TEXAS AGRICULTURAL EXPERIMENT STATION

BULLETIN NO. 208 JANUARY, 1917

DIVISION OF HORTICULTURE

THE FIG IN TEXAS

B. YOUNGBLOOD, DIRECTOR,
COLLEGE STATION, BRAZOS COUNTY, TEXAS.

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THE FIG IN TEXAS

BY

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**In cooperation with United States Department of Agriculture.

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THE FIG IN TEXAS.

INTRODUCTION.

The Thirteenth Census gives 187 counties in Texas reporting fig trees. The number of trees reported at that time was 815,567. This is 332,039 trees more than given for California. All of these trees that are now alive should be bearing and the production should be very large. Practically all of these trees were very young when the report was made so that the average yield cannot be determined. The California crop for 1910 was given as 22,990,353 pounds or about 85 pounds of dried fruit per tree of bearing age. If all of the Texas trees reported in 1910 did this well we would have an annual production of about 140,000,000 pounds of fresh fruit. (Based on two pounds of fresh fruit equaling one pound of dried.) If only one-half the trees reached bearing age and have only one-half the average California crop, we would have about 35,000,000 pounds of fresh fruit, or about eight and one-half pounds for every person in the State.

The Texas crop is probably very much less than this, but a glance at these possible figures shows that the Texas growers are face to face with a tremendous distributing problem. Maximum distribution, whether of fresh or preserved fruit, depends upon good fruit, well grown, properly prepared, shipped and marketed and reaching the consumer in sound condition. The Texas grower has very good fruit but the remaining essential items are not well understood. It was with the hope of assisting in this great problem that the studies for this paper were undertaken.

CLIMATIC REQUIREMENTS OF THE FIG.

In Texas the fig should have a place in every home orchard. This may seem a rather broad statement, but when our people realize the value of this crop, the ease with which it is grown and the fact that some varieties are fairly resistant to cold they will not longer deny themselves this pleasure. Figs grow luxuriantly over a large part of North and East Texas without winter protection. An occasional cold spell has killed a part or all of the wood to the ground, but the recovery is rapid and they often have some fruit the next year. During the trying winters of 1910 and 1911 and 1911-1912 the figs on the Beeville Station went through without any loss. Though not record breakers these years were very hard upon all subtropical fruits. January 2, 1911, the thermometer went to 13° Fahrenheit, the coldest for that winter. On January 6, 1912, it dropped to 11° Fahrenheit, the record for that winter. Other trees in South Texas withstood the cold equally well, but many were injured and a few were killed to the ground.

A prominent nurseryman of North Texas says: "We think it ad-

visable in North Texas to grow a few figs in the orchard. We use Magnolia, Brown Turkey, Celestial and Brunswick varieties. These grow up and fruit on the new wood even though they may be killed down to the ground. We find it a good practice to bank up the trees ten to fifteen inches with earth in the fall, so if frozen they will not be killed around the roots."

Figs are grown along the Atlantic Coast as far north as Virginia. Inland the cold is more severe and the plants are usually bent to the ground and covered with soil or some other protection. In order to facilitate covering the trees are grown in bush form instead of the single standard.

The fig is a native of a semi-tropical climate and requires similar conditions for perfection. But by development in colder countries they have become more resistant. According to Bailey, in the Standard Cyclopedia of American Horticulture, the fig will stand 10 to 20 degrees of frost under favorable conditions. It has been known to fruit in Michigan with only a high board fence for protection. If grown north of Philadelphia they are lifted in the fall with a considerable ball of earth and stored over winter in frost-free rooms. From Pennsylvania to the Carolinas they are bent to the ground in the fall and covered with earth or pine boughs.

The Thirteenth Census reported figs from the following Northern states: Illinois, New Jersey, New York, Ohio, Oregon, Pennsylvaia, Rhode Island, West Virginia and the District of Columbia. In all cases the quantity was small and presumably for home use or for fresh use in nearby cities.

In Texas there are 187 counties reporting fig trees. These are well scattered over all sections except the "Panhandle" and the El Paso area.

Though figs may be grown for home use over the entire State, the requirements for commercial orcharding are rather exacting. This is especially true if drying is to be attempted. There are certain parts of the State, now growing but few figs, where this phase of the industry may be found profitable.

Thus far the Texas fig crop has been preserved, canned or consumed fresh. The use of the fresh fruit is so small as to hardly be considered in the disposition of the crop. Preserving the fruit is practically the only method of disposition now in vogue, but the growers must seek to encourage the use of fresh fruit and where practical drying must also be resorted to. The preserving of figs is practically a new industry and there has been no previous extensive operations to serve the growers and packers as a guide. So far Texas has taken the lead in this industry and the pioneers have not escaped the usual vicissitudes met with in a new field of endeavor.

As mentioned above, figs will grow over a very wide climatic range. Still, there are certain conditions required for ideal results. Taking some of the best fig regions of the world as an example we find they all are more or less alike in some conditions. And yet with all of these resemblances we are not sure how such a climate would affect our fruit

for preserving, as all of these regions have gained fame by their dried product. Still, with our present knowledge, we have no reason to believe that a climate suitable for drying would in any way affect the preserving qualities. In fact, one would think a country that could produce dried figs would have no trouble in preserving them if the right varieties were used.

In growing the fig commercially the first question to be determined is that of temperature. An ideal locality for this would be one where the minimum temperature was never below 16 degrees Fahrenheit and with a maximum summer temperature of 90 to 100 degrees Fahrenheit in the shade. Many Texas figs have passed uninjured through colder weather, but ordinarily such spells have caught the trees when dormant and so able to stand a lower temperature. A temperature of 20 degrees Fahrenheit or even 24 degrees Fahrenheit has been known to severely injure immature branches and young trees. As a general thing the older the trees the more cold they can endure. Warm weather is essential for the proper development of the fig, as with cool weather the fruit does not ripen up, remaining hard and with low sugar content. Excassive heat often causes sunburn and shrivels the fruit.

The fig tree thrives with an abundance of moisture, but for best fruit there should not be an excess at any time and especially not near maturity. Good drainage is essential and pools or ditches of water must not be allowed within reach of the roots. Twenty-five inches of rainfall annually, during the winter and spring, is considered sufficient, provided the soil is retentive. Rain during the ripening period is disastrous for drying and often causes the fruit to sour or split open so as to be valueless for preserving. Mist, fog, or heavy dew, while the fruit is ripening, is also very injurious.

Most of the commercial fig orchards in Texas are now between 28 and 30 degrees north latitude and 94 and 96 degrees west longitude. As a general thing they are not considered profitable north of 30 degrees, though they extend above this in some places and especially in East Texas and in the other Gulf States. The close proximity of large bodies of water very greatly affect the climate. This accounts for the extensive culture along the Atlantic Coast as far north as Virginia. There is no reason why fig culture should be so largely confined to the area mentioned above. Figs could be successfully grown as far south as the Rio Grande and west to Eagle Pass or Del Rio. Some parts of this southern and western area are well adapted to the production of dried figs and will be referred to more in detail later.

The following table will show the chief fig producing states, and the amount and value of their product, according to the Thirteenth Census:

TABLE 1.

Fig Producing States and Amounts and Values of Products.

State.	Bearing.		Not Bearing.		Quantity, pounds.	Value.
	No. of farms reporting.	No. of trees.	No. of farms reporting.	No. of trees.		
Texas	11,380	230,171	6,450	585,396	2,411,876	$ 97,078
Arizona	360	3,848	280	2,088	127,081	4,103
Alabama	15,219	52,731	4,365	33,893	1,773,126	80,960
Arkansas	1,456	4,174	824	2,514	80,707	5,953
California	7,846	269,001	5,612	214,527	22,990,353	260,153
Florida	2,969	12,784	1,417	12,602	474,287	20,886
Georgia	13,032	49,424	3,079	11,813	1,183,494	50,326
Louisiana	10,871	71,464	4,993	102,043	2,025,308	97,009
Maryland	245	1,432	74	713	38,772	1,388
Mississippi	15,457	65,397	5,929	38,654	1,949,301	107,609
North Carolina	7,159	21,054	2,296	7,783	660,624	22,632
South Carolina	9,938	24,807	2,466	7,325	975,136	49,169
Tennessee	617	2,287	226	793	68,535	4,070
Virginia	1,486	10,136	508	4,925	234,059	9,652

The following table, also compiled from the Thirteenth Census, shows the counties in Texas having more than a thousand bearing trees:

TABLE 2.

Fig Trees of Bearing Age, Total Yield and the Approximate Average Yield Per Tree of Fresh Fruit.

County.	No. of trees bearing.	Total yield pounds (fresh).	Average yield per tree (pounds).
Bexar	1,140	5,708	5.0
Brazoria	39,136	80,093	2.0
Galveston	62,041	215,755	3.5
Harris	34,722	669,481	19.2
Hidalgo	10,457	5,862	2.0
Houston	1,288	34,861	27.0
Jasper	2,533	94,470	37.3
Jefferson	1,836	32,346	17.5
Lavaca	1,486	27,310	18.3
Liberty	9,573	373,338	39.0
Matagorda	11,148	34,736	31.0
Montgomery	1,021	1,960	2.0
Nacogdoches	1,116	19,834	18.0
Panola	1,087	18,443	17.0
Parker	1,552	1,060	0.6
Robertson	1,136	19,048	16.0
Shelby	1,784	34,671	19.4
Travis	1,136	7,619	6.5
Tyler	1,300	47,078	36.0
Victoria	2,319	3,056	1.3
Waller	2,632	10,000	3.8
Wharton	1,620	21,090	1.3

There are several counties having only a few hundred trees and not included in the above list that have a much higher average per tree. Trinity County reports a yield of 71 pounds per tree, Hardin 67 pounds and Val Verde 55 pounds. It is very evident from the yield reported that all of the trees are young. A ten year old tree should yield about 200 pounds of fresh fruit.

PROPAGATION.

Figs are easily propagated. This fact is common knowledge and may account in a measure for the losses sometimes reported.

Trees may be grown from Smyrna seed, but owing to the fact that they produce trees bearing fruit usually of poor quality, it is seldom practiced except for experiment purposes. As the common figs seldom produce seed, they are rarely used, but if seed are obtainable this method might be used to some advantage.

Cuttings.—The chief method of reproduction is by cuttings. The best time for making cuttings is during the fall and winter. They will grow if made during the growing season if the more mature wood is used, but this system is never followed. The cuttings are usually made of wood one-quarter to three-quarter inches in diameter and of the past season's growth. Larger and older wood, however, is often satisfactory. Branches two to three feet long and several inches in diameter may be used for planting directly in the place where the orchard trees are to stand. For the most part the cuttings preferred are about three-eighths inch in diameter, ten or twelve inches long and of one or two year old wood. In pruning old trees the branches removed may be made into cuttings at once or heeled in and worked up later. Care should be taken to see that the branches do not become dry.

If a young fig cane is split open it will be seen that the interior is filled with pith except at the joints or nodes. Here there is layer of hard wood extending across the pith and dividing it into sections. Ordinarily there is a bud arising from the node just a little above this layer of hard wood. In making cuttings the cut should be as near through this hard wood as possible. This method will facilitate the rooting and largely prevent decay from destroying the cutting.

If the soil conditions are right, the cuttings may be planted in the field or nursery row as soon as made. They are often stored in moist sand or moss and planted when spring opens up. There is nothing to be gained by the last named method and often serious loss may occur. If set at once in their places the cuttings are free to form roots as soon as warm weather comes. On the other hand, if the boxes of stored cuttings are not kept in a cool place roots may form that are nearly sure to be lost in planting. They are also subject to molds and decay.

In planting the cuttings in the nursery rows they should be set deep. Not more than one bud should be left above the ground. If the soil does not bake it does no harm if the entire cutting is covered an inch deep. The cuttings are usually set about ten inches apart in the nursery row and the rows are usually four feet apart. The usual method is to plow a furrow and set the cuttings carefully by hand to insure each is set at its proper depth. The soil should be well firmed about the bottom end of the cuttings so as to prevent drying.

The cuttings should receive careful attention during the following year. The average farmer is very likely to neglect his young plants and for this reason it is often best for him to buy his trees from a

nurseryman. A stunted plant of any kind is very much like the "runt" pig, always a "runt." Having a small and shallow root system the cutting may often suffer from drouth while other established plants have plenty of moisture. Unlike many leaves, fig leaves do not curl when suffering for water, but upon examination the terminal bud will be found to be wilted. If possible, irrigation should be given at once. While the trees are in the nursery row is the best time to start them forming a deep root system. Deep cultivation will tend to discourage the formation of shallow roots and to increase the growth of those further down where moisture is more constant and where the dreaded nematode is not so injurious.

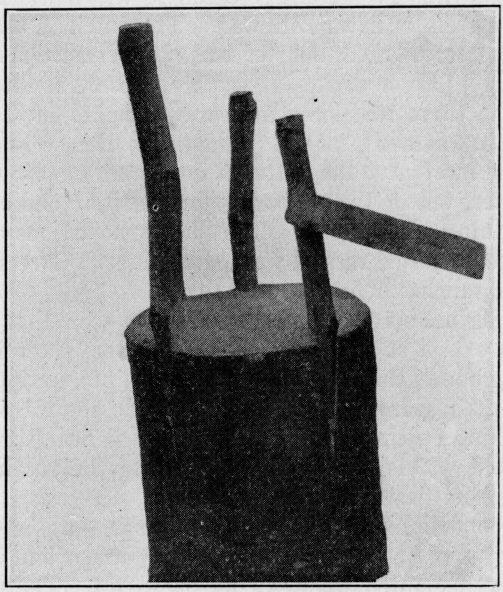

Figure 1—One method of top-working old trees.

Grafting.—On account of the ease with which fig cuttings strike root, grafting is not necessary except where it is desired to top-work one variety onto another. The hundreds of old trees in California which have been changed over to Smyrna would indicate that this operation is not very difficult. For this work the old limbs are cut squarely off when they are about two inches in diameter. One or two old branches should be left to partly shade the young grafts and to cause the sap to flow upward more freely. In all cases the limbs should be healthy when cut and free from knots or twisted grain.

The cions (or grafts) are selected from two year old wood. They are usually about four inches long and are better if they have a terminal bud. The cion is shaped by starting at a point about one inch above the base and drawing the knife downward through the wood so that it will

come out at the bottom on the other side. The cut limb (stock) is now prepared by removing the bark from a "V" shaped cut, one-half inch in length, and then slightly loosening the bark around the edges of the cut. The cion is now forced into this cut so that all of its cut surface is either against the wood or covered with bark. The union is now securely tied with cord and all cut surfaces are covered with grafting wax. There is another method in common use which is a modification of the veneer and cleft graft combined. (See Figure 1.) The stock is cut off as above and a "V" shaped incision is sawed into the wood about one-half inch deep at the top and running out to the surface about one inch below. The cion is then cut into a wedge so that one side is much wider than the other. This is inserted in the cut of the stock with the wide side out, tied and waxed as above. In all cases it is essential that the bark of the stock and cion coincide as much as possible.

Rooted cuttings have been whip-grafted very much as for apples and it is probable this may be done more in the future. Certain varieties of figs are said to be resistant to nematodes; others to root-rot. If this is found to be true, cuttings of the resistant varieties will be rooted and later grafted or budded a few inches above the ground.

Grafting Wax.—As stated above all cut surfaces in grafting should be covered with grafting wax. The following formula has been used successfully: 4 pounds of powdered resin, 1 pound of beeswax and 2 pounds of tallow. Melt all together and pull until smooth and white. Dark wax draws heat and may cause the cion to die. A prominent Californian recommends the following: 8 pounds of resin, 3½ pounds of beeswax and 1 pint of raw linseed oil and the mixture worked until white.

Budding.—Budding is seldom used with the fig, though it may be done successfully. The ring or patch bud is used.

In all cases of top-working old trees it must be remembered that the fig is very subject to sunburn. Some provision must be made for shading the trunk and branches until the cions have produced enough leaves to furnish shade. The young growth is also weak at the joint of union and it is necessary to provide support for a few months.

Layering.—Figs often form natural layers by the lower limbs becoming covered with soil and roots forming. These rooted branches may be removed and set in other places. Branches bent to the ground and covered with mellow earth will form roots and be ready to move in about one year. Rooting is often hastened if a small tongue is cut through the bark on the lower side of the branch before covering.

VARIETIES.

A detailed description of varieties is not within the scope of this bulletin. A few remarks, however, will be made on certain varieties known to do well in Texas or that may seem worthy of trial. The dis-

cussion of Smyrna and Caprifigs will be taken up in the second section.*

In selecting a variety of figs there are two things that must be taken into consideration: first, climate, and second, the purpose of the crop. Those persons living outside of the commercial fig belt must select those varieties known to be resistant to cold. Hardiness, rather than quality must be the chief consideration. Fortunately, we have several varieties that will stand considerable cold and yet are of good quality. In looking over a great many varieties recommended, Turkey or Brown Turkey is quite frequently mentioned as the most resistant to cold. Others highly recommended for this purpose as well as quality are: Celeste, White Ischia, Brown Marseilles and Lemon. Turkey, Celeste and Brown

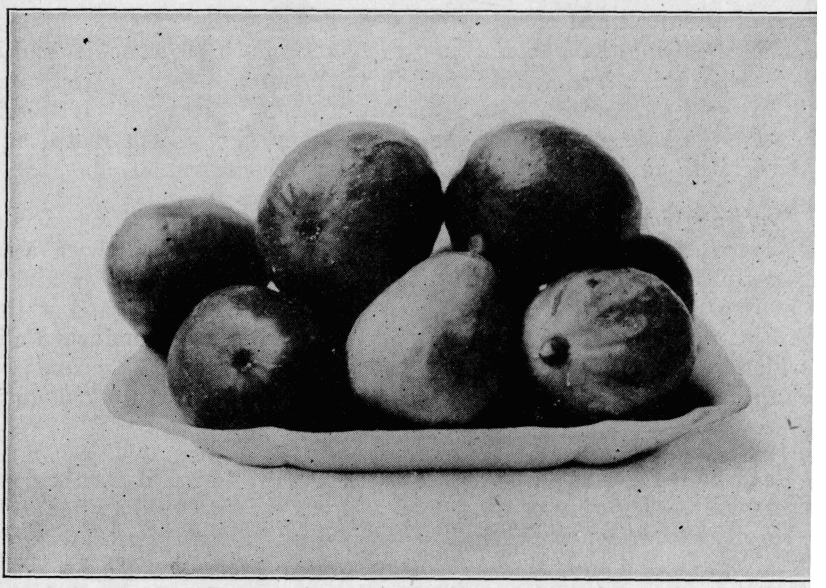

Figure 2—Magnolia Figs.

Marseilles have been known to pass through near zero weather, unprotected, with little or no injury. At this time they seem best for North Texas.

Prof. R. H. Price† says the following have proven hardy at College Station: Adriatic, Adam, Angelique, Turkey, Black Ischia, Brown Marseilles, Brunswick, Early Violet, New French and White Ischia.

Brown Turkey, Celeste and Brown Marseilles would be satisfactory for any of the home uses, but there are better varieties for commercial

*For a detailed description of varieties see Bulletin No. 9, Division of Pomology, United States Department of Agriculture, and Bulletin No. 77, Georgia Agricultural Experiment Station.

†Bulletin 62, Texas Agricultural Experiment Station (1901).

purposes. Some of the above are too small for the best preserves—best in this case referring to appearance in glass jars.

Magnolia at this time is the most popular for preserving and fresh shipments. This variety is a little coarse and its flavor is not the best, but it has other qualities that more than counteract these deficiencies. It has the eye open when mature and may be injured from insects or souring. Mr. Sam H. Dixon* says: "The variety locally known as the Magnolia is the leading variety grown in South Texas. I am not sure that the fig growers should plant this variety to the exclusion of Brown Turkey, Blue Celeste and the White Ischia. It has many points in its favor, however, and I shall not discourage its future plantings. The Brown Turkey, Blue Celeste, and White Ischia possess many points of excellence and I feel that I should encourage their planting along with Magnolia. The fig growers may be slow in adopting my suggestions, but when they do so they will find that they have acted wisely. . . . In the more northern sections of the state the Magnolia would prove a failure owing to its want of power to resist cold."

Celeste is an old favorite throughout the Gulf and Atlantic States. It is hardy, prolific, and of excellent quality. Though small they are preserved and can be found on the markets of California and the South. Professor Storms of Georgia rates the Celeste very high for his section and says except for its size he would place it at the head of the list. It is the most common "door-yard" fig in Texas.

Brown Turkey is a large fig; browns in the sun, but is lighter colored if grown in the shade. The skin is smooth and fairly tough. It ships well when fresh and is of good quality. It makes an attractive preserve. The tree is large and thrifty, very resistant to cold and prolific. The fruit does not sour badly.

White Ischia is not as generally planted as it should be. The tree is vigorous and prolific and the quality is of the best. The size is medium to large, green-white in color. It preserves well and has a long ripening season. It does not sour badly and is resistant to cold. Professor Storms places it first for Georgia.

Brown Marseilles is only moderately vigorous in growth, but is very prolific. The fruit is small to medium sized, red-brown in color, very sweet and preserves well. Like White Ischia and Celeste it often dries on the tree and can be used for this purpose. It is resistant to cold and seems to withstand the nematode as well as any other variety.

Brunswick is of medium vigor and of rather open growth. The fruit is large and preserves well. It is claimed to be resistant to cotton root rot, but this has not been fully determined. It is not very resistant to cold.

*Bulletin 32, Texas Department of Agriculture.

Adriatic has not been grown very extensively in Texas and little information is available as to its value. Of the few reports received some have been unfavorable and it does not seem suited to some sections. It seems to be of considerable promise, however, for Southwest Texas. The conditions there are rather similar to the interior valleys of California where it grows to such perfection. It is a white fig of large size and good quality. It dries well and now constitutes the bulk of the California crop. It is often preserved and the fresh fruit may be found on the market throughout its season. The tree is a good strong grower. It is not satisfactory on poorly drained soil.

Mission is another very popular California fig and until about 1850 was the only variety grown. It produces two distinct crops of rather large black or dark purple figs. The fruit is of fair quality and dries well. It is preserved to a certain extent and seems to be the best variety grown for shipping fresh.

SOIL.

The fig will grow on a very wide range of soils. If given plenty of moisture it will even do well on very poor land. To obtain the best results, however, there are certain things desirable. The soil should be warm and retentive of moisture, deep, well drained, and have an abundance of lime.

Professor Hume* says the best soil is clay or heavy soil which is uniformly moist, and adds: "No greater mistake can be made than to attempt the culture of figs in light sandy soil, more or less deficient in moisture in the lower South."

Hardpan or impervious clay subsoil should be avoided unless there is some satisfactory means of correcting this before the trees are planted. Trees grown from cuttings are often shallow rooted. This seems to be true with the fig, and a shallow soil only tends to make it more pronounced. Shallow soils should have the subsoil broken up before the trees are set. This will also aid drainage, lack of which is held responsible for much sour fruit.

Alkali is very injurious to figs. If the soil contains more than .05 of one per cent. of total salts in the upper four feet of soil it should be considered unsafe.

The nematode works freely on the fig roots in sandy soil and is said not to be injurious on the heavier types. This worm is probably the worst fig pest in Texas and will be mentioned more fully later. It is worst on the shallow roots, however, so that a deep soil will help combat this pest.

Lime is very necessary for the production of the best figs. This is of especial interest to growers in the Gulf Coastal prairie, where the soil is often filled with water and often slightly acid.

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*Standard Cyclopedia of American Horticulture.

PREPARATION.

The soil preparation of any orchard is very important. With the Texas figs this is especially true. A few years ago there were thousands of trees set with only the slightest preparation and this in a measure accounts for many losses and the great difficulty of finally getting the land into shape.

Some of the soil in the fig section is not suitable for this crop. Nearly all of it should be given to some cultivated crop for several years before planting figs. This will allow air to enter, sod to decay, and sweetening to take place. It will also enable the grower to see to proper drainage and to learn any peculiarities it may have. The crops best suited for this purpose are some of the cereals as corn or sorghum. Cotton is a

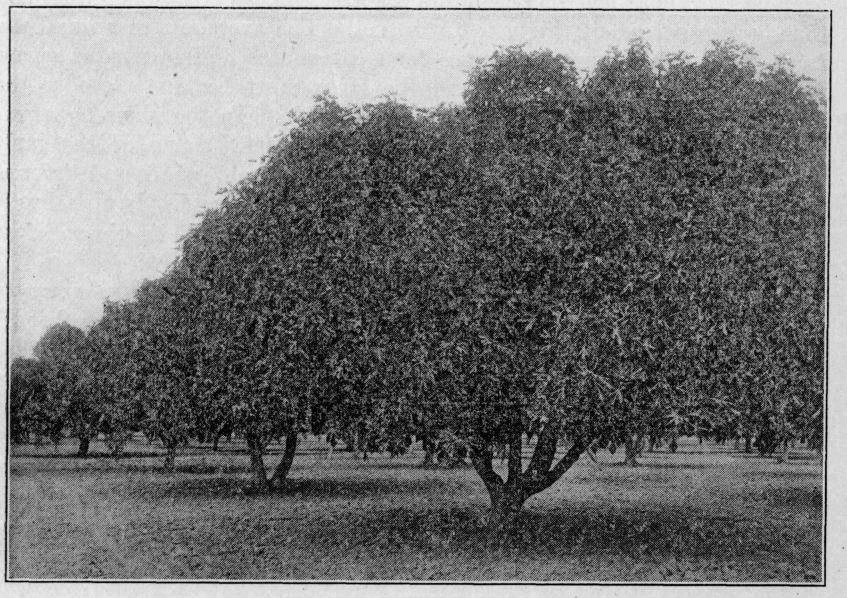

Figure 3—A ten-year-old California fig orchard. (Courtesy Dr. J. E. Coit, University of California.)

good crop for sod land, but it may introduce cotton root rot. Some other crops are as likely to introduce the nematode. These two pests are so serious for Texas figs that the grower must use every precaution to prevent their introduction.

In preparing old land for figs the plow should be run deep, followed by disk, spike-toothed harrow and planker if necessary, to get the soil in the very best physical condition. By this deep preparation deep rooting is encouraged, greater water holding area is obtained and air is admitted.

If irrigation is to be followed preparation should be now made for leveling the land and constructing ditches. There are no figures available to show the amount of water required by figs in Texas. In nearly

all cases the rainfall is abundant if properly conserved. In the interior valleys of California, where the fig is so largely grown, they have 12 to 15 inches annual rainfall. To this they add one miner's inch to eight acres. They expect to enter their dry season with an average of from 8 to 12 per cent. of moisture in the first six feet of soil. They flood the light soils and use furrows with the heavy soils. No water is used for six or eight weeks before the crop is mature.

PLANTING.

The fig should have more room than is generally given. There are many orchards set as close as fifteen feet square and their branches are now in contact. It is likely the roots spread much farther than the branches. There are scores of old fig trees in the Gulf Coast section that have a spread of thirty to forty feet. The average tree around the farm yards has a spread of more than fifteen feet. In orchards where fruit must be harvested by hand the trees must be kept close to the ground and the growth is correspondingly wide. In the older fig growing region the tres are set 30x30 to 60x60 feet. Some of the early plantings were set close as a protection from cold wind and freezes. As the trees become older they are more resistant to cold. In the closely planted orchards some thinning is needed and it should be given before the trees begin to suffer.

One year old trees are generally best for planting. They grow so rapidly there is no need of older ones. Then, the older trees are harder to transplant.

The trees may be set from November to March. The later planting is preferred by many because of danger from frost injuries during the winter months. Others say that if the tree is set in November it becomes established, in a manner, before spring and is ready to start growth with the first warm weather.

The holes should be prepared just before planting. They should be of sufficient size and depth to allow the roots to be spread as they grew in the nursery. Mellow surface soil may be thrown back into the hole if it is too deep. Every tree should be carefully inspected before setting. Even with the best of nurserymen and in spite of nursery inspection, diseases may slip by and every grower should be on the alert to prevent their entrance to his orchard. He should watch especially for the nematode. This worm causes small swellings on the roots, that look, to some extent, like beads on a string. Trees showing this or any other serious disorder should be burned.

In moving the trees to the field great care should be taken to avoid exposing the roots to sun or wind. They are very easily injured by drying and a fig tree with dry roots is practically worthless. Some growers haul them to the field in barrels of water and then use the water for watering the set trees.

The roots should be cut back until the milky sap flows and all broken or injured roots should be cut back to sound wood. In some cases it is

best to puddle the roots by dipping them in a paste of clay and water. The best available soil should be packed tightly about the roots and the holes filled with water, using at least 10 to 12 gallons to each tree. After the water has been absorbed the holes may be filled with dry earth. The tree should be cut back at once to about eighteen inches, higher or lower depending upon the system of pruning to be followed. The part removed may be used for cuttings if desired.

There are a number of good methods for laying out an orchard so that the rows will be straight and the trees equally spaced. A discussion of these points is beyond the scope of this bulletin. Those desiring such information are referred to "The Principles of Fruit Growing," by Bailey, and "Productive Orcharding," by Sears, etc.

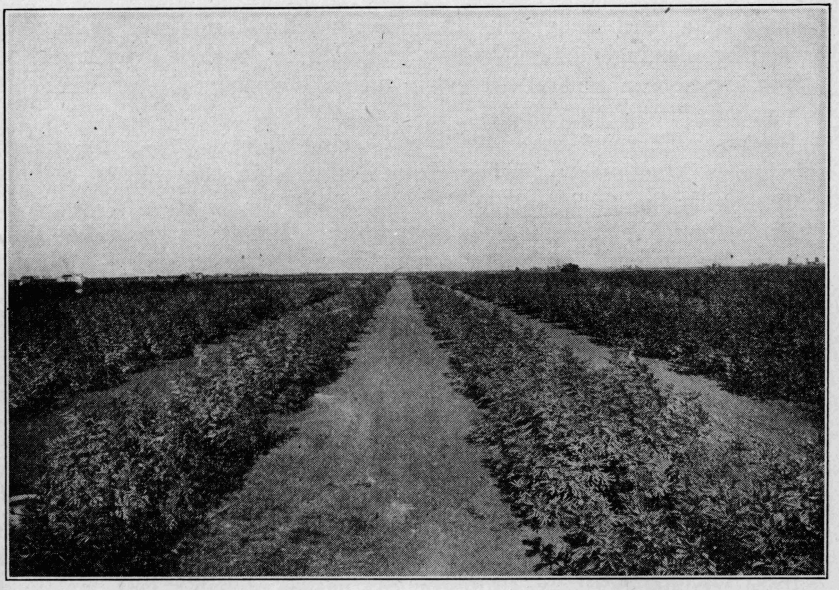

Figure 4—A three-year-old Magnolia fig orchard, near Alvin, Texas.

CULTURE.

Many of the trees for home use are set around the dwelling. They receive little or no cultivation and seem to thrive under such conditions. Often their roots extend under buildings where the supply of moisture is usually abundant and fairly uniform. They often receive the waste water from the laundry or kitchen. In other cases a considerable mulch of straw and litter is formed so that moisture is preserved. There is little that can be done to better their condition.

If all the trees in a commercial orchard could be situated as these door-yard trees there would be less advantage in cultivation. This, however, is impossible, and we must resort to other methods to hold the moisture and keep up the fertility so essential to their best development.

Among the methods are cultivation, fertilizing, cover crops, and sometimes irrigation. To be convinced of the value of cultivation, for this crop, one only has to take a trip through the fig area and observe the answer in sod orchards, compared with those receiving good culture. Many have said the fig needs little culture and some have said that the hoe is about the only tool to allow in the orchard. There may be some situations where this is true, but good culture is the rule in all of the most productive regions and there is no reason why this is not true in Texas. In regard to cultivation in California Dr. Coit of the State University says: "One good plowing (8 to 10 inches deep, depending upon soil depth) a year, to turn under weeds or cover crop grown during the rainy season is sufficient. This should be followed by thorough cultivation in both directions. The cultivator should be run at different depths at different times in order to prevent what is known as "plow sole." This consists of a hard layer which forms just below the stirred soil and is caused by plowing and cultivating at the same depth and by tramping of the horses. In general five or six inches is considered a proper depth to cultivate."

Professor Starnes* says: "Deep plowing is ruinous—mere surface stirring is harmless; no other obstacle stands in the way of orchard culture with the fig."

Professor Price† recommends clean culture, but says it should be light —"disc the orchard lightly at frequent intervals during spring and early summer to keep down the weeds and conserve moisture."

Mr. A. C. Van Velzer of Houston, Texas, in his book "Fig Culture," says: "Plowing once a month will not injure the trees, if shallow, but one deep plowing in winter, followed through the growing season by diskings, will prove satisfactory."

The foregoing are only a few of the opinions expressed on fig cultivation. They show that there is no one best method that may be applied to all conditions. The California soils, for the most part, are deep, or can be made so by plowing, so for them deep preparation and culture certainly seems best. The soils in Georgia are often thin and the shallow culture recommended by Professor Starnes is probably best for them.

In the Texas fig area we have a wide variation in depth of soil so that local conditions will determine the depth of plowing. Shallow soils, in some cases, may be slightly deepened by turning up a little of the subsoil, but there is not much that can be done along this line and serious injury might result in bringing too much of this to the surface at one time. So, in shallow soils, the roots must remain near the surface and light cultivations must be given.

If the deeper soils are broken eight to twelve inches deep and cultivated five or six inches deep there will be plenty of roots formed at a favorable depth for moisture. They will also be more free from nematodes and will not so readily respond to warm spells in the winter.

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*Bulletin 61 of the Georgia Agricultural Experiment Station.

†Bulletin 62 of the Texas Agricultural Experiment Station.

With clean culture a cover crop is essential. This may take the form of native weeds, but this is not generally best. Mulching has been used to help keep up the humus content of the soil. Large quantities of stable manure are also used, but none of these methods is quite as cheap and satisfactory as cover crops. The value of decaying plant matter is too well known to be discussed herein.

The crop to be used for this purpose will largely depend upon personal preference, but such as are known to be the hosts of fig troubles should be avoided as far as practical. Oats and rye have proven good Bur clover, Canadian field pea, and vetch are good, but may serve to introduce root rot and nematode. The crop should be seeded as soon after September 1 as moisture conditions will permit.

The cover crop should be plowed under in February or March as deep as the soil will permit. In some cases disking may be necessary before plowing to insure covering all of the crop.

Some of the growers in the Gulf Coast region plow their land so as to throw the soil toward the trees. This leaves the "dead-furrow" in the middle of the tree rows and insures better drainage. The next year the plow is run the other way or at right angles to the previous year. In this way the trees are always on a ridge. The cultivations during the summer gradually work the soil down so that the orchard is nearly level by winter.

PRUNING.

There is some controversy as to the best method of pruning fig trees. Nearly all authorities agree that some pruning is needed, but opinions are quite diverse as to the method and amount. Different climatic conditions and different ways of disposing of the crop probably account for this divergence of views.

There are now in Texas two chief ways of shaping fig trees. According to one the plant is cut back pretty low (12 to 18 inches) when planted and the future framework of branches is allowed to form on the upper foot. This gives what is called a "Single Standard" or single stem with a low head. The other method is to cut the tree still closer at planting—say two to six inches—and allow some of the branches to form on this while the others are forced out from below the ground. Not more than six shoots are allowed to grow. This is generally spoken of as the "Bush Form" or "Fig Bush." Each of these methods has very firm advocates and each is followed to some extent in the important fig growing sections.

In Smyrna two cuttings are often planted where the tree is to stand and the resulting shoots allowed to form the tree. This, however, is not a universal custom. In California the single standard is used exclusively. The bush form is best where the trees are to be bent to the ground and covered to prevent frost injury. On the whole it is more satisfactory where cold weather is to be expected as it gives a better chance for the tree to escape without total loss of top whether protected or not. The single standard is better adapted for commercial planting, as tillage and

other orchard operations are easier. There are no figures to show which type gives the highest yield of fruit.

When figs are grown for drying it is generally best to head the trees three to five feet above the ground. This permits cultivation close to the trees and makes it easier to harvest the fallen fruit. Figs for drying are allowed to mature on the tree and gradually dry and shrivel until they fall to the ground of their own accord. This makes it essential to have the ground clean and the heads high so that air may circulate freely and so the fruit may be gathered easily.

Whatever the system selected, pruning should be begun promptly. The first two years should see the permanent framework established. Subsequent pruning should be light and confined to removing dead or

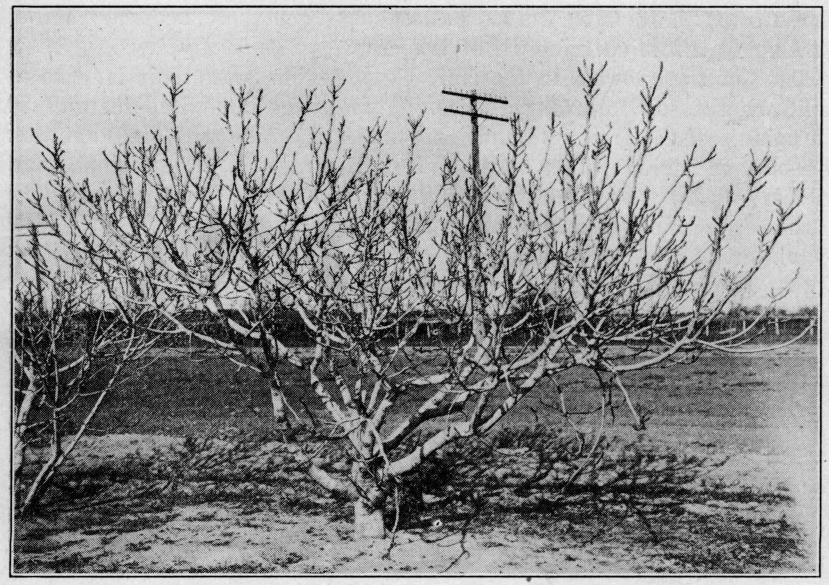

Figure 5—Fig tree pruned to single standard.

useless branches or branches that interfere with each other or with cultivation. In no case should the leading branches be indiscriminately headed back. It may be advisable in some cases to cut these, but the general result is not satisfactory. With the terminal bud removed the branch sends out numerous laterals that will quickly make the top of the tree so dense as to prevent the admission of sunlight or the free circulation of air. The long, slender shoots that arise from the main stem or branch should be removed at the point of origin, as they seldom produce good fruits and will interfere with the other branches. If the center of the tree should become too dense some of the larger branches may be removed where they leave the trunk.

All pruned wood can be worked up into cuttings. This may be done at once or the branches may be heeled out and worked up later. If it

should be decided to heel out the cutting wood, it should be well protected from drying wind or sun.

FERTILIZERS.

There is very little known as to the fertilizer requirements of the fig. Apparently there has been no systematic work in Texas along this line. So far the trees have seemed to make as much growth as desired and the fruiting has been as heavy as their ages would warrant, but it is unreasonable to conclude that this condition will continue indefinitely. Where this fruit has been grown for hundreds of years, as in Europe and Asia Minor, the growers practice fertilizing very conscientiously. In 1893 Jaffa and Colby, in Bulletin 102 of the California Station, have this to say: "With the exception of grapes, it seems that the fig draws rather more heavily upon the mineral ingredients that will need to be replaced by fertilization than do any of the other fruits we have examined; following closely the amounts taken up by the grape and fig of foreign growth. As compared with the fig, apricots and prunes, like oranges, do not in any case draw nearly so heavily upon the mineral matter; lemons and prunes, however, very nearly approach it." They also say that the fig draws decidedly more nitrogen than other fruits; that potash is the leading ingredient in the ash of the fig, equaling three-fifths of the total ash; that they range a little below other fruits in the phosphoric acid and that they have twice as much lime as prunes and three times the amount in apricots, but less lime than lemons or oranges.

The following table is taken from Bulletin No. 102 of the California Station:

TABLE 3.
SOIL INGREDIENTS EXTRACTED BY DIFFERENT FRUIT CROPS.
For Fruit Alone.

Fruits.	Total ash.	Potash.	Phosphoric acid.	Nitrogen.
Figs.				
Europe:				
In each 1,000 pounds	8.00	3.89	0.89	2.27
Crop of 15,000 pounds	120.00	58.35	13.35	34.05
California (White Adriatic).				
In each 1,000 pounds	7.81	4.69	0.86	2.38
Crop of 15,000 pounds	117.15	70.45	12.90	35.70
Grapes.				
Europe:				
In each 1,000 pounds	8.80	5.00	1.52	1.70
Apricots.				
California:				
In each 1,000 pounds	4.91	2.90	0.64	1.94
Crop of 30,000 pounds	147.30	87.00	19.20	52.20
Prunes.				
California:				
In each 1,000 pounds	4.86	3.10	0.68	1.62
Crop of 30,000 pounds	145.80	93.00	20.40	48.60
Oranges.				
California:				
In each 1,000 pounds	4.32	2.11	0.53	1.83
Crop of 20,000 pounds	86.40	42.20	10.60	36.60

These figures show that fig trees cannot be expected to yield heavy crops without returning something to the soil. Good physical condition of the soil will greatly aid the plant in procuring the needed food, and there is nothing that will help this more than the judicious use of cover crops and culture. The Texas grower, so far, has felt little need of giving this subject serious consideration, so the following paragraphs are given, not as a guide, but to show what has been done along this line.

A prominent fig grower of California uses on his fourteen-year-old orchard 700 pounds of acid phosphate and 500 pounds of bone meal to the acre. In addition to this he applies large quantities of stable manure.

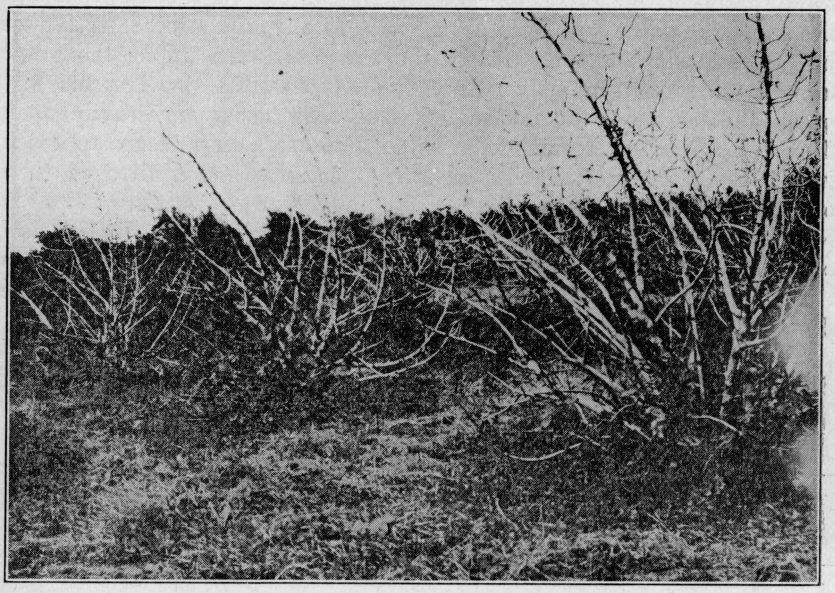

Figure 6—Result of fig rust.

The following is recommended by Professor Starnes for figs in Georgia:

534 pounds nitrate of soda.
1146 pounds acid phosphate (14 per cent.).
320 pounds muriate of potash.

Mix and apply three to nine pounds to the tree, depending upon the size. He also says to use five or six pounds of air-slaked lime. He recommends three or four pounds of cotton seed meal or stable manure when the trees are young. Other writers condemn the use of stable manure or other fertilizers containing large amounts of nitrogen, saying it causes tender vigorous growth that may be winter killed.

The trees of the Horticultural Department of the A. and M. College at College Station receive 300 pounds of cotton seed meal and 300 pounds

of acid phosphate per acre. The soil was thought to contain enough potash.

INSECTS AND DISEASES.

Many reports mention the fig as being free from serious insect pests and diseases. This is true in a large measure and especially when compared with the peach, apple, citrus and many others, and yet, there are a few troubles that the alert grower will constantly guard against so that they may not gain a footing in his orchard.

INSECT AND RELATED PESTS.

One of the worst pests of this nature is the nematode (rootknot) (*Heterodera radicicola*). Though not really an insect this worm is often spoken of as such and is usually handled by entomologists. The injury is very characteristic and will hardly be confused. It causes, at first, small swellings on the roots which gradually enlarge until the usefulness of the root is impaired. Decay frequently enters and the root is destroyed. They have been reported on trees all over the State, and as they infest such a large number of plants it is safe to say the most of the orchards have them. The young nematodes feed upon several hundred plant species or sub-species. This list includes practically all of the orchard and garden crops and many weeds. They do not seem very serious upon the cereals and some are said to be entirely free.

The worm cannot be seen without a microscope and even then it is difficult to see it, owing to its lack of coloring. The male is long and slender while the female is rather rounded or pear-shaped. They develop in the knots and the female starts laying her eggs there. As the young have the ability to develop a protective covering they are not easily affected by climatic or other conditions. For this reason they are very difficult to control. The chief method of control is the rotation of crops, as they are not known to seriously infest cereals. The land to be planted in figs should be given over if possible to cereal crops for a year or two preceding the setting. Another method is by deep cultivation, as they do not seem able to do serious damage when air is not abundant. Mr. Gilbert Onderdonk, of Nursery, Texas, says: "Cultivate frequently four or five inches deep to smother the nematode, which does not flourish if deeply covered." Professor H. H. Hume, in the *Standard Cyclopedia of American Horticulture,* says: "In the light, dry, sandy soil the nematode (rootknot) works serious damage to the roots of the trees and the plantings soon die out. But on heavy soils the nematode is not able to work such havoc and the fig thrives in spite of their limited attack."

Tobacco dust, lime, and fresh wood ashes, worked into the ground about the roots have been reported as beneficial.

Borers.—There has been a tree borer (*Ptychodes vittatus*) reported from various places in Texas that may become serious. Several years ago this pest was reported as quite serious in Louisiana. It is a white,

flat-headed worm with brown mouth parts. The adult lays its eggs around limb crotches or gains entrance through injuries to the bark. The only remedy known now is to dig out the borers and prevent others from starting. All tree wounds should be cleaned and painted with tar or some other covering. The tree trunk may be sprayed with soap and carbolic acid to prevent egg laying. This pest is not serious when the trees are strong and vigorous.

Fig Eater.—This is the common "Green June Beetle" (*Allarhina Netida*). It has been reported as working on figs and other fruits. The larva is a white grub that works on sod or other plant roots, and is not serious. The adult eats the fruit, and though little is consumed,

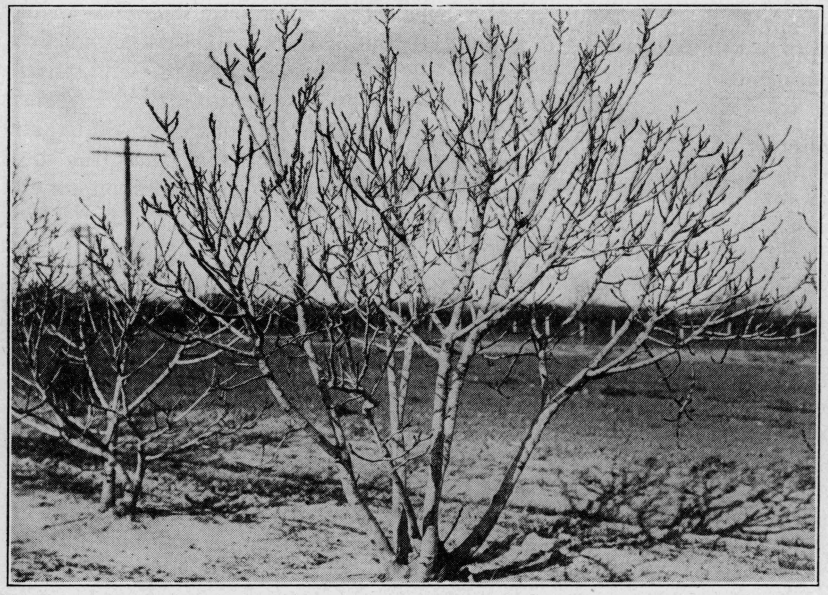

Figure 7—Fig tree pruned to bush form.

considerable fruit may be ruined. This pest is not often reported as serious. The remedy is to gather the injured fruits, apply poison to the surface and expose them in the trees. The beetles may also be jarred from the trees and killed upon the ground.

There are no other serious insect pests attacking the fig, though a number have been reported as doing some injury. Among these are several kinds of scale, a curculio, pear thrips and a small brown beetle that crawls into the interior through the open eye. Mr. Ed. L. Ayers, State Nursery Inspector for Texas, reports that the cotton caterpillar moth caused heavy loss for a few days during the fall of 1915. Not only did the moths suck the juice of the fig, but seemed to carry rot spores.

DISEASES.

The fig rust (*Uredo fici*) is probably the worst disease. The affected leaves take on a characteristic rusty apparance and finally may drop from the trees. (See Figure 6.) The late crop may be much reduced or may entirely fail to mature. This may be controlled by spraying with strong Bordeaux Mixture three or four times during the winter and spring.

Cotton root rot (*Ozonium omnivorum*) does much damage to the fig. The plant shows little evidence of trouble until suddenly it wilts and dies. Upon examination the roots will be found to be entirely decayed so that the plant can be lifted out of the ground. There is no specific remedy. In general farm practice rotation is followed as this disease does not bother the cereals. The disease can be held in check to some extent by deep and frequent plowing. Figs should not be planted upon land following cotton or other known host plants and care should be exercised in the selection of the orchard cover crop.

Mr. Ayers has also reported a fig canker, but no remedy has been offered. There are a few other diseases and pests known to affect fig trees or fruit. Among them are: Crown Gall, an anthracnose, Die Back and Leaf Mite.

Sunburn is very serious with figs in some sections. The bark of the trunk is killed by the heat of the summer sun. This is especially bad on the southwest side of the tree. The dead bark offers a lodging place for various insects and decay. The affected part should be cleaned, painted with some disinfectant and shaded in some way. Low-headed trees are not subject to this trouble. Young trees may be protected with old newspapers or the patented protectors offered for sale. The fruit is often burned if it extends beyond the foliage. Such fruit must usually be discarded in harvesting.

Splitting and Souring.—Figs are frequently found split and soured. This is thought to be due to excessive moisture either in the ground or in the air. It seems especially bad after rains and damp weather. It is worst on figs having a low sugar content. This fruit is generally a total loss. If the fruit should split without souring it may be worked into jam or if dried it will sell for about one-third the normal price.

Dropping or shedding is caused by a number of conditions. The lack of moisture and food often cause many fruits to fall. Many figs having male or female flowers have been sent to the College for information. It must be borne in mind that the male fruit will always drop and the female also, unless pollinated. Such trees may be top-worked to the common type or dug up and others planted. It will not be found advisable to try to pollinate a few trees. (Pollination is discussed under "the Smyrna Fig and Caprification." See page 36.)

HARVESTING AND MARKETING FRESH FRUIT.

The marketing of any perishable commodity is a big undertaking. Few growers fully realize this until they are face to face with the hasty

disposal of a crop. Figs are one of the most highly perishable crops grown and require close attention to all details to be successful. Texas growers, however, are successfully marketing strawberries and there is no reason to believe figs would be more difficult.

Fruit marketing is divided into four distinct operations and yet all are closely associated. These steps will be briefly mentioned in order to emphasize their importance.

(1) Production. This deals with all of the steps connected with growing the crop, such as cultivation, spraying, pruning and fertilizing. None of these can be neglected if the most successful crop is to be secured. This phase of fruit production has received much attention in the past, but the growers are now learning that it is only the first step and the others are very often the hardest.

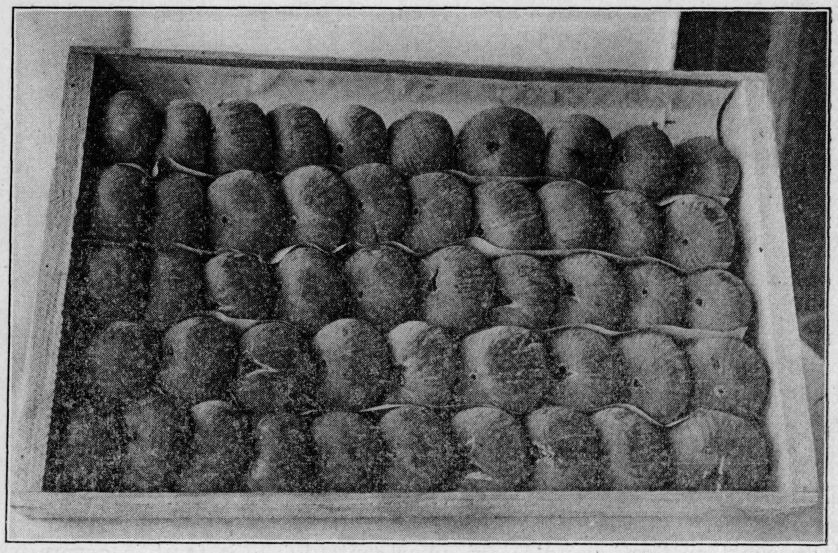

Figure 8—Crate of Smyrna figs.

(2) Preparation. This embraces all the various operations from harvesting to placing the packages in the car. In this we find an extremely important stage and one often neglected. In this would come the degree of ripeness for certain uses, the actual method of removing the fruit from the trees, the type of picking basket to avoid injury, grading, sizing, and arrangement in the crates or baskets. Loading and bracing the cars would also be a part of this step. All of these have a direct bearing upon the condition of the product at its destination and to neglect one of these may mean loss. It is here most of the growers fail. This is due to a lack of understanding of the injury done. It is not realized that a bruise or scratch upon a fruit will not only cause it to break down, but that it will very seriously endanger others.

(3) Transportation. In selling locally or to nearby markets this does not assume the grave importance it does when car lots are shipped. So far the Texas growers have not shipped many figs in this way, but it is entirely possible and very probable such shipments will be made in considerable quantities. Under transportation would come such points as billing and routing to insure quick delivery, pre-cooling, refrigeration or ventilation, re-icing, switching, diverting and storage. The grower should study the construction of refrigerator cars and learn their possibilities. These functions are now largely handled by the

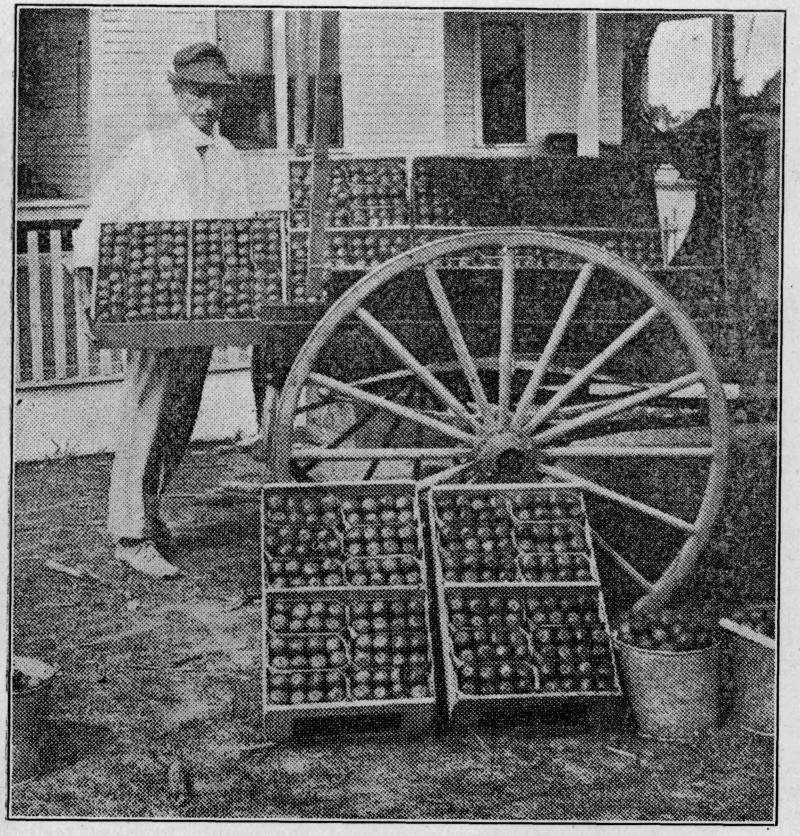

Figure 9—Crating Magnolia figs in strawberry boxes.
(Courtesy Texas State Department of Agriculture.)

railways, but there is a tendency for the growers to control these through their associations. This has a direct bearing upon the condition of the product at market and so is of vital interest to the grower.

(4) Marketing. This is the last stage and the one that has caused the greatest complaint. If all the other steps are perfect and this fails, the grower gets nothing. This, too, is largely out of the grower's hands at the present time, and probably will continue to be for many years.

This is where the "middleman" takes control and gets his per cent. of the profits. It is here that all of the failures of the earlier steps are manifested. A bruise, not noticed when grading, has become mouldy or decayed, soiling other fruits and ruining the crates' appearance. The fruit jobbers have been tempted and some have fallen, but a large part of the marketing dissatisfaction is due to carelessness in preparation.

Overproduction. There has been talk of the fig crop exceeding the demand. There is some truth in this with the present system of distribution and marketing. But with all the trees that are now coming into bearing there is little danger of overproduction if the fruit is properly distributed. Fresh figs are not common on the Houston and Galveston markets, the centers of the fig section. During past seasons

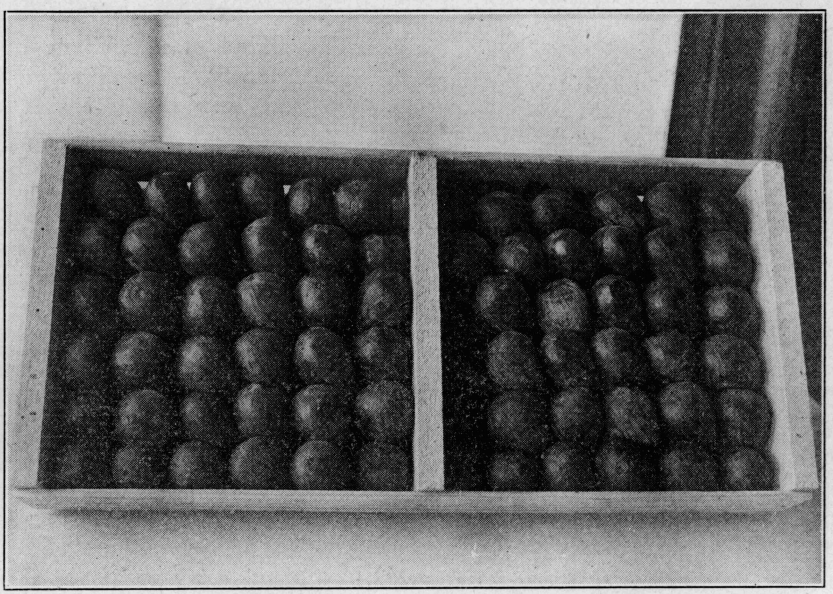

Figure 10—Crate of Mission figs.

numerous towns were visited within easy shipping distance of the fig section, and yet very few figs were found on the market. In the North it may be necessary to educate some of the people to like fresh figs, but such is not the case in the South, where figs have been grown for generations. As long as there are scores of towns in the State without figs, there can be no overproduction.

The chief thing for the grower to learn and to put into practice at every step is that he is in a very specialized business and that it takes special methods to make it a success. There is no crop that requires more careful handling, and none that offers more certain profits if preparation is correct. There are enough people now in the North from Southern Europe who have known figs for all of their lives, to consume hundreds of cars at a fair profit to the growers.

Gathering. The fig increases very much in sweetness, weight and general quality as it reaches maturity. For this reason it should be allowed to remain on the trees as long as possible. There is no distinct ripening after the fruit is picked, as is the case with some other fruits. But like other fruits they must be picked before reaching full maturity if they are to be shipped any distance. The length of this shipment will determine the stage. Figs must be picked with the stems attached. This can be done with most varieties by catching the fruit by the stem and giving a quick upward movement. In some cases it may be best to cut the fruit with clippers or a knife. Every precaution should be used to prevent injury. For this reason and for the comfort of the pickers, cloth gloves are often worn. The fruit should

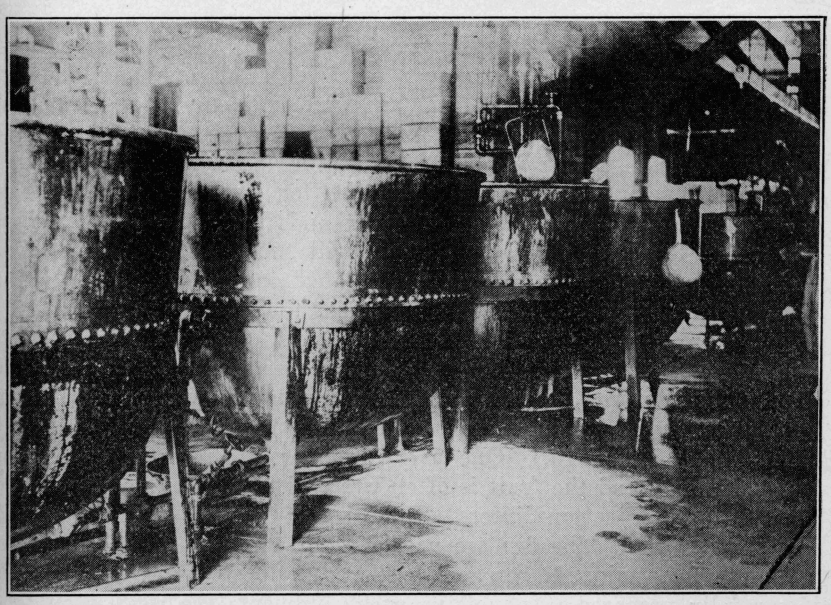

Figure 11—Fig preserving kettles at Pearland, Texas.

be placed gently in shallow trays or baskets and not handled again until it is packed. The fruit should never be poured from one receptacle to another. Strawberry trays are often used for picking. There is also a shallow, flat tray used. This is about twelve by eighteen inches in size and has a detachable handle. The trays are slipped into a frame having compartments to fit. In this way the figs are protected from sun and dust.

Picking is best done in the early morning, after the dew has dried, but before the heat of the day.

The fruit should be hauled from the field upon a wagon having springs and shaded as much as possible. The fruit should be graded as to ripeness and size. Great care should be taken to keep out any

bruised or injured fruit as it will quickly break down and ruin the appearance of the package if not causing the other fruit to rot. The skin near the stem is often broken in picking and this point should receive close attention. The eye is another point to receive special attention. In some varieties small insects may enter here. Souring is first outwardly shown here. Even a small amount of juice would justify discarding the fruit. Splitting and small cracks should be watched, as these may be forced open in transit.

There is no standard fig crate. The variety and local uses largely determine what shall be used. The twenty-four-quart strawberry crate has been used quite generally. The figs are nested in the boxes, the bottom row with stems up and the top row with stems down. Two layers of eight Magnolia figs each, or sixteen figs, will fill a box. For more tender varieties or for long shipments other crates and methods may be better. The California growers use, for the Smyrna variety, a shallow crate holding one layer of figs. It is one and one-half inches deep, seventeen inches long and sixteen inches wide (outside). This is fitted with four square baskets holding sixteen figs each, or sixty-four figs to the crate. There is another package frequently used for Smyrna figs. This has five rows with ten figs to the row. Strips of paper are cut the length of the tray and five inches wide. These are folded the long way so that they will form a right angle. The folded strips are placed in the crate so that one side is flat upon the bottom, the other standing upright against the side. (See Figure 8.) The figs are now placed with the stems down. When the row is completed another strip is placed in the crate so that the upright side separates two rows. Mission and other less tender varieties are often nested two layers deep in crates holding about one hundred and fifty fruits. (See Figure 10.) One-layer containers are regarded as best for long shipments and the fruit is often wrapped with soft paper or nested in wood-wool or cotton linters. No form of press is used in nailing on the crate top. The figs are packed flush with the top of the crate.

Figs may be shipped anywhere in Texas by local express without ice, if carefully prepared. In making such shipments the route should be looked up and as much of the journey made at night as is found practical.

For longer shipments greater care is required. The fruit should always be wrapped in soft paper and a mat of cotton placed above and below. The shipments may be made in solid cars or with other fruits. In either case the fruit should be kept at a low temperature. Precooling or loading into previously cooled cars is necessary for the best results. In shipping with other fruits in refrigerator cars the figs should be placed at the ends of the car and at the bottom of the piles because this section is the coldest.

Pony refrigerators have been successful and their extended use will be justified. One lot of early Smyrnas recently sent to Chicago from California in pony refrigerators brought at auction $2.75 per crate of thirty-two figs. This lot was shipped with others not fully ripe. The

green fruit did not ripen or improve in flavor and sold for $1.30 per crate. Shipments have also been made of figs dipped in paraffin. These reached the market in fair physical condition, but the flavor was entirely ruined and the figs were worthless. In all cases where cotton or wood-wool is used for packing the fruit must be wrapped to prevent this material from sticking to the figs.

There is much work to be done along this line, but if the growers ever get a system perfected so that the fruit may reach Chicago and New York City in sound condition they will receive great financial reward.

A summary of the few available reports on fresh fruit shipments may be of some value. R. H. Price in Texas Station Bulletin No. 62 says figs for home use should be harvested ripe, but for long shipments should be harvested slightly green. Great care must be used to prevent bruising. Pick by catching hold of the stem and bending upward. Harvest in the early morning. The fruit may be shipped in refrigerator cars to Kansas City, Topeka and Saint Louis.

Professor Starnes in Bulletin No. 61 of the Georgia Station says if not overripe the fig will carry well if carefully handled. Pack in berry boxes or shallow trays. Figs cannot be gathered prematurely and ripened well as peaches and plums. Handle rapidly and tenderly. A twenty-four-hour trip reaches the danger line. A rainy season during ripening spells ruin. Even too much atmospheric moisture is dangerous and often causes the figs to sour or split.

Dr. Coit in the *California Cultivator* for November 12, 1914, says: "There is a heavy demand for fresh figs in the bay cities (San Francisco, Oakland, Berkeley, Alameda, and Richmond, California). Fruits fully ripe are cut from the trees—never pulled—and packed in shallow boxes one layer deep with stiff paper between the rows. Some shippers use wood-wool in the bottoms of the crates. It has been found very profitable."

Mr. Roeding in *Practical Horticulture*, February, 1914, says: "Calimyrna (Smyrna) figs have been shipped fresh by regular refrigerator service to New York, Chicago and other Eastern points and have netted growers ten cents per pound."

Mr. Earle in Bulletin 5, Division of Pomology, U. S. D. A., says: "The fruit is very perishable. Pick in the morning with stems attached. Do not bruise. Use only small picking vessels. Strawberry crates and shallow trays holding only one layer are best. For distant shipments pick while still firm. The fruit does well under refrigeration and will keep for twenty-four to thirty-six hours at ordinary temperature."

Wilcox and Hunn, in Press Bulletin No. 47 of the Hawaii Station, have made an interesting report on storing fresh figs. "In this test figs of several varieties were placed in storage at from 32 degrees to 45 degrees Fahrenheit. They were ripe enough for table use and were allowed to stay one day in the station fruit room before going into the refrigerator. The results were as follows: after twelve days at 32 degrees a few figs showed surface mould, but their color and flavor were

unchanged. The remainder were in excellent condition without sign of mould. After twenty-two days few mouldy spots. At thirty days flavor and condition of pulp perfect. After forty-four days, flavor began to deteriorate and to take on an odor similar to ammonia.

"When stored at 45 degrees they seem to break down sooner than at 32 degrees. At the end of forty days all figs showed mould on the outside and had deteriorated in flavor.

"Conclusion. Figs seem adapted (picked ripe) to cold storage at 32 degrees Fahrenheit for a period of one month. As a result the pulp is firmer and more attractive in appearance and equal in flavor to fresh fruit."

PRESERVING.

Preserved figs form the basis of the fig industry in Texas. So far the growing and management of the trees have been with this object in view. As there is no region far advanced in this particular line of the work the Texas manufacturer and grower has been without a guide to help him surmount his difficulties. He has been a pioneer not only in Texas but in the world. His mistakes have been numerous, but still the production of and demand for his products have steadily increased.

Fig preserves have been common in the South for many years, and this has helped in the establishment of a market. Restaurants and dining cars have aided in the introduction of the product into Northern sections. The immigrants from Southern Europe also use large quantities, and in some cases special packs are being put up for them. These, with the natural pleasing of fig preserves, would seem to indicate a constant increasing consumption.

COMMERCIAL PRESERVING.

The grower should use nearly the same care in harvesting his fruit for the preserve factory as for fresh shipments. One successful manufacturer said his greatest trouble was in getting sound fruit at the proper stage of ripeness. Only shallow vessels should be used and the fruit harvested when dry. Constant care must be taken to avoid gathering sour figs. There will be many of these during damp weather and their presence very greatly detracts from the value of the crate. Split figs should be placed in separate containers, as they bring a fair price for jams and paste. They should never be mixed with the best grade as a few of them will tend to cheapen it. Fruit injured by birds or insects may also be used for jam. These fruits generally sell for about half the price of the first grade.

Figs for preserves are harvested just before they reach the best table quality. Mr. J. C. Carpenter of La Porte, Texas,—one of the first men to go into this work—says: "I consider the Magnolia fig mature when the vivid green has receded into the stem, leaving the skin mottled. In this condition it absorbs the syrup perfectly and does not crush."

As the fig reaches maturity it grows very fast and the increase in

weight is a considerable item to the grower. This increase is largely sugar and so reduces the amount required in preserving. Mr. A. C. Van Velzer of Houston, Texas, places this gain in weight as high as 15 per cent. daily.

At this time the fruit is harvested by breaking the stem at the point of union with the branch. This method gives rise to many figs with the skin broken around the neck and under such conditions the fruit must go into jams as it will not stand up under the various preserving processes. The use of small clippers will probably be found profitable.

During the warm summer weather the fruit ripens very rapidly and should be picked every day. The usual price for this work is about twenty-five cents per hundred pounds. Cloth gloves are worn to protect the fruit and the hands of the pickers from the fuzz and milk.

From the shallow picking baskets the fruit is carefully poured into field crates. These are usually made of sweet gum and are strong and

Figure 12—Texas preserved figs.

light. Mr. Carpenter gives the following as the best size: "After years of experimenting I have finally adopted a box made of gum, eight inches deep, three-fourths inch ends, three-eighths inch sides and bottom, twelve and three-fourths inches wide and nineteen inches long, inside measurements. The gum is water-soaked and then thoroughly nailed with 6d cement coated nails. A cleated lid of three-eighths inch wood is useful in protecting the fruit from the sun and also permits stacking the boxes without injury to the fruit."

Only wagons with springs should be used for hauling the fruit. The field boxes should be kept in constant repair, as loose nails and splintered sides are very injurious to tender skinned figs.

The figs are worked up as quickly as possible after reaching the factory. If this cannot be done they must be stored in as cool a place as is available.

The first step in preserving is to remove the skins with the fuzz and

dust adhering. This is done either by placing the figs in boiling water for one to three minutes or by dipping them in a dilute solution (two per cent.) of boiling lye. The fruit is now passed through several vats of fresh running water or subjected to a strong spray of water to completely remove the skins and all traces of the lye. From the washing vat the figs pass through sizing and grading processes. Here two or more sizes are made and any injured fruit is removed. The fruit now goes to the preserving kettles. These are usually copper jacketed and may be either flat or upright. The capacity varies greatly, but four to twelve bushels is the most common size. The fruit is now covered with a screen made of wire and heavy enough to keep all the figs under the syrup and still not press them on the bottom. Sugar syrup is now poured over so that the fruit is well covered. This syrup is made from canner's sugar or granulated sugar and water. The factories measure the amount of sugar to use by a saccharometer. The usual density at the start is about 30 degrees Balling, but is gradually concentrated by evaporation as the cooking continues. The fruit is cooked slowly, without stirring, for about four hours; removed and packed hot into the various containers. Hot syrup is now poured over the fruit and the jars or cans are sealed. In some cases the preserves are allowed to cool and are then placed carefully in the glass jars by hand. This, of course, necessitates sterilizing the finished product.

Various modifications of this method are found in the different factories. One well known firm starts with a syrup of high density and slowly brings the figs to 180 degrees Fahrenheit. They are then run into shallow pans and set aside until the third day, when they again are brought to 180 degrees in a little heavier syrup. This continues until the fruit is thoroughly saturated with sugar and becomes semi-transparent, the whole process covering several days and from three to five cookings.

In some cases the fruit is slightly pricked with copper needles so that the sugar may be more readily absorbed. The use of very heavy syrup at first may cause the figs to shrink and become hard on the outside. If the figs are found to be too soft to stand up they may be hardened by placing for a few hours in alum water (1 oz. to 8 gals. of water) before starting the process. If more fruit is received than can be worked up it may be held for four or five days by sulphuring for a few minutes and then setting aside in vessels of fresh water.

In certain sections of Texas where there are no factories, large quantities of figs are given a preliminary cooking and sent to Northern (chiefly Chicago) factories to be finished. This consists of peeling the figs and packing them in five-gallon tins. These are filled with a light syrup, sealed and brought to 212 degrees Fahrenheit. They are then shipped in car lots. This method has been reported as fairly successful if proper care is taken in the preliminary preparation. Several California houses have followed this to some extent.

PRESERVING AT HOME.

Most of the Southern housekeepers are familiar with fig preserving. The following recipe is obtained from one of them: The fresh fruit is graded and separated into two sizes, washed in cold water and weighed. Steam for ten minutes to soften the skins and place the fruit in boiler. Pour over this a little water and then add one pound of sugar for each pound of fruit. Cook slowly for one hour or until the fruit is easily pierced with a fork. Put into jars while hot and seal. Flavors of different kinds are added to the syrup in cooking if desired. Vanilla, lemon juice and peel, ginger, cloves and spice are often used. The fruit may be peeled by hand, with lye or by scalding.

Jam.—The cull fruit is cleaned and cut into several pieces. It is then weighed, put into a boiler, covered with water and cooked until it becomes pulpy. When the jam is nearly done, three-fourths of a pound of sugar is added for each pound of fruit. This is put into jars while hot and sealed.

CANDIED AND GLACE FIGS.

In France and in some sections of the United States there is a considerable industry in making a fig confection that is eaten out of the hand as chocolates or bonbons. The principle is that of saturating the fruit with sugar and removing moisture so that the fruit retains its natural color, shape, and flavor. The details of the various methods are too long for quotation here, but a brief summary will be given.

Sound, nearly mature, fruit is selected so as to be firm for the operations. The fruit is put into jars and a hot syrup of low density (15 degrees Baume) is added. Set aside for one day. Remove the fruit, drain and return to jars and pour over a stronger syrup (17 degrees Baume). This is repeated until a syrup of 36 degrees Baume is reached. In this condition the fruit will keep for several weeks. From this stage the fruit is put on the market as preserves, brandied, crystallized or glace. To crystallize, the syrup is slightly concentrated (38 to 40 degrees Baume) and the fruit allowed to stand eight or ten days. It is then removed, washed lightly with a sponge and cold water and placed on screens in a dry room. When dry the fruit is placed several layers deep in a crystallization box. A syrup is made of eight pounds of sugar to one gallon of cold water. It is then heated until it marks 33 degrees Baume when boiling. It is then cooled and poured over the fruit. Crystals will form within twelve hours. The syrup is drained off and fruit dried.

To glace, the fruit is dipped into a very dense hot syrup when it comes from the dry room instead of going into crystallization tanks. This forms a transparent sugar coating.

DRYING.

The bulk of commercially grown figs were dried until preserving was developed in the Southern States. In other countries drying is still the chief use of the crop and probably always will be. The per cent. preserved of the total world crop is very small.

There has been little drying attempted in Texas. There are many families drying a few for home use, but there does not seem to have been any attempt from a commercial standpoint. The largest part of the fig producing area is located in a section with heavy annual rainfall and high humidity, so that natural drying is out of the question. There are several "cook stove" evaporators in the homes of this section that are used for drying figs and other fruits for home use. For this purpose the fruit is allowed to dry on the trees until it shrivels, but is gathered before it falls. If the weather is suitable it is spread on cloths in the sun during the day and rolled up and put under cover during the night. If the weather becomes bad the fruit is placed in the trays of the evaporator and a slow fire maintained in the stove. When finished the fruit is packed tightly into earthen jars, covered and set aside until needed.

In commercial drying the fruit is allowed to ripen and fall to the ground. The fruit is picked up every six or seven days and hauled to the drying yards. Here it is placed on trays in the sun for several days, the length of time depending upon how fast the fruit dries. When the texture has become soft and pliable the fruit is considered dry. It is graded and sized and then dipped into a solution made of salt and soda dissolved in water. This is to cleanse and disinfect the figs. In some cases a small amount of lime is used instead of soda. The fruit is allowed to remain in the solution for about twenty minutes. It is then put on the trays and exposed to the sun for about six hours. After this the trays are put into stacks for a few days to complete drying. They are then placed in sweat boxes and allowed to remain for about ten days when they are ready for packing. In some cases the fruit is subjected to the fumes of burning sulphur a few minutes after dipping, before drying. This will bleach the fruit and kill any insects present.

The fruit is usually steamed just before packing to make it soft and pliable and to disinfect it. There are several grades made. The fruit is split by the packers with a knife from near the eye to the stem. It is then rolled and spread between the fingers until the eye is up and the stem tucked away below. The fruit is then placed in a form or mold that will hold a certain weight. When the form is filled the figs are pressed down lightly and the form removed. These bricks are then wrapped in paper and labelled. The lowest grades are put loose into fifty-pound boxes. There are also various special packs put on the market and numerous modifications of the method summarized.

Though there are few figs dried in Texas the southwestern section holds considerable promise.

TABLE NO. 4.

Comparative Temperature, Rainfall and Humidity Records, Fresno, California, and Southwest Texas.

	January.				February.				March.				April.				May.				June.				July.				August.				September.				October.				November.				December.			
	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.
1911																																														
Fresno	72	27	4.23	71	69	29	1.14	68	83	42	3.30	74	85	34	1.03	58	97	41	.22	48	102	51	T	39	111	58	T	32	104	55	0.00	35	99	48	.01	43	91	41	.09	51	77	31	.17	53	72	24	1.05	69
Beaumont	82	15	3.06	....	.....	.....	.....	....	.....	.....	5.96	....	100	51	1.71	....	101	67	3.81	....	96	67	8.91	....	99	58	2.48	....	97	69	2.79	....	96	41	5.73	....	86	25	2.09	....	73	30	15.12	....
Beeville	88	13	.33	....	88	32	2.09	....	95	42	2.34	....	93	53	3.13	....	96	56	6.06	....	103	65	1.76	....	99	70	.13	....	102	69	T	....	103	70	.48	....	96	36	.82	....	90	19	2.66	....	78	24	4.12	....
Brownsville	82	21	.45	....	83	38	2.05	....	86	49	1.78	....	92	57	2.05	....	94	58	1.84	....	101	68	1.21	....	96	70	.63	....	97	69	T	....	97	71	2.75	....	94	44	.66	....	88	27	1.54	....	80	34	2.16	....
College Station	86	12	.31	....	87	27	3.50	....	92	36	3.05	....	89	43	7.08	....	100	49	2.70	....	106	62	.38	....	101	66	5.67	....	104	63	2.64	....	101	65	1.61	....	98	38	3.55	....	87	20	1.87	....	76	26	7.25	....
Corpus Christi	84	21	.24	86	80	37	.72	82	83	45	2.64	84	92	55	3.95	86	90	57	3.74	79	97	72	1.00	80	92	71	2.04	81	92	73	0.00	81	92	72	1.77	82	89	47	.86	77	83	29	1.49	71	76	35	2.65	85
Falfurrias	92	10	.35	....	91	30	.49	....	98	44	.93	....	102	53	3.62	....	99	56	1.29	....	106	54	.10	....	105	68	.81	....	106	66	.67	....	103	67	1.11	....	100	35	3.61	....	96	20	1.76	....	89	24	2.25	....
Del Rio	92	14	.15	....	89	28	2.29	....	95	38	1.59	....	95	47	2.85	....	101	54	.27	....	105	70	T	....	105	67	.54	....	106	72	1.14	....	103	72	.36	....	97	34	1.11	....	86	18	2.65	....	76	24	2.23	....
Galveston	73	19	.90	91	75	36	.69	84	76	48	3.88	81	82	53	7.63	87	93	56	1.90	74	97	69	1.45	77	88	70	4.73	76	92	69	5.48	76	90	72	3.50	79	88	49	5.92	80	76	26	5.06	79	68	40	9.99	88
Laredo	94	17	.18	....	94	34	1.55	....	98	44	2.27	....	105	53	1.72	....	102	55	2.00	....	107	70	0.00	....	108	72	.71	....	107	67	.52	....	104	65	0.00	....	104	40	3.07	....	93	27	4.85	....	82	27	.52	....
San Antonio	87	16	.02	69	85	29	1.66	73	92	39	2.72	70	92	49	3.41	79	96	54	2.01	69	101	68	.30	60	102	64	1.03	65	102	67	.48	61	95	74	.12	68	95	40	3.57	66	87	23	2.01	62	76	30	1.35	70
1912																																														
Fresno	73	24	.72	81	75	30	T	58	72	37	3.02	67	77	37	1.86	60	88	40	.41	49	107	51	T	37	109	55	T	33	106	54	0.00	36	98	49	.10	44	89	38	.01	44	80	36	.85	65	66	27	.35	64
Beaumont	82	24	2.77	....	76	32	3.31	....	80	36	3.32	....	86	44	9.37	....	95	55	6.96	....	96	61	4.32	....	99	68	6.15	....	97	69	6.33	....	97	61	.21	....	94	46	1.91	....	85	29	1.19	....	81	31	13.39	....
Beeville	78	19	.63	....	84	22	4.82	....	84	37	1.02	....	92	44	3.18	....	95	53	5.78	....	96	63	2.84	....	103	69	.15	....	102	72	.91	....	102	58	3.10	....	94	55	4.67	....	84	30	1.37	....	80	31	1.54	....
Brownsville	87	24	3.28	....	94	27	.17	....	86	40	.20	....	97	52	1.76	....	98	56	1.59	....	92	64	12.78	....	96	71	.13	....	96	70	.12	....	97	63	2.35	....	90	53	13.53	....	85	39	1.40	....	80	34	1.51	....
College Station	79	10	.92	....	79	16	2.53	....	80	34	6.58	....	87	45	2.11	....	97	52	4.12	....	98	56	2.21	....	105	68	2.98	....	101	68	.21	....	102	55	1.14	....	98	48	1.64	....	84	27	.92	....	73	28	5.33	....
Corpus Christi	78	22	.44	80	83	25	1.49	75	80	40	.58	87	88	53	1.57	90	89	60	8.45	87	92	65	6.48	82	91	74	.11	79	91	75	.04	82	93	61	1.33	79	86	54	4.02	79	82	39	1.58	80	77	36	1.53	83
Falfurrias	88	20	.39	....	93	22	1.63	....	90	37	.35	....	100	41	1.44	....	102	58	1.75	....	98	57	1.80	....	105	65	T	....	105	67	T	....	105	53	.72	....	98	54	4.87	....	89	30	1.22	....	84	29	1.46	....
Del Rio	89	22	T	....	92	18	.07	....	85	34	.58	....	94	37	1.17	....	108	46	0.08	....	107	57	6.22	....	106	72	.10	....	106	74	.17	....	103	50	4.89	....	93	43	1.94	....	80	29	1.09	....	76	24	1.76	....
Galveston	71	20	2.44	83	70	27	1.91	72	73	40	2.00	88	83	53	4.29	87	88	61	4.50	80	88	67	4.03	79	93	75	.16	76	90	70	1.56	77	94	65	1.04	76	87	55	2.04	77	78	43	.41	73	75	38	8.61	84
Laredo	93	20	0.00	....	98	19	0.00	....	96	35	.39	....	100	45	1.42	....	110	47	.85	....	110	60	7 42	....	108	67	0.00	....	108	72	0.00	....	109	64	1.20	....	101	48	2.12	....	88	33	.14	....	83	25	1.46	....
San Antonio	83	18	.28	66	78	18	5.12	60	82	35	1.86	76	90	42	1.78	72	101	55	1.49	65	98	59	3.22	68	104	70	1.27	63	100	70	.29	65	100	57	1.47	62	93	51	2.74	67	81	30	1.45	66	74	31	2.76	73
1913																																														
Fresno	67	17	1.22	69	74	28	1.71	65	83	34	.63	55	94	38	1.01	48	98	40	.30	45	97	50	.10	45	109	58	.33	37	108	54	T	35	107	48	T	37	92	43	T	36	79	34	1.86	79	66	29	1.53	81
Beaumont	75	23	6.64	....	79	31	4.72	....	84	34	1.78	....	88	45	4.05	....	92	57	4.31	....	95	65	3.64	....	100	71	1.71	....	103	68	8.93	....	99	54	16.33	....	92	40	5.21	....	85	43	5.17	....	79	32	3.56	....
Beeville	82	25	.58	....	87	32	1.55	....	95	30	1.05	....	93	38	.14	....	98	52	.35	....	100	60	5.28	....	103	64	.12	....	104	63	1.77	....	102	46	13.06	....	92	30	2.84	....	86	42	3.97	....	89	30	2.06	....
Brownsville	79	30	2.05	....	85	37	1.00	....	83	33	1.86	....	84	44	.38	....	89	55	1.12	....	91	65	4.96	....	96	69	.28	....	96	70	1.04	....	98	56	14.38	....	93	45	1.76	....	85	44	.64	....	84	34	1.17	....
College Station	77	18	2.98	....	79	29	3.63	....	88	28	3.23	....	88	40	2.98	....	95	55	2.44	....	99	59	1.53	....	106	67	.06	....	105	65	.88	....	104	51	3.15	....	92	33	4.43	....	82	40	4.74	....	76	26	12.66	....
Corpus Christi	76	27	.92	82	76	35	2.23	87	82	37	2.01	80	84	48	1.26	78	82	63	.76	81	87	71	3.95	85	94	72	1.18	82	93	74	.60	81	92	59	9.17	83	87	45	.43	78	80	46	2.32	88	77	41	1.34	80
Falfurrias	85	27	1.01	....	90	30	1.32	....	96	29	1.54	....	97	37	1.54	....	99	53	1.15	....	101	66	4.81	....	101	66	1.10	....	105	64	1.16	....	105	47	6.17	....	100	32	.54	....	92	33	1.70	....	86	29	.99	....
Del Rio	.....	.....	.....	....	80	29	.50	....	100	28	.20	....	96	38	.51	....	97	55	.64	....	98	65	5.44	....	99	66	1.52	....	97	69	1.70	....	100	50	1.59	....	88	32	3.78	....	80	35	4.54	....	78	32	1.72	....
Galveston	70	27	2.92	86	70	36	3.27	83	79	37	1.43	81	78	49	2.46	77	83	60	3.87	78	91	68	2.51	80	99	75	1.48	77	96	67	3.88	76	91	62	18.68	80	85	43	15.37	81	76	47	2.49	90	72	38	2.11	82
Laredo	87	23	.47	....	93	34	1.18	....	100	28	.97	....	100	40	.06	....	103	57	2.16	....	102	67	7.76	....	104	68	0.00	....	104	69	1.32	....	104	53	5.93	....	97	31	5.68	....	90	30	1.28	....	89	35	.82	....
San Antonio	77	20	.90	68	85	30	1.91	74	91	31	1.36	65	90	41	1.32	61	95	56	2.88	67	88	70	2.90	74	101	71	.03	64	100	67	1.29	68	99	53	7.21	77	91	36	8.86	73	81	43	4.55	80	78	26	4.47	79

TABLE NO. 4—Continued.

Comparative Temperature, Rainfall and Humidity Records, Fresno, California, and Southwest Texas.

	January.				February.				March.				April.				May.				June.				July.				August.				September.				October.				November.				December.			
	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.	Max.	Min.	Rain-fall.	Hum.
1914																																															
Fresno	66	31	4.94	82	72	35	1.31	77	83	35	.25	70	92	43	.59	62	99	49	T	51	106	50	.23	42	104	57	T	36	106	54	T	35	99	52	.22	44	92	43	.26	54	83	31	.11	53	60	27	1.76	80
Beaumont	81	33	.43	....	77	28	1.66	....	79	36	6.39	....	87	43	9.23	....	91	58	19.85	....	102	68	1.16	....	102	73	6.39	....	97	70	8.91	....	97	58	2.61	....	93	40	.85	....	85	38	6.03	....	73	28	8.65	....
Beeville	83	30	.14	....	85	25	.99	....	86	31	1.41	....	94	38	6.05	....	92	61	10.54	....	100	65	.75	....	105	69	.08	....	106	67	13.33	....	99	53	1.47	....	98	45	8.10	....	85	34	2.39	....	80	27	1.37	....
Brownsville	88	30	.10	....	91	30	2.28	....	84	38	1.86	....	87	41	1.16	....	94	67	9.03	....	96	71	.63	....	98	72	T	....	97	72	.68	....	97	58	.86	....	95	54	2.58	....	85	47	5.13	....	76	36	2.19	....
College Station	80	28	.58	....	75	17	3.77	....	81	30	4.64	....	91	31	3.45	....	91	55	8.36	....	101	66	.26	....	106	67	.83	....	102	67	7.72	....	97	50	.69	....	94	36	.43	....	84	32	6.50	....	72	22	5.36	....
Corpus Christi	81	35	.19	75	81	29	.44	84	82	37	1.51	78	89	41	5.32	85	90	63	3.17	88	89	74	.04	83	95	72	.91	83	95	74	2.96	86	94	61	2.76	80	85	52	5.19	82	81	45	3.17	86	76	32	1.55	85
Falfurrias	90	21	.05	....	95	22	.34	....	92	29	.33	....	95	39	5.70	....	97	60	8.87	....	101	66	.45	....	105	65	T	....	108	69	.92	....	103	54	1.84	....	99	47	8.64	....	86	40	4.28	....	80	32	.59	....
Del Rio	83	29	.11	....	81	24	.90	....	91	28	.62	....	93	34	1.88	....	100	56	8.91	....	96	68	3.98	....	99	67	6.17	....	99	67	3.71	....	96	54	.59	....	93	44	6.67	....	77	38	3.76	....	73	25	.45	....
Galveston	73	38	.34	79	73	27	3.31	80	72	40	4.63	81	76	44	8.54	86	82	62	7.54	84	94	73	.12	78	94	74	1.29	82	86	78	8.17	79	89	63	5.20	71	76	67	2.95	81	75	45	9.19	76	68	28	4.43	82
Laredo	98	28	0.00	....	98	26	1.12	....	95	35	0.00	....	98	41	2.43	....	103	....	10.18	....	102	....	.59	....	105	72	.11	....	106	70	2.61	....	102	53	.90	....	98	48	3.71	....	85	40	3.95	....	77	32	.70	....
San Antonio	82	31	.09	59	78	23	1.38	67	81	34	.83	65	90	35	5.26	74	82	66	5.59	83	96	70	.01	72	102	74	.02	63	102	68	7.80	77	95	57	2.24	70	93	45	5.78	74	81	32	3.24	79	72	26	1.43	79
1915																																															
Fresno	64	31	2.78	77	74	36	3.47	72	84	40	.52	66	84	40	.81	64	93	40	.99	62	102	51	0.00	36	108	54	0.00	36	109	58	0.00	36	97	48	T	39	84	51	0.00	43	82	32	.30	60	....	....	....	....
Beaumont	79	30	5.76	....	76	37	2.82	....	83	32	2.80	....	91	36	2.64	....	94	58	7.56	....	100	69	.68	....	101	65	1.86	....	99	65	17.21	....	97	65	1.57	....	93	49	1.65	....	88	37	1.84	....	....	....	....	....
Beeville	77	26	1.27	....	84	32	.57	....	87	31	1.88	....	88	37	1.72	....	95	55	1.16	....	104	63	.19	....	104	61	.19	....	107	62	0.74	....	103	58	2.18	....	101	48	1.02	....	82	33	.21	....	....	....	....	....
Brownsville	76	30	3.35	....	83	37	.04	....	78	40	1.99	....	86	39	1.04	....	97	58	.50	....	97	68	T	....	98	64	.15	....	104	67	2.58	....	95	63	2.54	....	94	55	.82	....	88	42	.14	....	....	....	....	....
College Station	76	24	3.04	....	75	33	1.70	....	85	27	2.66	....	87	37	9.29	....	92	52	1.65	....	100	59	2.99	....	101	61	1.11	....	102	60	11.25	....	95	58	.78	....	93	44	.94	....	89	31	1.58	....	....	....	....	....
Corpus Christi	74	31	1.36	82	77	43	.23	77	84	38	2.56	79	81	44	1.58	90	86	62	3.22	84	91	68	T	83	87	78	.03	82	100	67	1.20	80	94	68	11.09	84	82	67	3.10	77	91	42	.22	75	....	....	....	....
Falfurrias	80	25	1.82	....	84	29	.07	....	89	31	1.68	....	93	34	1.67	....	101	54	2.59	....	105	64	T	....	105	60	.98	....	109	65	0.98	....	102	58	4.07	....	97	46	.56	....	95	30	0.00	....	....	....	....	....
Del Rio	71	25	2.32	....	77	32	.31	....	83	32	1.09	....	86	40	3.39	....	98	51	1.16	....	101	61	.63	....	101	67	3.85	....	100	60	4.21	....	98	63	2.90	....	88	47	.01	....	84	28	.01	....	....	....	....	....
Galveston	65	31	4.52	83	67	41	2.65	80	72	38	1.43	75	77	44	3.37	89	85	64	2.70	81	88	71	.08	77	91	70	2.45	75	91	68	19.08	80	90	69	2.12	79	85	60	2.81	75	81	43	1.47	72	....	....	....	....
Laredo	79	29	3.60	....	82	33	.27	....	92	34	.62	....	94	40	1.82	....	106	59	2.65	....	105	64	0.00	....	104	65	0.00	....	106	71	5.42	....	101	64	2.31	....	97	51	4.10	....	94	30	0.00	....	....	....	....	....
San Antonio	76	27	.53	65	76	37	1.81	61	88	29	1.20	67	85	39	11.64	79	91	56	1.89	73	101	62	.03	66	101	67	.92	64	101	58	3.60	68	94	61	2.39	78	92	49	1.11	64	75	52	.29	61	....	....	....	....

A glance at the table of rainfall, humidity, and temperature of some of the towns in this section compared with Fresno, California, will show the conditions are not very favorable for natural drying. With the greater abundance of cheap labor combined with a fairly dry climate and assisted, when needed, by artificial evaporation, the industry may become important. With labor at about $2.25 a day and high land values, it is estimated to cost the California growers one cent a pound to get their figs ready to pack. Texas growers can build drying sheds and still not exceed this cost.

THE SMYRNA FIG AND CAPRIFICATION.

The Smyrna fig received its name from the city of Smyrna in Asia Minor, which is the world's fig metropolis. The fig area is located

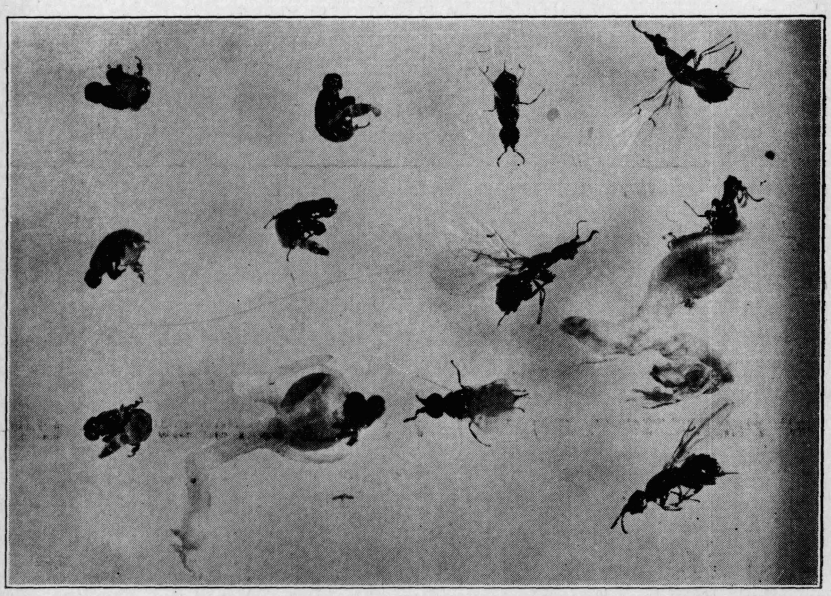

Figure 13—Fig wasp (*Blastiphoga grassarium*).

several miles away, but all of the export crop is shipped from this port.

The name Smyrna is used to indicate several varieties that produce only female flowers and that must be pollinated to ripen fruit. Their chief commercial use is drying.

The history of the introduction of the Smyrna fig into California and the subsequent colonization of the wasp forms one of the most interesting chapters in horticultural literature. The following paragraph will give a brief summary:

In 1880, Mr. G. P. Rixford, associated with the *San Francisco Bulletin*, introduced several thousand cuttings. These were planted widely over the state, but the fruit failed to mature. Several attempts were made to introduce and colonize the fig wasp (*Blastophoga grassarium*),

but all failed until 1899. At this time W. T. Swingle, and other agents of the United States Department of Agriculture, cooperating with Mr. Geo. C. Roeding, succeeded in establishing the wasp in the Roeding orchard at Fresno, California. From this time the Smyrna fig has spread rapidly and probably will replace the older types.

Caprification is the name given to the transfer of pollen from the male Caprifig to the female Smyrna. The following is a brief outline of how this is done: The fig wasp is a very small insect that lives and breeds in the fig flowers. The male is wingless, brown in color and seldom leaves the fruit where he developed. The female is winged, black in color and always leaves the fig to find others of proper age for egg laying. The fig wasps breed only in the wild or Caprifig. As the female leaves the fruit she is forced to pass through the male flowers surrounding the eye and her entire body is covered with pollen. When she has emerged her first act is to try to cleanse herself of the adhering pollen, but she is never completely successful. She then flies away to find young figs suitable for her purpose. If on the Caprifig tree, she enters the figs of the next crop, but if the fruits, in which she developed, have been removed and placed in a Smyrna tree, she will enter these. The Smyrna flowers are so constructed that she cannot lay her eggs in them, so in the search for suitable ones she crawls over many, brushing off the pollen she has brought from the Caprifig.

The Smyrna figs that have been pollinated show a change within a few days and develop into edible fruit. Those not pollinated soon fall to the ground and are lost.

As previously mentioned, the Caprifig has three distinct crops. They are known as the Mamme, Profichi and Mammoni. These may not all appear on one tree, so there are several varieties of this wild fig, each possessing desirable crops or some other peculiar characteristic. There are also three generations of the fig wasp that inhabit the three crops mentioned above.

The Mamme crop forms in the fall and the wasps pass the winter in the larva or pupae stage. Here, then, is one of the limiting factors in Smyrna fig culture. If these over-wintering figs are frozen the wasp is killed. Under date of November 20, 1915, Mr. Geo. C. Roeding writes as follows: "These figs will stand considerable frost and a succession of days in which it may be quite cold, without any apparent injury. It is safe to say they will carry through winters in which the temperature will go as low as 18 degrees Fahrenheit."

The Mamme or over-winter crop matures in April and the female wasp leaves the fruit to lay her eggs. She enters the young figs of the Profichi crop. The Profichi or second crop are the figs used to pollinate the Smyrna and it is important to have a large number of them. Any variety of Caprifig bearing only a few of this crop is not desirable for this purpose. The Profichi crop matures in June. At this time the Smyrna figs are about three-fourths inch in diameter and are ready to be pollinated. The Profichi figs are harvested early in the morning and distributed to wire baskets hanging in the Smyrna trees. The

wasps commence to issue as soon as the day warms up, finding no Caprifigs they enter the Smyrna and pollination is secured.

At this time the Mammoni Caprifig crop is also ready to be pollinated and the wasps entering these lay their eggs. This third crop matures in the fall and the wasps enter the Mamme, deposit their eggs and the year's cycle is complete.

Mr. Roeding places the cost of caprification at 25 to 50 cents an acre for trees four to eight years old. In older orchards the cost has never exceeded $1.00 an acre. It is estimated that eight good Caprifig trees will furnish enough insectivorous fruits for one acre of Smyrnas.

Smyrna figs have been tried at several places in Texas, but there does not seem to have been any systematic attempt to colonize the wasps. At Beeville, both Smyrna and Caprifig trees grew well and seemed as resistant to cold as some of the other varieties. The Horticultural Department of the College has received a number of fruits of both of these types from several parts of the State for identification, but in no case have they been grown in a commercial way.

In April, 1914, Mr. Rixford of San Francisco sent a few Mamme figs to Mr. H. B. Gaskell, of Kingsville, Texas. Under date of April 22, Mr. Gaskell wrote that the figs reached him in good shape and that the wasps entered his Caprifigs. In reply to an inquiry about the wasps, Mr. Gaskell wrote on November 23, 1915, that the cotton root rot had killed all of his trees before he was able to determine just what the wasps would do.

Mr. Rixford made another shipment of insectivorous figs in June, 1915, to Mr. A. P. Kahn, of Shreveport, Louisiana. Under date of August 25, Mr. Kahn reported to Mr. Rixford that the wasps entered his Smyrna figs and that he "succeeded in raising a crop of the most excellent figs I have ever eaten."

Though we have no record of the wasp passing through the Texas winters, it is practically certain they will do so, and it is not likely that they will be the limiting factor in the commercial production of Smyrna figs. The section most promising is within a line drawn from San Antonio west to Del Rio, thence southeast through Eagle Pass and Laredo to a point near Brownsville, thence north thirty or forty miles from the coast to Victoria and thence to San Antonio.