, was found in The Anthracnose disease probably Egypt, Algeria, Tunis, and Palestine, California.

I was not in North Africa at a

Different Phases of Date Marketing

The Saturday morning session of the Date Institute was devoted to a discussion of marketing problems and the three papers on this subject that are here published furnished the foundation and basis of the general discussion on grades and methods of selling that took up this session of the Institute.

This discussion was a general asking and answering of questions in which the chairman of the meeting, Mr. Geo. D. Olds, Jr., practically all growers present, and many others that were not actual growers but inter-ested in this subject, all had their part in making the meeting a success. Perhaps the marketing problem in date growing may be broadly sum-

marized as follows: 1. The ultimate end of selling dates is to make money for the grower.

2. Dates are not sold till they are eaten.

Sales begin in the garden, for no packing house can make good fruit out of junk.

The first two grades have to carry the load of the rest. 4.

5. The packing house should be guided by the salesman's knowledge of customer requirements for it is the buyer's ideas of grades that will finally be adopted.

6. Selling all dates under one control is the ideal method but can only be achieved when some one individual, or preferably organization, can show the ability and has the capital necessary to make good and give the grower a fair return for his fruit.

Marketing in the Date Industry

By Burdette K. Marvin, Riverside, California

THE request to read a paper here skim off their apparent uncertainthis morning took me unaware ties. as I was starting for Los Angeles last Tuesday. I did not know who from what viewpoint? The foreman, would be the other speakers or what superintendent, manager or owner of they would say. I should prefer to a plant may often be seen strolling give you that to which you are en- idly about, perhaps with his hands titled, viz., a carefully considered in his pockets, a picture of leisure summary of my experiences and con- to his hard working employes. But,

How shall we consider marketing, clusions. Instead, I can only give if the said overseer is worth his metaphor, we have found our antiyou opinions in the raw, requiring place, his eyes and his mind are busy some mastication, as it were, for noting the way the work is being to protect the consumer, but one to their digesting. In a word, it will done. Give any group of workers a be for you to boil down my remarks piece of work with which they are emption of farmer organizations, and to their essential meanings, and to not familiar and it is ten to one the growing realization that other

they will do it in a needlessly slow, awkward, laborious way for all their fast movements. Dynamic thinking is more natural to us than is reflective thinking. One day I walked back to the sealing bench and saw an industrious fellow sealing shipping cases of fancy cartons. Each case he sealed and set on the floor behind him, the next on that, the next on the floor alongside. When I got there I had to laugh; for he had surrounded himself with stacks of cases and could hardly jump out. In loading trays, cars, etc., workers think nothing of taking a few steps; and to make time, they step quickly. But an overseer who has in mind the result of the day's labor usually can move the car or only turn it around, yet eliminate the walking. He has greatly speeded loading without speeding the worker; rather, the reverse. He has done this because of his viewpoint to look at the far result, not the immediate. And this viewpoint must be ours, if we are to consider date marketing as a big business. The individual grower may reach for the nearest, easiest dollar; but the sales organization must consider the result of these many individual acts. If the workers in the packing house will not heed the foreman, one means of cutting unit labor cost is lost; and, so, if individual growers will not cooperate with sound sales principles, one means of bettering packing house returns will be lost.

As a nation we are still not decided whether competition is the life or the death of trade. Fifty years ago we thought only of consumerprotection, because consumers were as a flock of sheep preyed upon by wolves. Today, it is a different picture-Daniel in the lions' den, and not enough to go 'round. Dropping trust legislation not merely an act starve the producer. Hence, the exproducers need consideration. The zation which should determine prices, they compare with auction prices. record of the raisin growers and the packs and grades, but practical dif- In other words, the auction market record-in-the-making of oil produc- ficulties have blocked that movement functions as an exchange, the stock ers are warnings too plain for even at the start. I see no use in trying exchanges, the grain pits, produce veteran trust-busters to ignore. We to revive it. There are too many exchange, etc., to establish prices. should not ignore them. I think kinds and qualities of dates, and too Upon these prices great transactions that we may properly, and without many packers large and small, to are based. They govern business in danger of legal interference, con- make of probable success a dictated their lines over all the country. sider the stabilization of our mar- standard. The practical difficulties They do more, many of them; for keting. How are we to do it?

There are various factors which may aid in stabilization, and one is kind, if I taxed your attention this mine the pricing of brands. In a quality of production. This is en- warm afternoon with a repetition of word, they provide a standard for tirely a grower problem. Entirely? marketing troubles, but without one determining the sale of the coun-Well, nearly. Besides thought and least suggestion how to meet them. try's production. But, in dates, what labor, a date crop needs money; and The suggestion I have to offer I have sales standards have we? Are there the packing house has a responsibil- considered from time to time for sev- not too many grades of price and ity there. But grower-offerings of eral years; but I have not given it pack to say that we have any standunreasonable proportions of unde- the study it may deserve; and, so, I ards? sirable dates can only raise packing offer it with due reluctance. As I house costs and selling problems. It said at the outset, you are entitled date auction. We may have too is just one more vicious circle; but, to carefully considered conclusions, small production, although I don't in this case, the egg (that is, the rather than a suggestion dug up be- think so; and it might be that not date) came first. It is a grower's cause I must say something. problem.

Another pricing, and that presupposes stand- years ago I was engaged in over- innocents. But such a slaughter ardized grading and packing. Noth- sight of a citrus property, groves might prove to be really cheap ading would so steady demand, I think, and packing house. As the house vertising. In a reasonable time, as such standardization. Steady de- was a member of the California with offerings fairly controlled, buymand, an even flow of merchandise Fruit Growers Exchance, I became ers would set their own values on in accustomed channels is the ideal versed in Exchange operation. In each variety, grade and pack,-yes, of the merchandiser. To illustrate selling, Exchange fruit is sent to and on each House brand, just as in from my annual experience: We auction and private sale markets; citrus. What other influence would have been supplying a grocer in our and the sales managers get bids from so constrain us to make standardized town with a date that he sold in private markets and compare with offerings of our dates as the day by fair volume and at a satisfactory auction prices. Did you note that--- day price-judgment of the trade? profit. It was dependable business, mutually satisfactory. When he wanted more he had only to give us a ring to get the same goods. But each year he comes down here, or some grower on the way home steps in and offers him a "bargain." He buys and, maybe, sells, maybe, not. If he sells, he cannot repeat, and he has interfered with his customer demand for the date he was carrying. It is a fact that each year he has or sold at a loss to close out. He importations in quantity of Old of the past season or two with every reached for the nearest dollar, the World date offshoots 17 or 18 years prospect of material gains in the imas what we pay growers must de- ing the first decade or so of its velop on a basis that will be profitpend upon our sales, the growers growth, in attempting to root early able to growers readjustments of of the industry. I consider it the years. business duty of men in position to know, to tell the growers frankly that normally might have occurred mainly to the solving of cultural the result of their many individual five or six years ago, had early difficulties the date industry now acts. Standardized grading, packing plantings been more successful, pro- finds itself on the point of adding and pricing will eliminate among duction was held at such a compara- a brand new member to its already buyers the shopping disposition with tively low level during the inter- numerous family of problems-Marits resultant irregularity. But how mediate years that American grown keting-bringing with it also some obtain this threefold standard? The dates failed to quite pass out of the little brothers and sisters, one of answer we have had in the past was novelty class to be sold rather too which has quite a long name and is

remain.

factor is standardized entry into the date business a dozen it might be a real slaughter of the

they establish grades of wheat, corn, It would be gratituous, even un- produce; and, in citrus, even deter-

It may not be timely to consider a enough packers would patronize it. For a number of years before my Moreover, for the first week or two

Grades in Date Marketing

By T. J. Gridley, Thermal, California

WHILE commercial date growing at far higher prices than actual in the Southwest may be said to values might perhaps justify. stocked dates that were slow movers, have had its inception with the first The sharp increase in production immediate, not the far result. Our ago the extremely severe losses that mediate future indicates quite clearbusiness has been interrupted; and, were suffered by the industry dur-ly that if the date industry is to deultimately are affected. The grower cuts of domestic offshoots, had a present selling methods are in order who reaches for the nearest dollar very material effect on the rate of and better distribution facilities must may be working against the welfare increase in fruit production in later soon be provided.

Instead of the healthy increase devoted the early years of its growth a movement for one selling organi- easily to an interested public often called The Development of Packing

Thus it appears that after having

Dates Under Quantity Production.

tions to the family of date; growers' our path all along and which we pet worries seem to have enormously have all very quietly and carefully healthy appetites and the task of stepped around in the hope that it curbing and bringing them under might never become uncomfortably such control that they may not de- large. I am referring to the matter velop to undue proportions and cast of the establishment of commercial the clouds of doubt, distrust and dis- grades for dates. I am not recomhay over the industry is one that mending the setting up of grades for calls for all possible tact, patience dates at this time but I would like and clear thinking at our command. to present the subject this morning

packing and marketing of American it will be possible to establish grades grown dates on a profitable basis for dates. There are undoubtedly will, in the final analysis, be accom- many difficulties in the way. The plished by one or more co-operative numerous varieties grown, diversity organizations, by private companies, of soil and location, care of palms, by individuals or groups of indi- affecting quality and time of maturividuals or by agencies as yet un- ty, variability of seasonal weather thought of, is a question to which conditions, variation of fruit on inprobably time alone can find the dividual clusters, differences at prescorrect answer.

ther along the road leading toward ors that must be reckoned with.

House Methods to Properly Handle the solution of our difficulties I would like to speak of something These latest star boarder acquisi- that has been growing right up in Whether or not the successful for discussion. I do not know that ent that exist in processing and Before we proceed very much far- packing methods: these are all fact-

Date Sales from Growers Standpoint

By Bryan Haywood, Indio, California

date sales from the grower's less. standpoint, the idea being to bring out something of benefit to him.

I have been twice a member of the Deglet Noor Date Growers Association, once a member of the Date Corporation of America, and am now, temporarily I hope, packing and selling my own fruit.

In all three concerns my chief interest has been in the sales end, so have had a rather wide experience in the selling of our dates.

The net result of this experience leads me to believe that the less the grower has to do with the selling of his product, the better.

Marketing anything, in these days of fierce competition is necessarily a highly specialized operation, and is taking a lifetime effort of the best business brains in the country.

The individual grower has no such which hit them very hard.

HAVE been asked to speak on experience, and by himself, is help-

By far the greater part of our national farm production is in the worst condition it has been since the beginning of agriculture.

All the highlights of successful marketing of farm products today, are the result of co-operative effort among the producers, and our national failure of fair sales returns to the producer is due to the lack. of such co-operation, both in restriction of production and marketing.

The most impressive example of successful co-operative marketing I have ever seen was the work of the privately controlled, in which event California Walnut Growers Association in 1921 or 1922.

They had an extra heavy crop, and the wholesale grocery trade, this time by the Deglet Noor Date which was their sales outlet, were in Growers Association along these a bad way financially through the lines, which is certainly a step in tremendous post-war slump in sugar, the right direction, and I most ear-

It was also a time of retrenchingno one knew what he could sell, and all prices were falling-everyone in all lines of trade buying from hand to mouth.

Under these conditions, the wholesale trade were not in shape to place advance car lot orders, as usual, and especially for such a luxury as walnuts.

The Walnut Association didn't ask them to; instead they financed themselves, the warehousing of their crop in all the large cities of the country, and said to their wholesale customers, "There they are, help yourselves from day to day as you can sell them -the price is ____cents per pound."

The result was that they sold their entire crop and at their own price.

Had they tried to force sales to their trade along usual lines, they would have met great sales resistance, and certainly realized a much lower price.

Our date production is so limited in location, area and tonnage, that our sales problem is a joke compared to almost any other product of the soil, and yet here we are treading the same old paths of individual effort that have invariably led to disaster in every soil product in the past.

We have four different wholesale sales departments working on a national scale, each duplicating the effort and expense of the others, and what is even worse, with no consistent plan of marketing our dates.

I am convinced that the future will see one sales office and only one, selling the entire output of American grown dates.

Given Standardization of pack, it will make little difference how many packing plants there are, but it is absolutely essential that there be but one sales office-and it will come as surely as the sun rises.

If we growers have sense enough, it will be grower controlled; if not, we growers will take less for our dates.

A strong effort is being made at nestly hope it will succeed.