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TEXAS AGRICULTURAL EXPERIMENT STATIONS.

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REPORT OF PROGRESS WITH CITRUS FRUITS

AT THE

BEEVILLE SUB-STATION, BEE COUNTY

S. A. WASCHKA
SUPERINTENDENT IN CHARGE

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TEXAS AGRICULTURAL EXPERIMENT STATIONS.

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REPORT OF PROGRESS WITH CITRUS FRUITS.

BY

S. A. WASCHKA,
Superintendent in Charge.

This Bulletin was prepared with a view of meeting the heavy demands made upon the Superintendent and the Director of the Station for information concerning citrus fruit culture in South and Southwest Texas.

The citrus fruit industry is not yet permanently established. Great activity is going on along the coast belt, from Galveston and Houston to Brownsville. The information herein contained is based upon the experience of Mr. Waschka at the Beeville Station, together with the information which he has gathered from other sources. In some measure, the advice herein given may be premature, but it is believed that, on the whole, it will be of great profit and aid to the great number of people just beginning the industry. In any event, it will serve to take the place of a very heavy correspondence. For the last five years, until the cold spell in January of this year, the coast belt has not been visited by weather severe enough to test the endurance of the citrus trees. In January past, the temperature went to freezing even at the coast, and down as low as 20° to 24° over most of the citrus fruit belt. That the trees stood this temperature is a most encouraging circumstance for the development of the industry. One of the most frequent inquiries coming to the Station relates to the type of soils best adapted for the growth of citrus trees. It may be said that the citrus trees are apparently not very fastidious as to the type of soil best suited to them, and this is especially true if the right stock is chosen to work them on. Still, there are certain soils upon which we would not advise that they be grown. Sticky, heavy soils should be avoided for commercial groves. These soils are fertile enough, but they easily become dry and compact, unless under irrigation; and then they are more likely to become puddled or tamped and difficult to work. Soils that are not properly drained must, of course, be avoided; or soils that have hard pan are unsuitable, unless the hard pan is broken up so that the roots of the soil may easily penetrate it. Citrus trees are generally surface feeders, but still, provision must be made for the roots to penetrate to such a depth as will firmly anchor the tree in the soil. The trees succeed best on well drained, loose soils; preferably, perhaps, on a sandy loam that gradually changes into a heavy loam, underlaid by pliable clay, eighteen inches or more from the surface. Extremely open, porous soils are not desirable. A pure, sandy loam, with a clay subsoil, is well suited, provided it is properly enriched by the application of fertilizers.

PREPARATION OF THE LAND.

The land should be thoroughly prepared, as for any other crop. It should be deeply plowed—if the rainfall is low—and pulverized by harrowing and smoothing. If sod land is to be used, it is best to break it about three times—say, three inches the first time, followed by disc harrow, and then followed by a lever or section harrow. The second plowing may be carried five or six inches deep; harrowed as in the first instance. In semi-arid districts, the third plowing should be as deep as practicable—say, seven to ten inches; and harrowed as before. It is preferable, of course, that the land be prepared as above before the trees are set out.

Dugat Orange Tree, 4 Years Old.

PLANTING THE TREES.

The hole should be made large enough to admit the roots without cramping them and deeper than is necessary for setting the trees. Then the hole should be filled in with moist, surface, loose soil to the depth desired and tramped firmly before setting the tree. The trees should not be set any deeper than they stood in the nursery, but fully as deep. If there are broken roots, they should be cut off smooth. The tops should be cut back to about eighteen inches, but care taken to leave

plenty of buds from which to make the future tree. Moist, surface, loose soil should be introduced by hand until the roots are well covered, and then tramp or pack the soil firmly with the feet. This will leave a small basin around the tree, upon which should be poured a few buckets of water, if necessary. If water is used, it should be allowed to soak in completely before filling the basin with additional soil. When the trees are received from the nursery they should be immediately unpacked, and heeled in moist soil. The soil should be firmly packed about the roots, and it is better to *grout* the roots before heeling; that is, to dip them in soft, sticky mud or clay, so that the root cells are

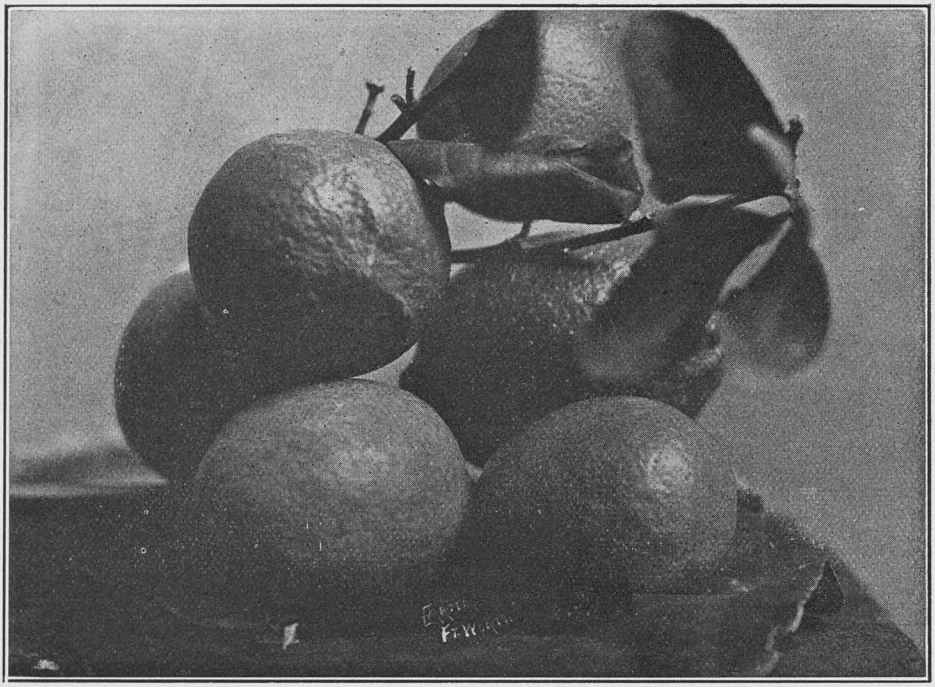
Pernambuco Pomelo or Grape Fruit.

closed; but it is better to set the trees as soon as possible after receiving them, and only a few trees should be taken out at a time from the heeling bed, because the sun, wind, and dry open air are very injurious to them. If the small fibrous roots have become dried to even a slight extent, it is better that they be removed, but not otherwise. Trees may be planted during the months of December, January, February and March, but preferably during December and January, since this gives the roots a chance to become better established before the hot, dry summer comes on. In case the trees are planted during the early months of the season, they should be banked with clean soil, covering about two-thirds

of the body of the tree, above the union, which should be about two inches above the level surface, if the budding or grafting has been properly done. These banks should be removed, of course, and the ground leveled off as soon as all danger of freeze is past.

SELECTION OF VARIETIES.

It may be said, first, that there is a decided advantage in planting early maturing varieties, so that the fruit may be gathered before frost. It is desirable also to plant the variety that will produce fruit at an early age.



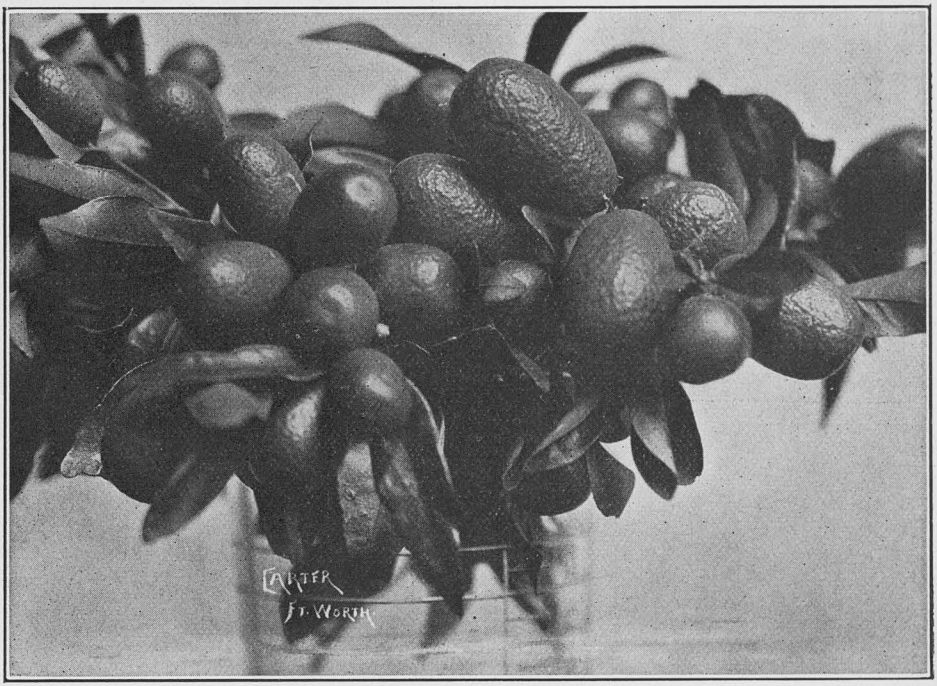
Lemons at the Beeville Station.

A selection of thirty varieties of oranges was planted at this Station in March, 1907. The trees were small, and one-year-old when set; the past year (1908), one year from setting, the following varieties are bearing some fruit: Satsuma, Dugat, Washington Navel, Mandarin, Mediterranean Sweet, and Parson Brown. Other varieties are expected to commence bearing this year. The following is a partial list of early varieties, which mature their fruit about as follows: Satsuma, Dugat, Boone's Early, Enterprise Seedless, Parson Brown, and Foster, October to November; Early Oblong, September to October; Centennial China, and Surprise Navel, November to December; Dancy, Washington Navel, and Nonpareil, December to January.

The Satsuma is the hardiest, and will resist more cold than any other orange. So far as our experience goes, the Dugat is the next hardiest. We have had more experience with these two than with any other variety. They are young and heavy bearers, and the fruit of both is excellent for market. The Dugat has produced 200 nice, marketable oranges when the tree was three years old, and 250 when the tree was four years old. The Satsuma will do about the same thing, if properly cared for.

STOCK FOR CITRUS TREES.

The sour orange, rough lemon, sweet orange, and pomelo, are commonly used in propagating citrus trees, but the *Citrus trifoliata* stock



Cluster of Nagami and Marumi Kumquats.

is preferable, because it is the hardiest, being deciduous. To some extent, it seems to impart some of its hardiness to the scions worked upon it. The trees budded on this stock come into bearing at an earlier age, as a rule, and produce their fruit early in the season. This applies to lemons and pomelos as well as to oranges. It has been claimed that the trifoliata stock dwarfs the tree, but this seems to be an error.

THE POMELO OR GRAPE-FRUIT.

The commercial value of this fruit is not properly appreciated, and the tree is not, therefore, being extensively planted in this State. This

is mainly because the fruit is not so well known as the orange. The planting and culture of the pomelo is the same as that of the orange. All the varieties that have so far been tried at this Station are heavy bearers the third year after planting. Some of the individual apples of the Tresca variety measure five and a half inches in diameter, while the other varieties average about four and a half inches in diameter. Our experience is that the pomelo is as easily grown as the orange, and nearly as hardy. The demand for the fruit is steadily increasing, and the market cannot be supplied at reasonable prices. The following table indicates the varieties tested at this Station and the number of well-matured fruits, at three and four years after setting:

Name of Variety.	Number of fruits produced at 3 years old.	Number of fruits produced at 4 years old.	Diameter average size of fruit —inches.	Number of fruits required to fill box.
Triumph	10	137	$4\frac{1}{4}$	64
Tresca	16	165	$5\frac{1}{4}$	28
Duncan	8	176	4	80
Pernambuco	65	276	$4\frac{1}{2}$	54
Royal	30	648	$3\frac{5}{8}$	96

The fruit intended for market should be well graded and each grade wrapped separately with tissue paper and packed separately.

LEMONS.

The commercial lemon has proven to be a young, prolific bearer; fruit is excellent in size and quality, and will doubtless secure a permanent place in the markets. But it must be remembered that the lemon is not so hardy and resistant to cold as the orange and the pomelo. The only variety that has been tried at this Station is the Villa Franca. The trees were small, one-year size, planted in February, 1904. In 1907 they bore six to twelve lemons to the tree. In 1908 some of the trees had as much as 164 lemons of excellent quality; the lemons measuring $2\frac{3}{8}$x$3\frac{3}{8}$ inches in diameter; fruit juicy, with very few seeds.

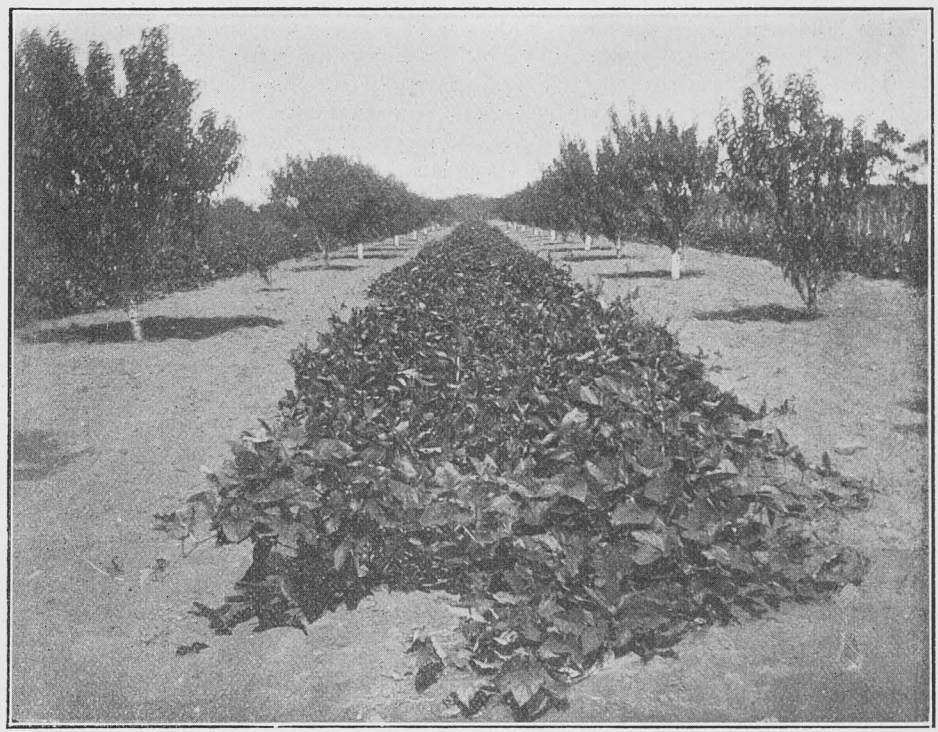
KUMQUATS.

We have grown two varieties of the kumquats, both of Chinese origin. The *Nagami,* oblong in shape, measuring about $1\frac{1}{8}$x$1\frac{3}{4}$ inches in diameter. The fruit of the *Marumi* variety is round, slightly flattened, and somewhat smaller than that of the Nagami. The kumquat, when ripe, has a perfect orange color, rather acid, but very aromatic, and is an excellent relish. The Nagami bears fruit mostly in clusters, and when cut with leaves attached forms a very attractive table decoration. Both varieties make excellent preserves, and, wherever known, are in great demand. For market it is usually packed in quart baskets and crated like strawberries or tomatoes. The trees are dwarfed, if, in fact, they may be considered trees, attaining a growth from eight to twelve feet in height, and two-thirds this measurement across the head.

They are very young and prolific bearers, setting a crop of fruit the first year after planting; comparing favorably in this respect with the Satsuma oranges; its hardiness being increased by using trifoliata stock to bud on. The low, dwarfish heads of the tree provide a great deal of protection to the trunk.

CULTIVATING THE CITRUS GROVE.

One of the most important features of success is taking proper care of the trees by thorough cultivation and conservation of the soil moist-



Cow Peas Between Rows of Trees.

ure in dry climates or dry periods, and in providing proper drainage in wet weather. Proper cultivation at the proper time is often equal to irrigation; in fact, it is at times better, because if irrigation is not properly conducted it may work positive injury. Cultivation should be followed after each rain or after each irrigation, if this be practiced. The ground should be properly worked with a harrow, or, if need be, with a cultivator, after every rain, in case the locality is one where the conservation of moisture is an important consideration. In fact, in such localities, it is a good practice to keep the cultivator or harrow going during the dry season, say, to the middle of September, after which cultivation should cease, in order that tree growth may be checked

and the wood hardened for the winter. Very deep plowing is not advisable after the tree begins to grow in the spring, but a plow may be used to advantage at some distance from the tree, and at some greater depth than the shallow cultivators give. The plow may be used even in December, but great care should be taken not to tear up the roots of the tree. Weeds of any kind should not be allowed to grow in the orchard at any time.

COVER CROPS.

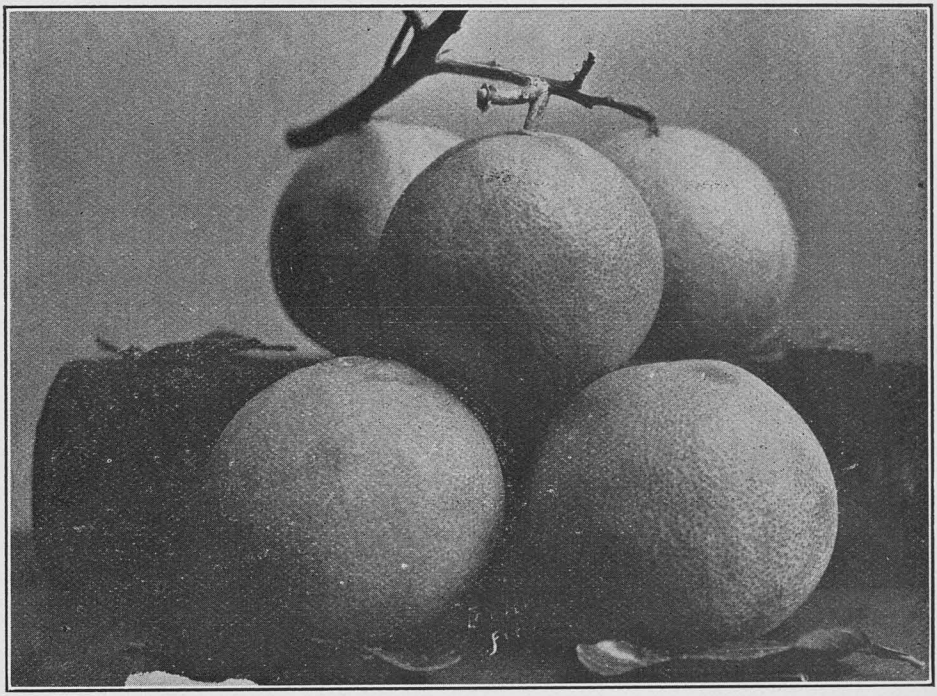
A leguminous cover crop is usually an important factor, even though the land is rich in nitrogen, humus, and other plant food. One may use as cover crops either nitrogen consumers or nitrogen collectors. The former comprises oats, rye, and grasses of various kinds, and should be avoided. The nitrogen collectors are legumes, such as: Velvet beans, cowpeas, burr clover, alfalfa, and peas, and should be used. We have tested two varieties of cowpeas at this Station, with very satisfactory results; even on ground that seemed quite fertile. Such crops make the soil loose and mellow, and prevent surface washing during rainy seasons, and at the same time regulate the moisture of the soil. We plant cowpeas in rows about three feet apart and cultivate them shallow as long as the vines will permit, never planting nearer than five feet from the trees, leaving this space for the proper cultivation of the trees. The pea vines should never be allowed to encroach on this space. This can be controlled by reversing the direction in which the vines grow; which, of course, must be done by hand. It is best to plant peas early in the spring, and, when the first pods are ripe, cut up the crop and soil with a disc harrow. The two varieties alluded to are the *Whippoorwill* and the *Iron cowpea.* The former is well known and needs no description. The latter is a trifle smaller than the Whippoorwill, and much better as a table pea. It is a very vigorous grower and makes more vine than any other variety known to the writer. They are not quite as early as the Whippoorwill, but are quite prolific.

PROTECTING THE TRUNKS OF CITRUS TREES BY BANKING WITH EARTH.

It is very essential to bank around the trees for winter, in order that a portion of the trunk may be preserved in case of a severe freeze. Should the trees get winter killed they should be cut back in the spring as far as they have been frozen, leaving the healthy wood to produce sprouts and make another tree, which they will do in two or three years. These mounds of earth should be removed as soon as all danger of a severe freeze is past—say, about the first of March. In the Gulf Coast section of Texas, the trees may, as a rule, be left unprotected until about the first of December. Nothing but clean earth should be used in banking, and a considerable portion of the tops should be left exposed.

PRUNING.

Citrus trees require less pruning than any other group of fruit trees. At the time of planting it is best to cut back to a height of about eighteen inches, and afterwards keep the knife and shears entirely away, except to trim out dead twigs, broken branches, etc. This system protects the tree from the extremes of heat and cold, and helps to conserve the moisture. By training low-headed trees, the fruit is much more easily gathered, and the expense of spraying is lessened; the effects of the wind against tree and fruit is better resisted.



Grape Fruit at the Beeville Station.

INSECTS AND DISEASES.

The citrus, like other trees and plants, have their insect enemies. These are scales of various kinds, some being more injurious than others; the white fly, the grasshopper, the orange dog, etc. The Beeville district is practically clear of these pests at the present time, except upon old, isolated trees that ought to be destroyed. The scales are especially troublesome when once they become prevalent in an orchard, and great care should be exercised in buying stock. As a treatment for these scales, we have found Whale Oil Soap very effective—one pound of the soap to two gallons of water; prepared to make a proper emulsion.

H. H. HARRINGTON, Director.