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The Agricultural and Mechanical College  
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EXTENSION SERVICE

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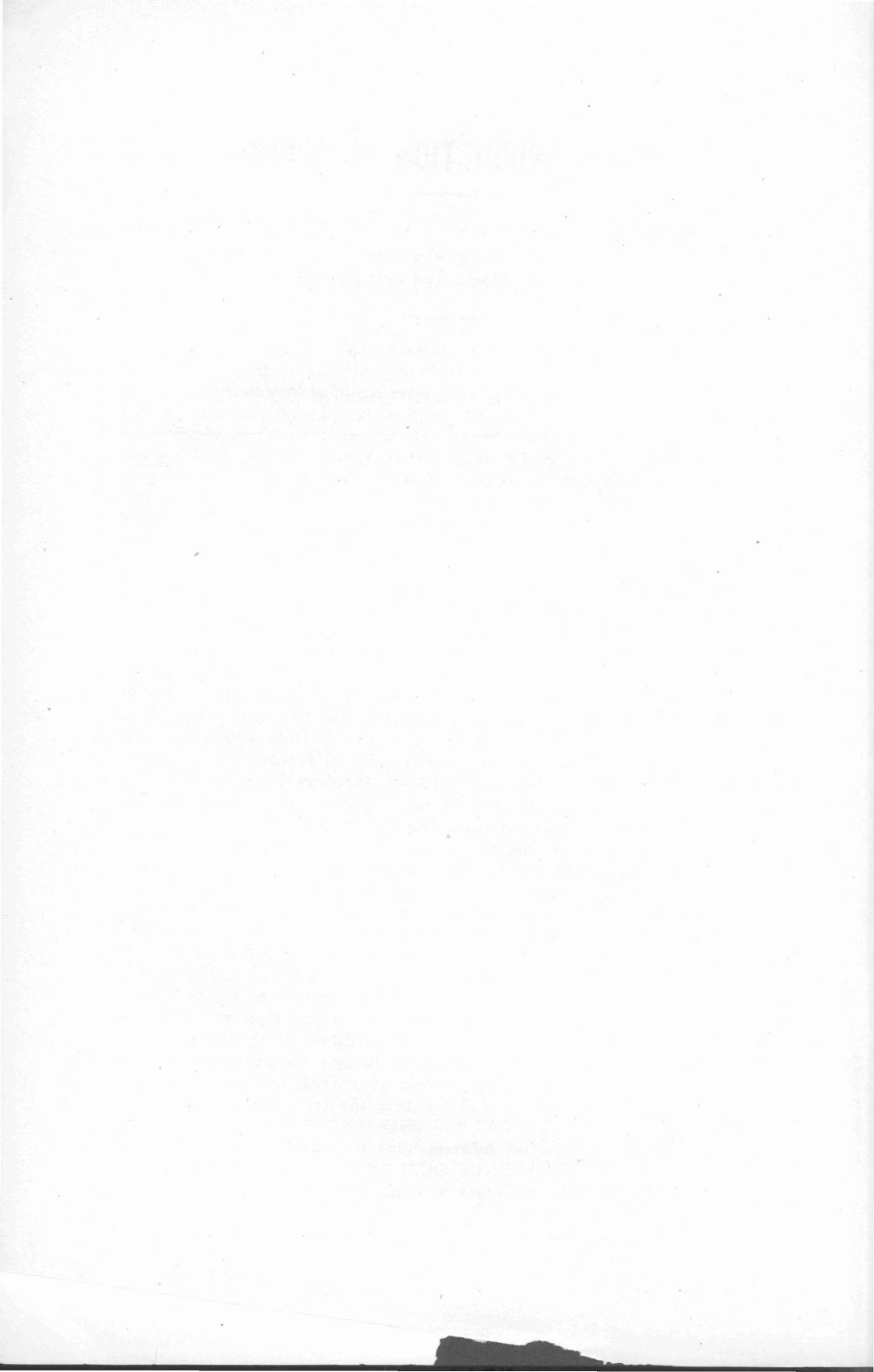
PEACH PRODUCTION  
IN TEXAS



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# PEACH PRODUCTION IN TEXAS

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According to the last United States census, Texas ranked second among the states in the number of bearing peach trees, having 9,737,000 trees. A majority of these trees were growing in a few districts; 10 per cent were located in a single county, and more than 50 per cent in half a dozen counties of Northeast Texas. Of the 417,770 farms reported in the state in 1910, only 108,959, or 25 per cent, reported any peach trees.

A lack of knowledge of peach culture is believed to be responsible for this uneven distribution of orchards. To meet this situation this bulletin has been prepared. It is not designed to cover all phases of peach culture in detail, but rather to offer in condensed form some of the more important facts to be considered in growing this fruit.

**Selection of Site:** Orchard land should be properly drained, for trees will not stand wet feet. Not only must water drainage be considered, but air drainage also. A high, or at least a rolling plot of land is better than a perfectly level one. If there is a prevailing wind, or frequent high winds, it is well, if possible, to select a place that is shielded by some kind of windbreak, but do not plant in what is known as a protected pocket, for in most cases it will prove to be a frost pocket. The better way is to select a sloping hillside where the cold air can drain off. The exposure makes little difference in this state, but if everything else is equal, a northern exposure is preferable to a southern, as the buds will probably be later coming out in the spring and there will be less danger of their being killed by late frost.

**Soil:** Peach trees do best on a deep sandy loam, but will succeed on practically any fairly fertile, well drained land. A soil with somewhat porous sub-soil is much better than stiff, impervious clay. It is a good plan to precede the orchard with a cultivated crop and a root crop is preferable, as it loosens the soil deeper than any other. The land should be broken deeply in the fall and if the planting is not to be done until spring, the soil can be advantageously left rough during the winter. This will allow the action of frost and will also enable the rough land to absorb and hold the winter rains and snows. Before planting, however, the soil should be worked down into good condition as though a garden crop were to be planted. It is much easier to give the ground this preparation before the trees are planted than afterward, and it pays to get the land into the very best condition before the trees are planted.

**Varieties:** Figure 14 shows the state divided into fruit districts. Following is a list of varieties recommended for each district. The map

was prepared by G. H. Blackmon, formerly Assistant Professor of Horticulture, A. and M. College of Texas. With a few changes, the list of varieties are as recommended by Professor Blackmon:

**DISTRICT I. (A)**

Greensboro, Mamie Ross, Elberta, Minnie Stanford, Indian Cling, Henrietta.

**DISTRICT I. (B)**

Greensboro, Carmen, Pallas, Minnie Stanford, Early Crawford, White English.

**DISTRICT II. (A)**

Mayflower, Alexander, Arp Beauty, Early Wheeler, Mamie Ross, Early Crawford, Yellow Swan, Slappy, Minnie Stanford, Elberta, Augbert, Indian Cling, White English, Henrietta.

**DISTRICT II. (B)**

Greensboro, Arp Beauty, Mamie Ross, Minnie Stanford, Elberta, Chinese Cling, Family Favorite, Salway, Henrietta.

**DISTRICT III. (A)**

Greensboro, M. Ross, Ea. Crawford, Chinese Cling, Elberta, Minnie Stanford, Indian Cling, Salway, Henrietta or Heath Cling.

**DISTRICT III. (B)**—Recommendations for this division are the same as those for Division A of District III.

**DISTRICT IV. (A)**

Maybower, Mamie Ross, Minnie Stanford, Elberta, Early Crawford, Salway, Heath Cling.

**DISTRICT IV. (B)**—Recommendations for this division are the same as for Division A of District IV.



Fig. 1 Digging hole in such way that locating stake will be in center of hole.  
Original.



Fig. 2 "Sighting in" by rows of stakes.  
Original.

**Selection of Stock:** As a general rule it is advisable to buy home grown stock. Northern stock may do well, but the home nurseryman is better acquainted with local conditions and can give valuable suggestions as to varieties. Also, if anything proves unsatisfactory, he is near at hand so that the matter can be adjusted. Above all, responsible nurserymen should be patronized. While there are some tree agents that represent reliable nurseries, there are a number of itinerant fruit-tree peddlers that are not responsible. It is much more satisfactory to deal directly with some reliable nursery, where you are sure to get trees true to name, for nothing is more exasperating than to incur heavy expense and spend years in bringing an orchard to maturity and then not have the varieties that were supposed to have been planted. Select one-year-old, well-matured trees of from 3 to 5 feet in height. However, the height should not be given as much attention as the diameter of the tree. A good, stocky tree, with a well developed root system is what is wanted. Before planting the trees should be examined carefully to see that they are free from insects, such as wooly aphid and San Jose scale, and diseases such as crown gall, or hairy root. Crown gall is a warty growth that is found on both the crown and roots of trees and for which there is no proven remedy. (Fig. 21.) Prevention is the only safe plan. See that the stock planted is free from this disease. Budded trees are better in this state than grafted ones, as they are not so likely to be affected with crown gall.

Orders for nursery stock should be placed early. Nurseries fill orders in the order in which they are received, so those who buy early get a better selection and, also, the trees are on hand and ready to plant when the ground is in condition.

When trees are received from the nursery, they should be unpacked and heeled in a trench, care being taken that the dirt is worked well around the roots so that they will not dry out. Often the very best stock is received from the nursery in good condition and when heeled out the dirt is not properly packed around the roots and they dry out. The trees, of course, fail to grow and the nursery receives the blame. It is a good plan when heeling nursery stock, if it is to stand for a considerable length of time, to soak the soil well with water in order to pack the dirt firmly around the roots.

**Time and Methods of Planting:** Better results are usually obtained from fall planting, but if the soil is not in condition in the fall, or if something prevents planting at that time, very good results can be obtained by planting early in the spring, although the later trees are planted the more care must be exercised in the operation of plant-

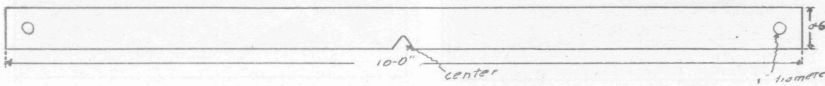


Fig. 3. Planting board. Useful in placing trees in exact position located by stakes. Original.

ing. The ground is generally in good condition in the fall and the farmer has more time for such work, while the spring is a busy season on the farm, and often the planting of an orchard is neglected or omitted entirely.

A proper distance to plant, in most parts of the state, is 25 feet apart, square. While a few more trees may be planted on an acre by the hexagonal method, they are more difficult to cultivate and it is more trouble to lay off the land.

Peaches may be planted as close as 20 feet in rich soil, where there is an abundance of moisture. Where moisture is limited they may have to be spaced 30 to 35 feet apart.

The land should be carefully staked off, placing a stake where each tree is to stand, care being taken that the rows are straight. No more fruit will be produced in straight rows, but the orchard will present a much better appearance and the chances are that the trees will receive better care than if the rows are crooked. The holes should be dug as the trees are planted, so the soil will not dry out. (Figure 1.)

**Planting:** After the hole is dug, the tree may be either "sighted in" (Figure 2) by the row of stakes or a planting board may be used. This is a piece of 1x6 board, ten feet long with a one-inch hole in each end and a notch cut in one side of the board five feet from either end (Figure 3). In using this board, the notch is placed over the stake, pins driven into the ground through the holes in each end of the board and the board lifted off of one of the pins and swung around on the other. The hole is then dug and the board swung back and put on the pin again and the tree slipped in the notch where the stake formerly stood. In this way the tree is put in exactly the same place the stake stood



Fig. 4 Working soil well around roots and crown of trees Original.



Fig. 5 Packing soil tightly by tamping. Original.

and if the land was first properly staked off, the trees will be in perfect alignment.

The holes should be dug about two feet deep and about three feet in diameter, and should be partially filled with rich top soil before the tree is planted. If the sub-soil is very tough, it is well to dig the hole three feet deep and four feet in diameter and partially fill it with rich top soil. The best results are obtained where two men work together, both digging the hole (Fig. 1), and then one throwing in the dirt while the other packs it firmly around the roots of the tree. After the hole is filled to within a few inches of the top, both men finish filling. (Figure 6)

The roots should be pruned back to about eight to twelve inches in length, cutting back to sound wood any that are broken or diseased, and if any are found infected with crown gall, the tree should be rejected and burned. Care must be taken to pack the soil firmly around the roots and if there is a heavy root system it will probably be necessary to do this with the fingers. (Figure No. 4.) Use only top soil in filling, as it is much more fertile than sub-soil taken out of the bottom of the hole. After the dirt has been worked firmly under the crown with the fingers, the roots may be covered with soil and packed down tightly with the feet, one man throwing in the dirt, while the other tramps it down, at the same time holding the tree to keep it in alignment. (Figure 5.) When planted, the tree should stand from one to two inches deeper than it stood in the nursery row, and the top of the soil should be left loose so that it will not pack and dry out.



Fig. 6 Leave top soil loose so that it will not crust and dry out. Original.



Fig. 7 Heading the tree knee high. Original.

## PRUNING.

Some of the objects of pruning are:

First: To establish a balance between the roots and top of the newly planted tree.

Second: To form a low, open top. This type of tree is easier to prune and spray. It is also easier to harvest fruit from such a tree.

Third: To force new wood, as the fruit of the peach is produced only on year-old wood.

Fourth: To thin the fruit.

In order to do good work in pruning it is necessary to have the proper tools. A pair of good hand shears, a pair of long-handled shears for lopping off large branches and a pruning saw should be provided. Several different types of saws and pruning shears are shown in Fig. 8. The two saws shown at the top of the figure are the saws that are most commonly used in this state; the one shown between the handles of the long handled pruners is the type that is generally used in California. This is a little more expensive than the other type, but is also more satisfactory, although the crescent shaped saws do very good work.

It is poor economy to purchase cheap, light tools. Whatever type is selected, it is very important that they be kept sharp. Good work cannot be done with dull tools.

### MAKING THE CUT.

The cut should be made just above the limb or just above a bud. A long stub should never be left, as it will die down to the next branch or bud, and leave an ideal place for rot fungi to enter. Branches should be cut off close, making the cut parallel to the portion left. Such a wound will readily heal over, while, if cut to a stub it will probably never heal. If a branch more than one and one-half inches in diameter is removed it is best to paint the cut surface with white lead and pure linseed oil.

If it is desired to spread the tree, cut to an outside bud. If the branches are inclined to be straggling and it is desired to make the tree grow more upright, cut to an inside bud.

**Time of Pruning:** Newly planted trees are usually headed as soon as set. Other trees may be pruned in Texas any time they are dormant—that is, after the leaves have fallen and before growth starts in the spring. If there are only a few trees to be pruned, the best time to prune them is just before growth starts in the spring. However, if a large orchard has to be pruned it cannot be left this late, for the chances are that it will not be pruned.



**Heading the Young Tree:** As the young tree comes from the nursery it has lost a large part of its root system in digging. The top must be cut back to establish a balance. If it is only a whip, as are most one-year-old trees, it should be cut off about 18 to 20 inches above the ground, or for convenience, knee high. (Figure 7.) Where there is a prevailing wind, care should be taken that the second bud from the top is toward the prevailing wind. This should be done so that there will be at least one branch forced out against the wind. Growers are often advised to prune so that the top bud is toward the wind, but experience has shown that the top bud simply turns up and prolongs the trunk and defeats the plan. Better results are obtained by having the second bud from the top toward the wind and the top limb can be cut out later if desired.

The only other pruning necessary the first season will be to keep the buds rubbed off the lower six inches of the trunk, letting all the others grow to protect the trunk from sun-scald and to provide branches from which the permanent frame work will be selected the next season.

**Second Year Pruning:** All but three to five of the best limbs, well arranged around the trunk, should be removed and those that are left to form the main scaffold limbs should be shortened back to about six or eight inches. In selecting branches for the main framework choose limbs that are well distributed around the trunk from the top to within a few inches of the ground. If all come out at top of the trunk, or directly opposite each other, a weak crotch that is easily split may result.

With the exception of keeping all other buds rubbed off the trunk, this is all the pruning that will be required the second year.

#### PRUNING AFTER SECOND YEAR.

The limbs left for the permanent framework will throw out numerous side branches. From two to four of these should be selected on each of the main limbs and the others removed. Cut these back to from sixteen to twenty-four inches in length, removing from one-third to one-half of their growth. If surplus limbs have been thrown out from the trunk these should be removed.

The second, and following years, the tree will not require such severe pruning, but the branches should be thinned out and cut back, forming a well balanced, low, open head. Peach trees should have an annual

pruning, however. Usually the branches should be shortened back from one-third to one-half of the current season's growth. (Fig. 9-10). Peach trees bear their fruit only on one-year-old wood, hence they must be pruned more heavily than most trees after they come into bearing. By judicious pruning, much of the labor of thinning can be avoided.

**Renewal of Tops:** If a peach tree has been improperly pruned in its earlier years, or if pruning has been neglected entirely it is often necessary to renew the top, for in such cases the fruiting wood is often in the top of the tree and at the end of the branches. (Figure 11.) The inclination is to leave this top and take off the lower limbs. This is a serious mistake, for if followed up the tree gets higher and higher, until it is out of reach of the picker and most of the limbs are bare of fruit.

If the trunk of such a tree is healthy it may be renewed by dehorning. (Figure 12.) Such a tree after a season's growth is shown in Figure 13. This tree should be thinned out and the branches cut back, much as with a young tree. It should bear a crop of fruit the following season.

If trees are properly pruned when young and given an annual pruning, it is rarely necessary to dehorn them, but even an old tree, if not decayed, can often be brought back into bearing by proper pruning, coupled with good care in other respects.



Fig. 8 Pruning tools. Saws at top good; center below, better but more expensive. Poor tools are costly investments. Original.

### THINNING.

One of the reasons trees fail to bear regularly is because they are allowed to overbear. All the food and vitality of the trees are used up in trying to mature a very large crop of fruit. The result is the fruit buds for next year are not well nourished and are easily killed by any unfavorable conditions.

When a tree has set more fruit than it should bear, a portion should be taken off. If it is properly thinned not only will there be as many bushels of fruit as if all were left, but the peaches will be larger, more highly colored and sell at a higher price.

Peaches should be thinned as soon as danger of frost is past. Be sure to thin before the seeds become hard. It is the formation of seed and not the flesh of the peach (which is nearly all water) that takes the vitality of the tree. Leave the little peaches 6 to 8 inches apart on the limbs and, of course, leave the most perfect specimens. This is a good opportunity to harvest the culls.

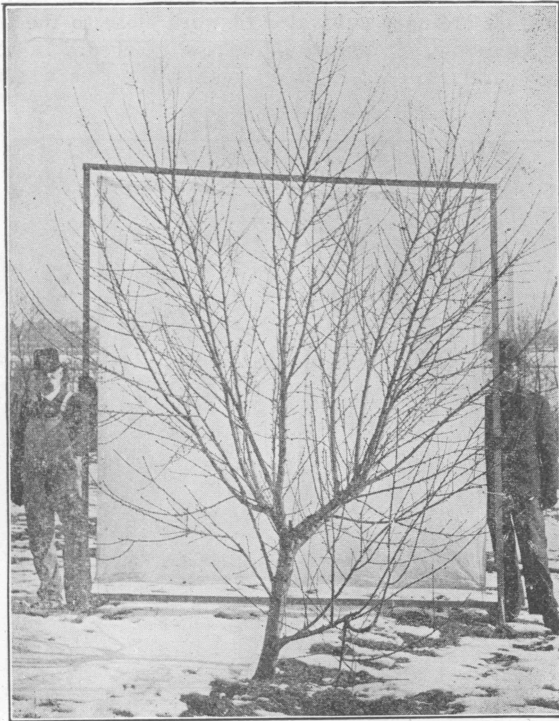


Fig. 9 Eight year o'd peach tree before pruning. Headed too high and branches coming out too close together make a weak crotch. Farmers Bul. No. 632.

## CULTIVATION.

It is very necessary that the orchard should receive good cultivation, if the best results are to be obtained. Clean cultivation during the growing season is the ideal method to be practiced. This will conserve all the moisture and take no plant food away from the young trees. However, if the soil is very fertile or if fertilizers are to be used, it will do little if any, harm to cultivate the orchard in some low growing crop for the first few years of its life.

### CULTIVATING YOUNG ORCHARDS.

**Clean Cultivation:** Cultivation should begin in the spring just as soon as the ground is in condition to work. If the soil has been ploughed and properly prepared it will not be necessary to break the ground again in the spring. It should, however, be kept cleanly cultivated throughout the growing season.

A soil mulch should be preserved throughout the season to prevent evaporation of the water already in the land, and a peg tooth harrow, or an Acme, is good for this purpose. If the orchard is very large, it is advisable to use an ordinary cultivator to work close to the trees, simply straddling the tree row, as one would a row of corn. In this way the soil can be thoroughly worked right up against the tree without injuring

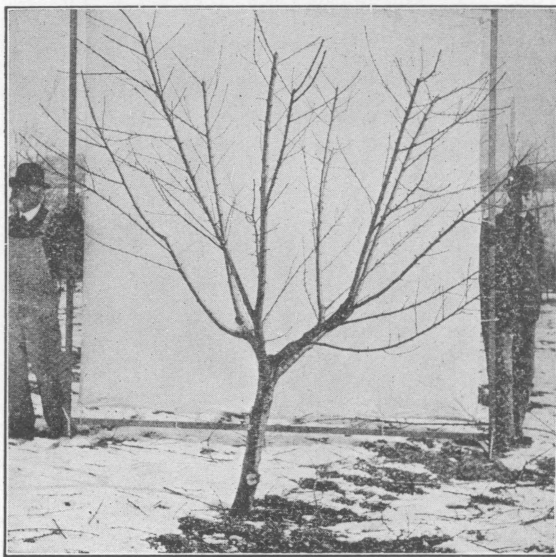


Fig. 10 Tree shown in figure 9 after being pruned. Owing to the lack of systematic annual pruning there is little fruiting wood low down on the main branches. Farmers Bulletin No. 632.

it. It would perhaps not be advisable to purchase a cultivator for this purpose alone, but if one is already on the farm it should be used.

Great care should be exercised at all times, not to injure the trees in cultivating. In the use of ordinary farm tools such as harrows, discs, peg tooth, etc., care should be taken that they are not driven too close to the trees and it will probably be necessary to do some hand work close up against the tree to prevent injury. However, this is less expensive than many would suppose and should not cost more than 75 cents an acre per season.

To keep the trees in good growing condition, cultivation should be continued until about September 1st. At the last cultivation, a cover crop of bur clover, winter oats or rye should be sown. This will protect the soil in winter and furnish green material to be turned under in the spring.

**Inter-cropping:** If the soil is very fertile a crop may be grown between the tree-rows for the first few years. The best crops to grow

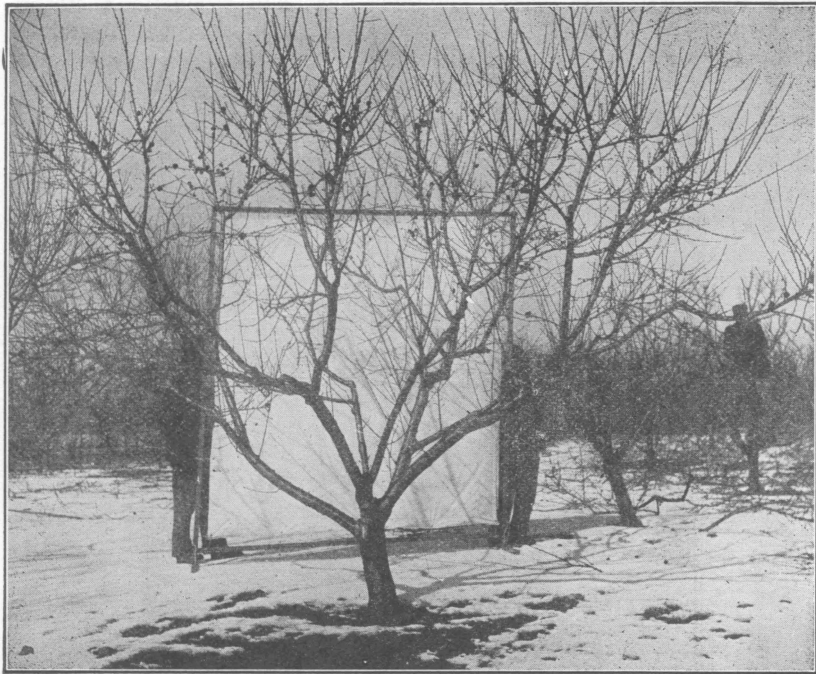


Fig. 11 Eight year tree improperly pruned. Fruiting wood is in the top and on the ends of limbs. Difficult to spray or harvest fruit. Farmers Bul. No. 632

are any of the ordinary garden crops or such crops as sweet potatoes, cowpeas, Irish potatoes or peanuts.

Cotton or corn should never be planted in the orchard. Only low-growing crops that require intensive cultivation are advisable, and these should not be planted closer than three or four feet on either side of the tree-row. The space immediately around the tree should be given clean cultivation at all times. Either clean cultivation or inter-cropping should be followed by a cover crop in the fall.

**Fertilization:** If a few handfuls of nitrate of soda or cotton seed meal are applied to the tree in the early spring it should make twice the growth it would make if this fertilizer was not used. Both of these fertilizers are very rich in nitrogen and will stimulate a heavy wood growth. Nitrate of soda is readily available to the plant and should be lightly worked into the top soil after the tree has started growth. Cotton-seed meal is not so readily available and should be applied about the time the buds begin to swell, and be worked more deeply into the soil. It is a good plan to mix a few handfuls of cotton seed meal with the soil when planting the tree.

It is desirable in the first few years of any tree's life to secure a heavy wood growth and to develop a strong, healthy framework for the future tree. For this reason, anything that will stimulate a strong, healthy growth, such as good cultivation and fertilization, should be employed.

#### CULTIVATING THE BEARING ORCHARD.

**Clean Cultivation:** As a general rule, after the orchard comes into bearing the trees require all the food material in the soil and it is



Fig. 12. Proper way to prune or dehorn tree shown in figure 11. Farmers Bul. No, 632,

not advisable to grow any crops between the tree-rows, especially crops that will be harvested.

As soon as the land is in condition to work in the spring, it should be broken. If the orchard has received good cultivation in the past, and the land has been regularly broken every spring, it can be plowed fairly deep, but if it has not received this cultivation, or if the cultivation in previous years has been very shallow, roots will have been formed very close to the surface, and deep ploughing may seriously injure them.

In breaking the orchard, it is advisable to throw the dirt toward the trees one year, and plough it in the opposite direction the next year, throwing the dirt from the trees, reversing the method the third year and so on. As soon as the ground is broken it should be thoroughly disced or worked down with a spring tooth or peg tooth harrow and well cultivated throughout the growing season.



Fig. 13 Showing tree shown in figures 11 and 12 during its second season's growth after being dehorned. This new growth should be thinned out and cut back as on a young tree. Farmers Bulletin No. 632.

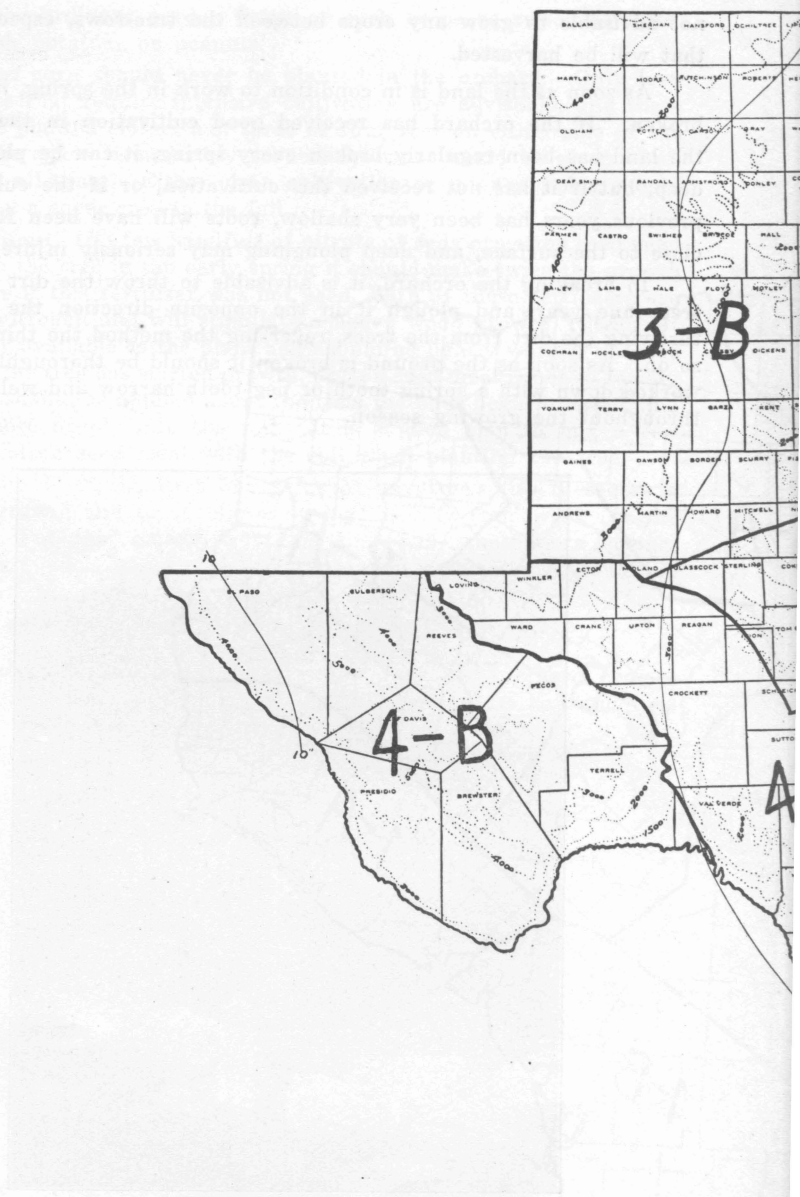


FIGURE 14. MAP SHOWING FRUIT DISTRICTS OF TEXAS.





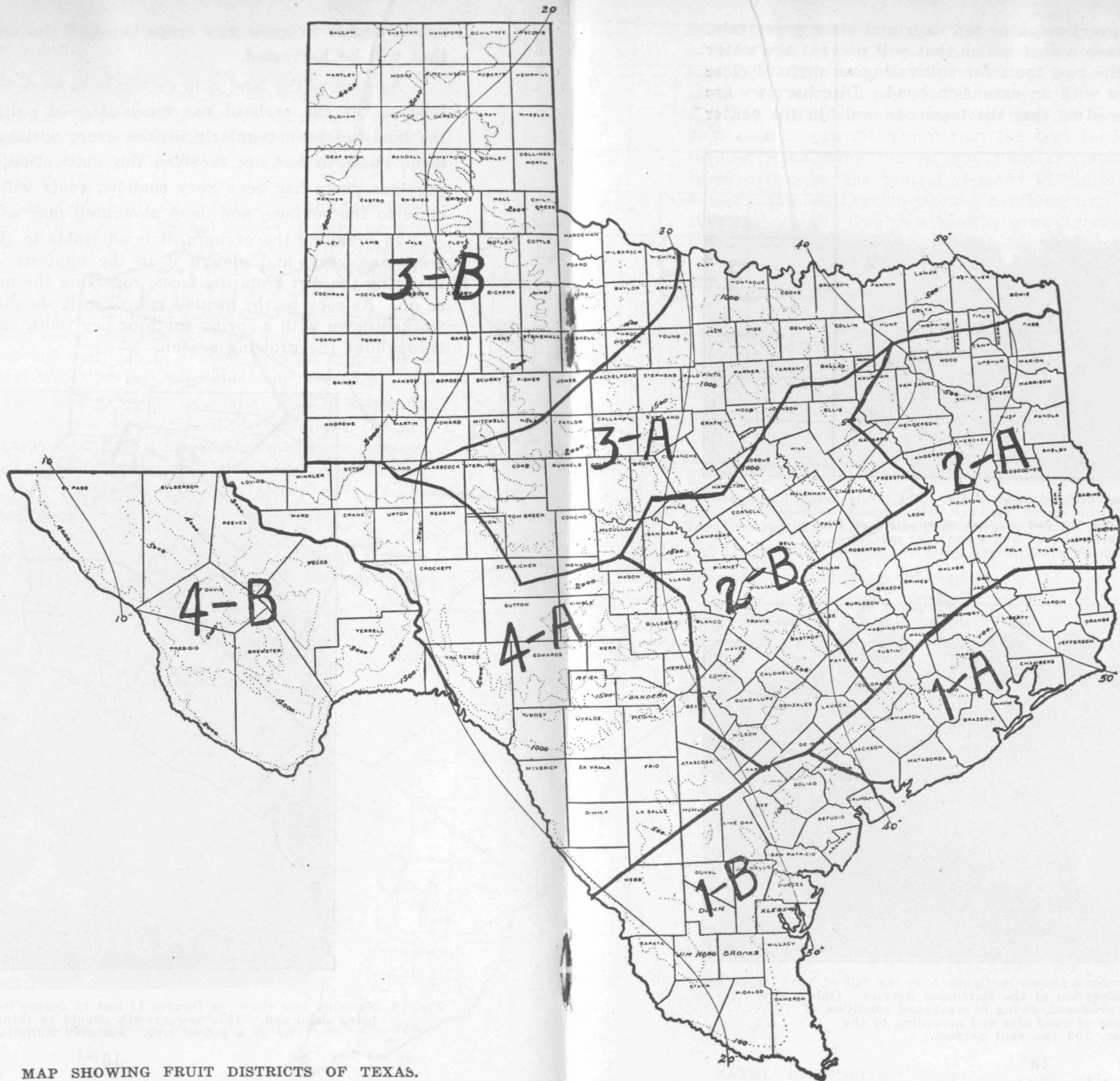


FIGURE 14. MAP SHOWING FRUIT DISTRICTS OF TEXAS.

It should be cultivated every week or ten days and after every rain. The idea is, at all times to keep a dust mulch that will prevent the water from evaporating. One of the best tools for cultivating an orchard close to the trees is a disc harrow with an extension head. Disc harrows are made with wide extension head so that the team can walk in the center



Fig. A. Portion of C. M. Jennings' orchard uncared for. The entire orchard presented about this appearance in the spring of 1916, having been entirely neglected for two years. A few peaches were produced that year, but all were too small and wormy for market.



Fig. B. A portion of the same orchard shown in figure A in the fall of 1916, cared for under the supervision and direction of the Extension Service. Only a few bushels of fruit were produced, owing to weakened condition of trees, but this was of good size and according to the owner, 100 per cent perfect.

of the tree row and the disc will work well under the trees, and on many of these the discs are protected by a shield so that they do not injure branches. However, if this implement is not available, very good work can be done with a peg tooth harrow.

The ground immediately adjoining the trunk of the tree, should be kept cleanly cultivated, not that the tree feeds close to the trunk (the feeding roots being further out), but this clean cultivation next to the trunk assists in the control of many of the orchard pests, especially the borer. This cultivation should continue until about September 1st to 15th to keep the tree in a healthy growing condition during the summer months, so that it will make large, healthy buds for the next season.

It is necessary for the tree to be well supplied with food and moisture during the growing season. Otherwise, if it is called on to mature a crop of fruit, the chances are that very few buds will be set for the next year, and the ones that are set will be small, poorly nourished, weak buds that will be easily winter-killed. On the other hand, if the orchard is cleanly cultivated in the summer and the trees kept in a healthy, growing condition, not only can a crop of fruit be matured, but healthy buds will be set for the next crop.

At the last cultivation, a crop of bur-clover, winter oats or rye should be sown. This will protect the soil during the winter months and furnish green manure to be turned under in the spring.

**Inter-Cropping:** While as a rule inter-cropping is not recommended for bearing orchards, there are some crops that can be grown that may not injure the orchard, if they are not harvested. Corn or cotton should never be planted in an orchard.

One of the most successful methods is to plant four or five rows of peas or peanuts in the center of the tree-row, cultivating them throughout the season and giving the land next to the trees clean cultivation.

The peas or peanuts should not be harvested or removed from the land, but they might be made a very profitable hog crop. In this way enough hog feed would be produced to pay for the cultivation and at the same time practically all of the fertility will be left in the soil in the form of manure.

### HARVESTING AND PACKING.

The subject of harvesting and packing peaches is covered in Extension Service Bulletin B-22. A copy may be obtained by addressing a request to the Director of Extension, College Station, Texas.

## PESTS OF THE PEACH AND THEIR CONTROL

It is not the purpose of this bulletin to go into details but merely to give briefly a few economic facts that will enable the grower to understand some of the problems in the control of peach pests.

### PEACH TREE BORER.

The peach tree borer is one of the most common pests in this state, and is one of the most difficult to control. It is found in all sections of the state where peaches are grown.

**Life History:** The adult that deposits the egg which produces the borer is a steel blue, clear winged moth. Each one is capable of laying from two hundred to six hundred eggs. The eggs are laid in the crevices of the bark at the surface of the ground. These are deposited in this state from April or May until October. They hatch in nine to ten days into the young larvae or "borer," which, if undisturbed, will feed in the trunk throughout the season and pass the winter in this stage. In the spring it transforms to the pupal or resting stage, near the ground line, usually attached to the bark. In three to four weeks the adult moth escapes. (Figure 15.)

**Parts of Tree Attacked:** The peach tree borer works only at the base of the tree; from six to eight inches above the ground to about the same distance below. Every peach tree is subject to attack by this pest, from the youngest tree in the nursery row to the old trees in the neglected orchard. The writer has taken as many as twenty-eight borers from a single tree, and cases are recorded where as many as fifty have been found. The peach twig borer, which works in the twigs is often mistaken for this pest.

**Control Measures:** There is only one remedy that can be successfully relied upon. That is, digging them out. This can be accomplished by the use of a knife, or by probing the hole with a wire. It is best to do this work in late summer or early fall, because the larvae

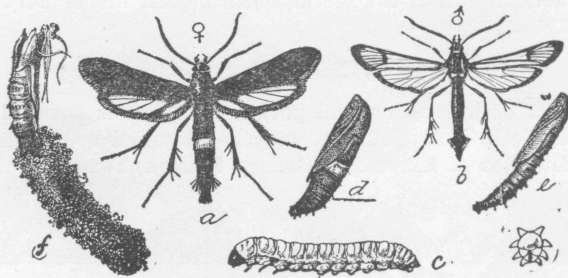


Fig. 15. Peach Tree Borer (a) female moth, (b) male moth, (c) larvae, (d) pupal stage, (e) egg stage, (f) moth emerging from the pupal stage. United States Department of Agriculture.

are small at this time and have not done as much damage as they will do if allowed to remain in the tree through the year.

It is advisable to mound the soil up to the height of about six inches in the spring, before the eggs have been deposited. This will cause them to be laid above the ground, so the work of digging out the larvae can be more easily accomplished. After digging them out leave the ground level.

The use of washes to keep out borers has been strongly recommended, but it can not be relied upon to keep out all borers. It acts as a repellent and will keep some eggs from being deposited, but it will be necessary to cut out the "worm," once it has entered the tree.

### SAN JOSE SCALE.

This pest is probably doing more damage to East Texas orchards than any other. It is scattered throughout a greater portion of the state where fruit is grown. It also attacks other fruit, shade and ornamental plants.

The San Jose scale is a tiny armoured insect that has sucking mouth parts. (Fig. 16.) They multiply with such rapidity that a single pair of scales early in the season will infect an entire tree by fall.

**Parts of Tree Affected:** The scale works on all parts of the tree above ground. They are usually found in larger numbers on the main trunk and in the crotches of the limbs. (Fig. 17.) They also appear on the leaves and fruit to a limited extent. It is this insect that causes the red blotch on the peach.

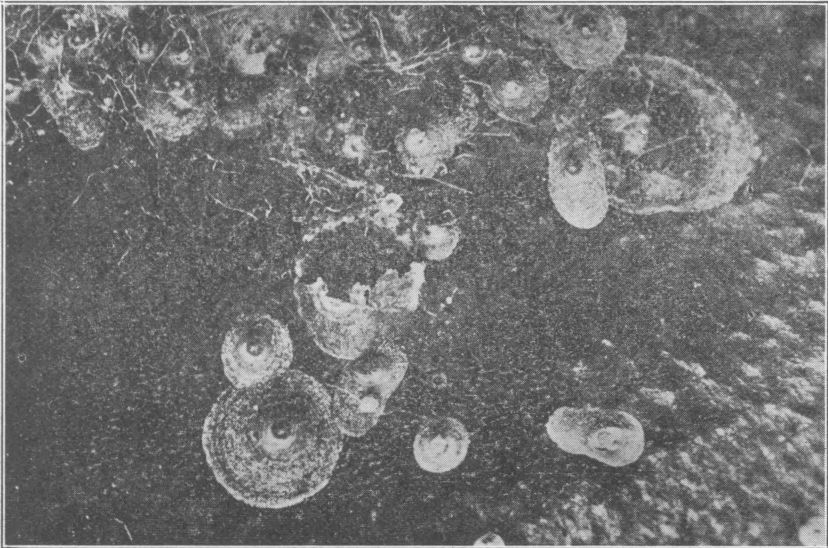


Fig. 16 San Jose Scale, greatly enlarged. Missouri Agricultural Experiment Station

**Control:** While this is a very serious menace to the orchard industry of the state, it can be successfully controlled by the proper application of an insecticide at the right time. Commercial lime-sulphur diluted according to table on page 29, applied while the trees are dormant will control this pest.

The application is made by spraying and care must be taken to cover every part of the tree. Since the scale is killed only by contact, it is necessary that each insect be covered with this material, which means a thorough drenching of the tree.

#### OTHER SCALE INSECTS.

There are several other species of scale insects that attack the peach but they are not often considered a serious pest. The same methods of control are used for these as for the San Jose Scale, as described above. In order to be sure which of the scales is present in an orchard, send a specimen to the Director of Extension, A. and M. College, College Station, Texas, for identification.

#### CURCULIO.

This is the insect that causes wormy peaches. The adult that deposits the egg is very similar to the boll weevil. The eggs are deposited soon after the petals fall on the young fruit. The female cuts a crescent shaped scar, into which it deposits the egg. Many of the fruits in which this egg has been deposited drop off. In those that do not drop off, the egg hatches in from three to seven days into a larvae or worm, which feeds in the peach. When the larvae has finished feeding in the fruit it crawls from the peach to the ground. Then it burrows into the soil about an inch or two, forms an earthen sack about the body, and transforms to a pupa. In about three weeks it emerges as the adult curculio. Figure 18 shows adults on the peach.

**Control:** The curculio can be controlled by spraying with arsenate of lead powder at the rate of 1 1-2 pounds to fifty gallons of water. To this is added two pounds of fresh lime, or it is mixed with the self boiled lime-sulphur for the control of the scab and brown rot. It has been found by experiment that the control of this insect means the control of about 90 per cent of the brown rot. See spray calendar for the time of application of this mixture.

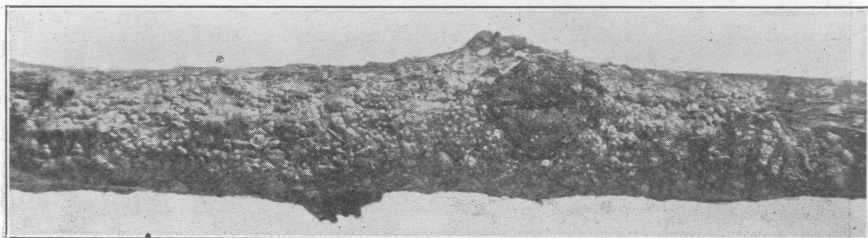


Fig. 17. Peach twig incrustated with San Jose Scale Mo. Agricultural Exp. Sta.

The curculio passes the winter in the adult or weevil stage under trash or rubbish and it is important that this material be cleaned up. Clean culture is very important. The practice of jarring the tree, shaking the adult curculio to the ground on a canvas that has been spread under the tree has some advantages in a small home orchard of a few trees, as the ones that fall can be destroyed. This practice cannot be recommended for a commercial orchard, however, as it is too slow and expensive.

#### THE FRUIT BARK BEETLE.

This pest is doing some damage in the more or less neglected orchards of this state. It is an indication that the trees are low in vitality. A peach tree that is in vigorous condition will withstand the attack of this pest. The presence of this insect is shown by gum exuding from the limbs, and also numerous "shot holes" in the limbs.

**Life History:** The adult beetle deposits its eggs in the bark early in the spring. It hatches into a young larvae in from three to ten days.



Fig. 18. Adult Curculio on Peach. This is the pest that causes wormy peaches. Farmers Bulletin No. 440.



The larvae works just beneath the bark in the sap wood of the tree. They become full grown in about twenty days, transforming into a pupa. In about ten days the adult beetle appears. There are probably three or more generations in Texas each season.

**Control:** In order to prevent serious damage from this pest it is necessary to keep the tree in a vigorous condition. This is done by pruning and cultivation. Trees in a weakened condition should be cut out and burned immediately in order to destroy the breeding place of this pest.

The winter spray for scale and peach leaf curl will have an indirect bearing on the control of this pest, in that it will control other pests that weaken the tree, making it susceptible to the attack of the borers.

### PEACH LEAF CURL.

This disease is caused by a fungus that distorts the leaves and causes them to curl up—hence its name. The disease is more common in wet, cool weather, than in dry weather. It causes much damage in Texas each season. In some sections it almost entirely defoliates the trees. Peach leaf curl causes a permanent injury to the orchards where it is severe, by causing the leaves to fall in early season. This weakens the tree and also the buds for the following year's crop.

**Control:** This disease can be controlled by a winter application of lime sulphur. Inasmuch as most orchards in Texas are infected with San Jose scale, the winter spray of lime sulphur for the latter will also hold the peach leaf curl in check. See spray calendar, page 26 for the strength and preparation of this material.

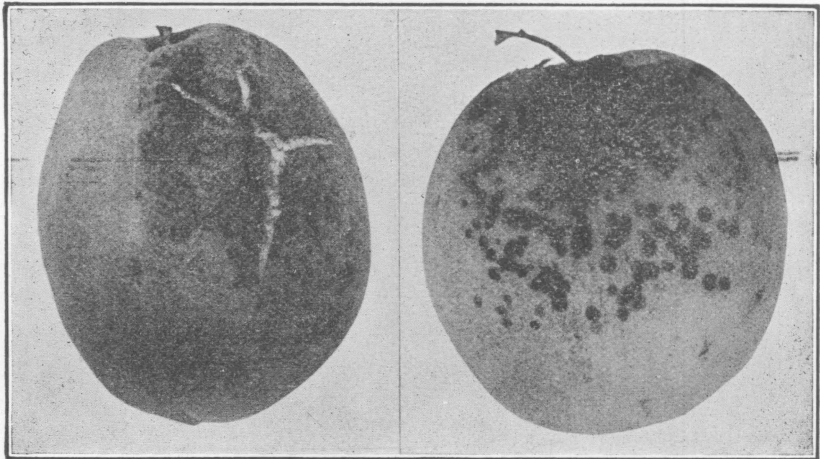


Fig. 19 Peach Scab. On right-peach badly infested with scab. On left-peach that has been cracked by scab; this allows the brown rot spores to enter. Farmers Bulletin No. 440.

### PEACH SCAB.

This is probably the most common disease of the peach in this state. It is commonly called "speck" or "black spot." It was particularly severe in 1916 in all sections of the state where peaches are grown. The fruit that is severely attacked by this disease often cracks and so allows brown rot spores to enter the fruit. (Figure 19.)

**Time of Infection:** The spores are scattered from two to four weeks after the petals fall. They continue until about a month before the fruit ripens.

**Treatment:** Self-boiled lime sulphur is the fungicide used for peach scab. See page 30 for directions for making.

### BROWN ROT.

This disease attacks the fruit just before ripening. In years when weather conditions are favorable this disease will destroy an entire crop within a few days. In case the peaches have been treated for scab and curculio, there is little danger from this disease as the spores must have an opening in order to gain entrance to the fruit.

Destroy all mummified fruit (Fig. 20) and clean up the orchard by pruning and cultivation. Spray with self-boiled lime-sulphur. The application should be made as for scab, and another about one month before the ripening of the fruit.

### CROWN GALL.

This is a bacterial disease that affects the roots of the trees. It

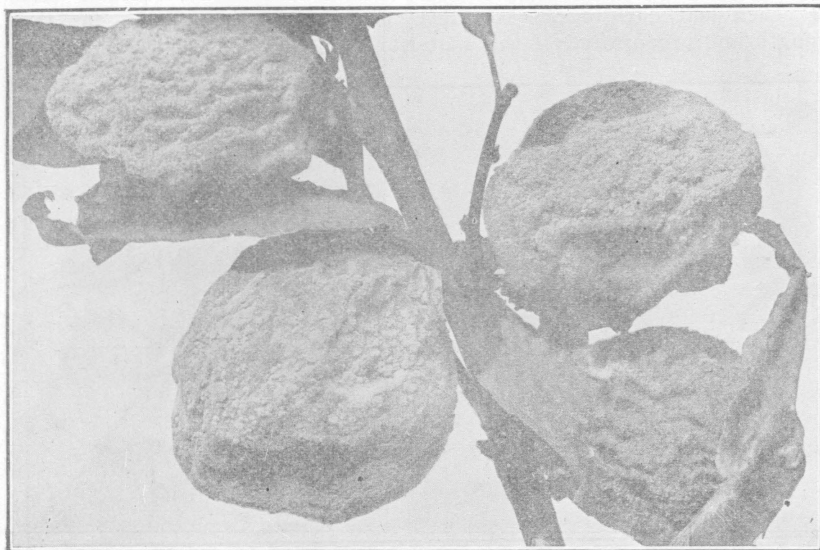


Fig. 20. Mummied peaches which have been destroyed by Brown Rot.

can be identified by the large swelling, or tumor-like growth near the surface of the ground. (Figure 21.) Crown gall also attacks other fruit and ornamental trees.

**Control:** There is no cure after the tree has been affected. Do not accept from the nursery any trees that do not have clean, smooth roots, as this disease is principally spread through nursery stock. It is also carried in the soil, so do not plant any tree in soil that has been recently infected with crown gall.

#### SPRAYING.

Reference has been made on the preceding pages to spraying for control of the various pests of the peach. There are a few general principles of spraying that must be borne in mind in order to obtain satisfactory results.

**When to Spray:** In the spray calendar each pest of the peach is listed, and the approximate dates of application are given. It is necessary that the material be put on as near that date as possible, because when the insect hatches, if something is not there to poison it, it

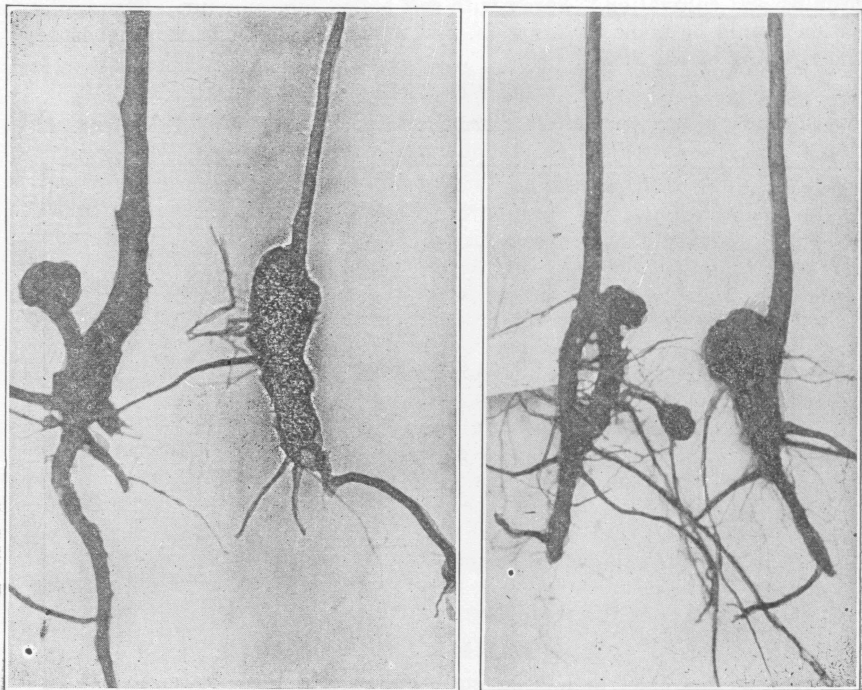


Fig. 21. Crown Gall. Enlarged portion of a tree affected with this disease. Something that should always be looked for and rejected in nursery stock. Texas Agricultural Experiment Station Bul. No. 20.

enters immediately into the fruit and then the poison will be of little value. The same is true of the spores of the diseases,—once established they cannot be controlled. Spraying is a preventive not a cure.

### SPRAY CALENDAR FOR PEACH

PEST	TIME OF APPLICATION	MATERIAL	REMARKS
Peach Leaf Curl San Jose Scale	While trees are dormant	Commercial Lime Sulphur 1-8. Home made Lime Sulphur.	Cover the trees thoroughly while dormant.
Curculio Scab	About 10 days after the petals have fallen	Arsenate of Lead 1½ pounds. Self boiled Lime Sulphur 8 - 8 - 50.	Just as the "shucks" are shedding.
Curculio Scab Brown Rot	About 3 weeks after the first application or one month after petals fall	Arsenate of Lead 1½ pounds. Self boiled Lime Sulphur 8 - 8 - 50.	For second brood Curculio and first appearance of Brown Rot.
Brown Rot	About 1 month before fruit ripens	Self boiled Lime Sulphur 8 - 8 - 50.	Important spray for Brown Rot. Coat thoroughly

**Spray Materials:** Each pest must have a material applied directly against it. That is, it is a waste of money and labor to apply a spray of any material that is not needed. If you spray for brown rot with the material designed for curculio the work is lost. The directions given should be closely followed, because it is false economy to apply more material than is called for by the formula because the material is expensive, and because excessive amounts will produce spray injury.

Spray materials must be properly mixed and agitated. If they are not properly held in suspension, some trees will receive enough to produce a caustic effect, while others will not have enough to destroy the pests.

**Methods of Application:** In any spray operation the material must be thoroughly applied and every part of the tree covered. If any portion is left untouched this will serve as a breeding place for the disease or insect pest. This is especially true in case of the winter application for San Jose scale and peach leaf curl.

High pressure should be maintained at all times. It is impossible to control the pests unless the pressure is sufficient to have the mist reach the entire surface of the tree, leaves or fruit.

### SPRAY MACHINERY.

One of the chief difficulties encountered in efforts to induce owners to practice better orchard management is that they do not have the equipment to properly follow out the recommendations made. This is especially true in the matter of spray machines.

There are many types of spray machines on the market; also, there are many manufacturers that make each of these types. The essential points of any spray machine are lightness, simplicity, accessibility, strength, efficiency and durability. Each machine should be examined for these points. There is no one spray machine on the market better than all others, for the strong points of one may be weak points of another.

The following factors must be considered in selecting the type of spray machine to use. For a small home orchard of one acre, or less, a single-barrel pump will probably be the most economical to use. This type of machine is cheap and, if properly managed, satisfactory results can be obtained. The cost of operating per tree will be greater than with some of the other machines, since it is hard to maintain a uniform pressure. For the orchard of one to eight acres, a hand power pump will be found practical. It is a double-action spray pump and can be used with good results and a uniform pressure can be obtained. Figure 22 shows one of this type.

For commercial orchards of from eight to thirty acres a junior power machine with gasoline engine will prove to be most economical. This machine will maintain uniformly high pressure at all times and the expense of operating per tree will not be as high as with hand machines. The initial cost of any power machine will necessarily be higher, but it



Fig. 22. A very satisfactory type of barrel pump for small peach orchard. Note the equipment. Original.

is impossible to obtain satisfactory results in commercial orchards with a small hand machine. Figure 23 is a good example of this type.

For orchards of from thirty to sixty acres a jumbo power machine made by any of the reliable companies will be satisfactory. These machines are heavier and will cost more in the beginning, but they will last for a longer period and with such a machine the owner is always sure of getting satisfactory results.

Do not try to cover more acres than your particular machine will handle. It is better to spray one tree well than to "spray at" half a dozen. The lack of proper spray machinery is one of the chief reasons why many growers who have sprayed have given it up as a poor practice. They do not do their work thoroughly.

In selecting a spray machine, consider first the following points:

**The Pump:** Get a standard pump with valves accessible so that they may be cleaned or repacked. The pump should also be durable.

**Engine:** The engine must be light and yet have sufficient power to run the machine. It must be so constructed that it will stand the usual amount of jarring as it is hauled through the field.

**Relief Valves:** Faulty relief valves probably cause more waste of material and trouble than any single point in a spray machine. In selecting a machine be sure that the valves are made of good material

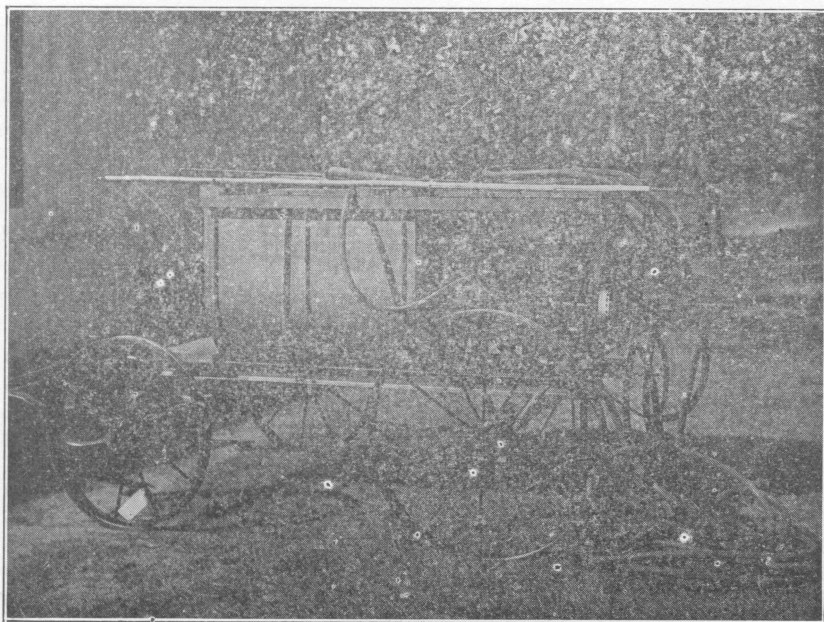


Fig 23. A Junior spray machine fully equipped for use. Original.

that will not corrode and that they may be easily adjusted and taken out to clean.

**Nozzles:** The driving spray types, of which the Bordeaux, Blizzard, and Cyclone are examples, are used for winter spraying. These nozzles throw the material more accurately and with better pressure than the mist type. The mist nozzles are used for summer spraying to cover the tree with a mist. The Disk and Vermorel are good examples of this type. In ordering nozzles the growers should equip with both types.

**Hose:** The strength of the hose depends on how it is made. Be sure that a hose is heavy enough to stand not less than two hundred and fifty pounds of pressure.

**Cut Offs:** The cut-off should be simply constructed and light. Complicated cut-offs cause trouble by stopping up and corroding.

**Extension Rods:** The Bamboo extension rods are lighter than the iron rod, but are more easily broken. Some kind of extension rod is necessary for the best results in spraying.

**Angles:** A 45-degree angle should be supplied for each spray rod. This angle is used to direct the spray material where it is wanted. By means of an angle the spray material can be directed into cracks and crevices that otherwise would go untouched.

The Division of Plant Industry of the Extension Service, will furnish inquirers a list of spray machine dealers from whom these machines can be obtained.

#### COMMERCIAL LIME-SULPHUR.

When it can be obtained this is the best material to use for scale and curl. It is a standard material and can be diluted according to the following table. It can usually be obtained from local druggists. If not, it can be secured from the larger chemical houses. It is more satisfactory to buy this material than to make home-made lime sulphur.

TABLE FOR DILUTING LIME-SULPHUR.

Degrees Baume	Specific Gravity	Gallon of Water per gal. of solution
36	1,330	9
35	1,318	8.75
34	1,306	8.25
33	1,295	8
32	1,283	7.50
31	1,272	7.25
30	1,261	6.75
29	1,250	6.50
28	1,240	6
27	1,229	5.75
26	1,219	5.25
25	1,208	5
24	1,198	4.50
23	1,188	4.25
22	1,179	3.75
21	1,169	3.50

20 .....	1,160.....	3.25
19 .....	1,151.....	3

The diluted product should register 3.5 to 4 degrees Baume. The readings are made by the use of a hydrometer. One can be obtained at a cost of \$1.00. This is the only accurate way to dilute lime-sulphur.

**HOME-MADE LIME-SULPHUR.**

If it is impracticable to buy commercial lime sulphur, a product of comparatively equal value can be prepared at home by the following formula:

Sulphur .....	15 pounds.
Lime .....	15 pounds.
Water .....	50 gallons.

The lime is slacked in an iron kettle. Enough water is used to prevent burning. The sulphur is "puddled" in water and mixed with the lime; enough water is added to make the volume fifty gallons. This is boiled vigorously for one hour in an iron kettle. When cooked the solution should be a clear amber-colored liquid. This is drawn off, leaving the sediment in the bottom of the container. It is then ready for use as a scale spray. If more than this amount is needed the following formula can be used:

36 pounds of lime
80 pounds of sulphur.
50 gallons of water.

To dilute this solution it will be necessary to use a hydrometer, as for the commercial lime sulphur.

The lime used for making this solution should be good, fresh stone lime. The sulphur may be either flour or flowers of sulphur.

This material can only be used for the dormant spray for scale or peach leaf curl. Do not apply when the fruit or leaves are on.

**PREPARATION OF SELF-BOILED LIME SULPHUR.**

This is the chief fungicide for the control of peach diseases during the growing season. The commercial lime sulphur recommended for control of San Jose scale is too strong to use on the peach when in leaf. The chemical action that takes place in boiling this material is toxic to the peach. Self-boiled lime sulphur is cooked only by the heat of the slacking lime. The formula follows:

Lime—fresh stone, .....	8 pounds.
Sulphur .....	8 pounds
Water .....	50 gallons.

The lime is put in a barrel and slacking started, with only enough water to prevent burning, and as soon as it has begun to boil vigorously add the sulphur which has been previously puddled. Allow this to boil for five to fifteen minutes; then dilute with the remainder of the fifty gallons of water. Stir constantly while making. The material is now ready to use, and should be applied immediately. Do not allow it to stand over night before using.



## ARSENATE OF LEAD.

Reference has been made to the use of arsenate of lead. This is the standard poison for chewing insects. It is safer to use than Paris Green, because it will not burn or injure the foliage. It also remains in suspension longer than does Paris Green and adheres much better to the foliage. Arsenate of lead can be readily combined with self-boiled lime sulphur, making a combination spray for summer use.

There are two chemical combinations of arsenate of lead on the market. The "standard" contains a slight amount of acid, and must always be used in combination with lime or with self-boiled lime-sulphur. The Tri-Plumbic, or T. P. arsenate of lead does not contain acid. It may or may not be combined with lime.

Arsenate of lead is also found in the powder and the paste forms. The paste is 50 per cent water. If the paste form is used, apply twice the quantity named for powder. The general recommendation for peaches is one and one-half pounds arsenate of lead powder, or three pounds arsenate of lead paste to fifty gallons of water. When lime is added use an amount of lime equal to the arsenate of lead.

## TREE WASHES.

Reproduced from Texas Experiment Station Bulletin No. 187, "Protective Tree Washes For Borers."

1. Dissolve one pound of hard soap in three gallons of water. Add one-half pint of crude carbolic acid and two ounces of Paris Green. Then add enough lime to make a thick paste, such as will be easy to apply to the trees.

2. Dissolve sixteen pounds of hard soap in eighty gallons of boiling water. Then add two quarts of crude carbolic acid and enough freshly slacked lime to make a thick paste.

3. Slake one bushel of lime in a small quantity of warm water. Add ten pounds of sulphur, which has been previously made into a paste. Then add one-half gallon of gas-tar and dilute with water to fifty gallons.

4. Dissolve seventy pounds of quick lime in fifty gallons of water, Add six pounds of caustic potash and two and one-half pints of crude carbolic acid.

These washes should be painted on the trunks and lower limbs of the trees, and the application should be very thorough to be effective. Every small crevice in the bark should be well coated with the wash. Unless rains occur immediately after the application is made, two or three applications will be sufficient during the summer.