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EFFECT OF THE RECENT COLD WEATHER ON THE DIFFERENT VARIETIES OF AVOCADOS IN DIFFERENT LOCALITIES

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Mr. Chairman, Ladies and Gentlemen of the Convention*:*

Your President has asked me to prepare a paper, stating what effect the cold weather of last January had on the recommended and other varieties of avocados in the different localities in Southern California.

I will briefly state the condition of the varieties as I found them on the, dates of my visits to the various places.

San Marino Ranch

First of all I will give you the experience I had with a ten acre Avocado orchard at San Marino Ranch, located in the city of San Marino, along the eastern city limits of Pasadena, elevation 520 feet. These ten acres were planted under my supervision in 1910, the stock being Mexican Seedlings. The distance between trees was 25 feet.

In 1911 I budded them to large fruiting varieties with good results, and after nursing them for two years carefully, the buds had grown to trees four to six feet in height.

The cold weather of 1913 froze every one back to and including the bud union. This somewhat lessened my interest in growing avocados. However, the root stocks of the Mexican Seedlings began to sprout again very vigorously, and by 1917 most of them were big trees, having two to five stems three to four inches in diameter.

In the Spring of 1917, I top-worked the whole orchard to the following varieties: Fuerte, Spinks, Sharpless, Taft, Lyon, Dickinson, Murrieta, Knight, Linda, Queen, Rey and some others which looked promising at that time. Most of them had made a wonderful growth by 1922. Some had tops ten to fifteen feet in height by as many feet in width. The cold spell of 1922, when the temperature at the Ranch dropped to 22 degrees on Jan. 20th, 24 degrees on Jan. 21st, and 26 degrees on Jan. 22nd, left very little of twelve years of patient work.

The following varieties were killed back to the trunks: Taft, Sharpless, Lyon, Dickinson, Knight, Linda, Queen, Rey, Murrieta. The Spinks appeared to be hardier than any of these. Most of the wood and some of the foliage on a few tall trees was retained, the Fuerte proving the hardiest of the collection. Some trees in the lowest part of the orchard lost their leaves entirely but others retained most of them, except those on the young tender growth, which was frozen back all over the orchard. In this connection I would say that there are some seedlings planted at the lowest and coldest end of the orchard which proved to be considerably hardier than the Fuertes planted next to them. The seedlings appear to be natural hybrids between the Mexican thin-skinned and

some larger thick-skinned varieties of which, however, I have no record as to parentage. The few fruits that ripened on them in March of last year were of rich and nutty flavor, and weighed 14 ounces. The skin was less than one-sixteenth of an inch thick, but leathery.

On another and more protected part of the ranch, I planted a collection of Guatemalan varieties which the United States Department of Agriculture sent out for experimental purposes. The young trees, 60 in all, were in a thrifty condition and mostly had sappy young growth. The height was from four to six feet with a spread of from four to five feet. The temperature was from 3 to 4 degrees warmer than in the first mentioned orchard. The results were:

NABAL, No. 44439—Lost all foliage, but is sprouting out to the end of limbs.

TERTOH, No. 44856—Lost all foliage, wood killed back 3 to 4 feet.

LAMAT, No. 43476—Practically totally defoliated, wood killed back 18 inches.

CABNAL, No. 44782—Some foliage retained, young growth affected 6 to 10 inches.

CANTEL, No. 44783—Two plants severely frosted, two others in a less degree.

ISHKAL, No. 43602—Very badly frozen to bud union.

NIMLIOH, No. 44440—Two severely frozen, two others killed by water-logged soil.

MANIK, No. 45560—Foliage practically all frozen, and wood frozen back 18 inches.

BENIK, No. 44626—Two trees slightly frozen and two heavily so.

PANKAY, No. 44785—Two plants slightly frosted, two others very severely.

PANCHOY, No. 44625—Three frozen very badly, one killed, soil being water-logged.

ISHIM, No. 45562—Very little affected, considerable foliage retained.

KANOLA, No. 43560—One slightly frozen, three very severely so.

The following plants were two years younger, two to three feet high and very tender:

Akbal	No. 45505
Coban	No. 53932
Kaguah	No. 45561
Kanan	No. 45563
Kayab	No. 44681
Mayapan	No. 44680
Tumin	No. 44627

All in this lot except the Kayab were frozen back severely.

SEEDLINGS

Next to this plot were planted about twenty-five seedlings, the seeds of which were put in during May, 1920. The plants stood from four to five feet high.

The varieties from which the seeds came were Linda, Knight, Queen, Fuerte, Lyon, Spinks, Sharpless and several large fruited unnamed varieties. Among the twenty-five were five which were practically not affected by the cold at all, even in their young sappy stage.

In another section I had planted ten seedlings in a row, four of which came from the United States Department of Agriculture, these four I understand, were grown from seed sent in by Mr. Wilson Popenoe from Guatemala for propagating purposes. Having an oversupply, the Department distributed the balance to different growers to plant and see what they could get out of them. Two seedlings were from Queen fruit, two from Linda and one from a Fuerte. The Queen and Lindas came from Mr. Knight's place, the Fuerte from Mr. Whedon's, all of which were planted in 1919, except the Guatemalan, which I think were older.

The cold weather killed all of the seedlings grown from seed sent in by Mr. Popenoe from Guatemala. Two of the Knight varieties were frozen severely, two others only back to the trunk. On the Fuerte seedling, only the tender leaves were affected. This in my mind, proves that a large number of the so-called thick-skinned varieties are hybridized through some source with the Mexican hardier type, and a certain percentage of the hybrid seedlings retain the hardiness of the Mexican parent. In a good many cases the foliage will indicate the hybrid nature of the trees.

Perhaps it would be in order to add a few words in regard to "waterlogged" soil. The summer irrigation, which was practiced, in this last orchard of young trees, was the basin system; the size of the basins was about ten feet in diameter with about three inches of mulch on top to save hoeing the basins after each irrigation. The nature of the soil was heavy loam (ideal Avocado soil in my opinion); however, there was not sufficient drainage beneath, in some places, on account of heavy clay subsoil. I neglected to break up the basins before the heavy winter rains began last December, consequently, the basins that had impoverished subsoil held the water too long, which most likely soured the soil and the trees died very quickly. In ordinary winters this might not have affected them so quickly, as, for example, the two weeks continuous rain of last December.

ALTADENA

March 12,1922

MISS MCNALLY'S PLACE located on Marengo Avenue, near the Foothill Boulevard.

This orchard is a little over three years old.

Lyon, Sharpless and Dickinson varieties severely frozen. Fuertes only slightly affected, plenty of foliage left on the trees to protect them from sunburn. A number of flower buds in good condition, some of them just breaking. Lowest temperature 23 degrees.

MR. POPENOE'S PLACE, Calaveras Street.

This place, just slightly lower in elevation than the above mentioned, suffered considerably more from the frost.

Some of the young Fuertes along the lower end of the orchard were defoliated completely. The large trees, however, as well as the Pueblas and Dickey were only

slightly affected, some of them coming into bloom at that time.

Most of the Guatemalan varieties were injured considerably.

Large Solano trees were badly frozen, completely defoliated and wood clear into the heavy limbs was affected. Several rows of eight to nine year old Tafts were affected so that even the upper part of the heavy trunks showed black bark.

SIERRA MADRE

March 12, 1922

W. J. LAWLESS, 506 West Grand View.

As the location of the Lawless place is at an elevation of about 1200 feet, I was somewhat surprised to find so much damage done.

Some young trees of the Knight varieties I found frozen back severely, but not killed, due to the fact that they were sheltered slightly by buildings. Out in the orchard, between rows of citrus trees, were planted several rows of young Sharpless, Lyon, Dickinson and Spinks. The Sharpless, Lyon and Dickinson varieties appeared to be nearly killed. Spinks, however, only frozen back somewhat. Even on the lower and colder end of the orchard some of the larger Spinks trees retained some of their foliage. Large Challenge and Taft trees frozen badly.

The Pueblas and Fuertes came through practically untouched. Most of the flower buds were in perfect condition and some of them in full bloom.

March 12, 1922

E. W. CAMP'S PLACE

This place just across the street from the Lawless Place at a slightly higher elevation, showed the Puebla and Fuertes in good condition with some of them in bloom, while large Taft trees about nine years old were badly frozen, not only defoliated, but the wood appeared to be killed back some considerable distance.

On the same street about one mile farther east is the Nollac Place, located at a considerably lower elevation than either the Lawless or Camp Places. I noticed a Linda tree on this place which was only slightly affected by the frost.

THE WARD NURSERY, 192 North Mountain Trail, at Sierra Madre, is just a few blocks south of the Nollac Place.

The parent Ward tree was not affected at all by the cold. The young budded trees, however, suffered some. A large Dickinson tree next to the parent Ward tree was frozen considerably.

MONROVIA

March 21, 1922.

The THOMAS H. SHEDDEN PLACE, located at the base of the foothills at an elevation of about 900 feet.

The damage by frost at this place is not nearly as great as it appears to be. Heavy winds previous to the frost defoliated part of some of the trees on the northeast side,

thereby exposing some of the tender twigs to the cold. The lowest temperature recorded was 26 degrees. It affected the tender varieties considerably in the low spots of the orchard, however, the same varieties along the high section as well as next to the steep slopes were not affected at all.

Part of this orchard having heavy soil and permanent basins has a tendency to water-log in a wet winter like the past, which in turn will weaken the trees somewhat and render them less frost-resistant. Consequently, the damage in some of the orchards is more spotted than in others.

Varieties in general seem to be far advanced for the season. Sharpless just breaking into bloom. The Guatemalan varieties sent by the United States Department of Agriculture were affected, principally due to their location in the orchard. The same applies to the Knight varieties, as well as the Taft and Dickinson. Spinks and Fuerte trees and a few other less known varieties through the orchard appeared in good condition.

DUARTE

March 7, 1922

SPINKS PLACE.

Practically all of the Spinks orchard (with the exception of a small area) escaped untouched.

March 13, 1922.

GARCIA PLACE.

This place certainly showed a great deal of damage, more so than any other in this section, which is remarkable when one remembers that it is close up to the foothills.

The lowest temperature recorded in about the middle of the orchard was 25 degrees. Being on a slope, the upper end did not get as cold as the lower. Most of the Knight and other Guatemalan varieties, about 6 to 8 feet in height, were practically killed. They were interset with lemons, the latter all good sized trees, showing very little sign of frost and considerable good fruit left on the trees. Some Spinks and Fuerte trees scattered among 'the orchard were not affected.

One of the most interesting demonstrations on this place was the hardiness of a seedling of the Murrieta Green. The parent seedling as well as all the buds taken from it and inserted in other big trees in different parts of the orchard showed no signs of frost whatsoever, even to young buds a few inches long.

One of the buds (2 ½ years old) was in full bloom, with a few fruits apparently set. It will be very interesting to watch the ripening season as well as the size and quality of the fruit.

CHARTER OAK

April 11, 1922.

W. S. FUNK PLACE.

About 300 Fuertes are planted here between large Valencia orange trees. The Avocado

trees range in height from 6 to 12 feet. All of them are frozen very severely, a number of them killed to the seedling stock.

Mr. Funk could not give me the lowest temperature that prevailed during the cold spell, but from all appearances I think it was probably about 18 degrees above zero.

UPLAND

March 20, 1922

C. D. ADAMS PLACE, located at Upland, a few blocks below the Armstrong Nursery, at an elevation slightly under 2,000 feet.

Good sized trees of Blakeman and Taft planted next to the street were nipped considerably in foliage, the Taft more than the Blakeman. The Knight varieties were frozen severely. In another section of the orchard the Guatemalan varieties from the United States Department of Agriculture, mostly young plants, were affected considerably, some varieties more than others. A few young Lyon and Dickey A trees were affected only slightly, while Fuertes next to them were in perfect condition.

ARMSTRONG NURSERY, located on Twenty-fifth Street near the foot of the hills in Upland, elevation slightly over 2,000 feet.

Nursery stock one year old, from four to six feet tall, was frozen severely in the following varieties: Knight, Linda, Queen, Sharpless, Dickinson, Wagner and Spinks, Fuerte and Pueblas seemed to be in good condition.

NORTH WHITTIER HEIGHTS

March 30, 1922

This whole section up to the steep slopes was affected very severely by the cold.

Part of the Hart Bros, property, located at the foot of the slope and consisting of a thrifty orchard of large topworked trees, was exposed to the cold since it opens out of a canyon. The varieties are Puebla, Fuerte, Dickinson, Spinks, Taft and a few others.

A number of large Puebla trees had Guatemalan varieties (which the United States Department of Agriculture sent out) budded into them.

The part of the orchard located at the mouth of the canyon suffered the most.

The Taft trees were a sad looking lot. The Guatamalan varieties mentioned as being budded into limbs of large trees, and which had made a growth of seven to eight feet, were frozen very badly. The balance of the orchard was only slightly affected. However, most of the fruits of the Fuerte, Dickinson and Spinks varieties in the lowest section of the orchard dropped to the ground because the stems were frozen.

In a number of cases where trees did not how any effect of frost on either foliage or wood, the stems of the fruits were frozen. A heavy frosted' stem will drop the fruit while a partly frozen one will hold fruit for some time and such fruit may even mature.

The terraced hills of the Hart Bros, and Barber holdings suffered practically no frost damage, excepting the Meserve and Taft varieties along the lower terraces.

March 30, 1922

The J. M. ELLIOTT PLACE in the same locality was affected only slightly. According to Mr. Elliott's own statement, about 8 per cent of the trees were frost bitten, mostly on the lower terraces, principally on south exposure, which caused sun-thawing in the early part of the day.

The temperature at this place, at an elevation of 875 feet above sea level, ranged from 28 degrees on January 20th to 30 degrees the next day, and 32 degrees on January 22nd. At this elevation frost effects were noticed principally on Meserves and Colorados. The Guatemalan varieties are planted above this elevation, and did not seem to be affected by the cold at all.

March 31, 1922.

The section between El Monte and North Whittier Heights, with the Sherlock Nursery as a center comprises about fifty acres mostly young trees. There was considerable frost damage in spots, decidedly so in the case of a planting of Solanos and Colorados, some of which appeared to be injured nearly beyond recovery. On the Sherlock Place proper, the Fuertes and Pueblas, about two years old, showed practically no damage to wood, while some of the foliage was affected. A number of trees showed flower buds.

The Guatemalan varieties, however, were mostly killed. Two Dickey A trees were frozen quite badly. Sharpless, Lyon and Spinks in some cases were badly defoliated, and some of the wood was black.

MONTEBELLO

April 2, 1922.

STEPHENS PLACE.

This place showed the effect of the cold very much. The large trees of Lyon and No. 16, as well as other large fruited varieties were partly, and some completely, defoliated, which of course means not only the loss of this year's crop, but no crop next year, and in some cases not for two years.

The THOMPSON PLACE, also at Montebello, suffered in the same proportion.

The planting, which consists mostly of Seedlings (the seed of which came from Mexico) has produced the Thompson, a promising variety, which, however, proved to be less hardy than the Fuerte.

WHITTIER

March 10, 1922

RIDEOUT HEIGHTS, A. R. Rideout's Place.

I found this place in good condition. Along the boulevard I observed some of the Lyons and other varieties slightly frozen. On the hillsides, however, all varieties appeared to be in good condition. Along the road leading up to the Rideout's residence I noticed small Lyon trees planted. These were only from 2 to 3 feet in height and showed no effect of the cold weather whatsoever. Flowers were just breaking through the buds in good condition.

March 10, 1922.

G. S. GANG'S PLACE, 801 Citrus Avenue, just a few blocks from Ride-out Heights.

Conditions here I found somewhat different. Fuerte and Puebla trees showed practically no effect from the frost. Most of the flower buds were in good condition and ready to open. Colorado trees were affected the most; the foliage and tender growth of some of them suffered considerably.

Sharpless and Lyon trees seem to be of the same degree of hardiness on the Gano place. Each variety was frozen slightly, half way up. Several young trees of the Knight varieties were killed completely.

A neighbor of Mr. Gano has a number of Lyon trees two to four feet high, all of which were badly frozen and a number of them appeared to be entirely killed. Mr. Gano could not give me the exact temperature during the cold spell as he owned no thermometer.

MURPHY OIL COMPANY PROPERTIES

There are thirty-five acres of avocados planted on rolling hills, Tafts prevailing, next Perfectos, then Spinks and some of the Knight varieties. The temperature evidently did not get very low in these hills, because there was very little evidence of frost either to foliage or wood, even in the case of the Tafts.

LA HABRA HEIGHTS

April 7, 1922

This section as a whole pulled through the last winter's cold remarkably well. I noticed in one section young budded Avocado stock, with the buds just out of the shields, which had escaped injury while in another small valley, a young orchard planted to Sharpless trees was in good condition. It appears to me that there is a good deal of hillside as well as tableland in this section adapted for Avocado planting, at least as far as good soil and frost protection are concerned.

FULLERTON

March 24, 1922

EARL D. GAGE'S PLACE.

This place, located on a slope at a somewhat higher elevation than the City of Fullerton, was scarcely affected by the cold. Most of the trees showed defoliation on one side, caused by severe winds. Among the more tender varieties, the good sized trees of the Taft did not suffer, while the younger trees of the Queen showed frost damage.

ANAHEIM

April 7, 1922

The DUTTON PLACE, located in West Anaheim, consists of a planting of young Fuertes, Duttons and some Guatemalans, all of which were affected by the cold. The Fuertes were defoliated, the Dutton defoliated and wood affected considerably, the Guatemalan frozen to the ground.

YORBA LINDA

March 21, 1922.

WHEDON'S PLACE.

Practically no damage was noticeable here.

The same can be said of the Oliver Place, also at Yorba Linda.

KNIGHT'S PLACE, located a few blocks below the two just mentioned, suffered greatly by the frost.

As Mr. Knight tells me, practically all of his nursery stock was destroyed. His large trees consisting of the Linda, Queen, Kist, Rey and Knight varieties were frost bitten severely, a number of them completely defoliated, principally the Queen. This of course means the wood was damaged somewhat.

To my great surprise the lemon orchards surrounding this place were not noticeably affected.

March 24, 1922.

DR. KELLER'S PLACE.

Considerable frost damage was noticeable in the lower section of this orchard, and some fairly large trees were nearly killed. On the other hand, the hillside plantings appear to be uninjured. Some medium sized Taft trees showed only slight signs of frost on the foliage.

March 24, 1922.

O. A. MANN'S PLACE.

This place, just opposite the Keller place, looked very discouraging.

Some young Fuerte trees in the lower section seemed to be almost destroyed. More tender varieties on the higher places suffered very much, while the Fuertes near them, escaped practically untouched.

ORANGE

April 7, 1922.

The TAFT PLACE in this section was in rather good condition so far as frost damage is concerned. According to Mr. Taft's statement the temperature did not go below 30 degrees. However, some of the Taft trees in the lower section of the orchard showed slight frost damage, especially on the wind-swept side.

VILLA PARK

April 7, 1922.

I made a visit to the BILLINGSLEY PLACE for the sole purpose of determining the hardiness of the Billingsley seedling, which has promising qualities. The temperature however, did not get low enough here to make this test. The only plants noticeably affected by the cold were bananas. The oranges, lemons and avocados were not affected.

TUSTIN

March 24, 1922

B. H. SHARPLESS PLACE.

The upper and warmer sections of this place, near the wind break, did not seem to be affected by the cold, while the lower section showed considerable frost damage. Young Sharpless and Fuertes suffered very much. Some trees were almost totally destroyed. Among the larger and older trees of the same variety few were affected.

March 24, 1922.

IRVINE RANCH.

The large trees on this ranch, interset with oranges, suffered considerably in the lower section of the orchards. Some Taft tree were completely defoliated. Along the higher elevations, however, the damage is perceptibly less, and none at all in some sections.

SAN DIEGO COUNTY

According to reports sent in by different Avocado Growers from various locations in this County, it appears that the 1922 frost did very little damage, if any, to the avocado industry. Most of the damage was confined to flower buds and slight injury to the foliage.

Temperature records sent in by Mr. Barren, for a few of the lower sections, are as follows: Chula Vista, lowest point reached 28; Point Loma, lowest point 33; Sunnyside, lowest point 26; Bonita, lowest point 27 (Government Station).

Temperature records sent in by Mr. C. Passil: Carlsbad, elevation 60 feet, lowest point, 28; Carlsbad, elevation 150 feet, lowest point, 36.

HOLLYWOOD

March 17, 1922.

The Hollywood section, especially along the foothills, shows very little damage from the cold. However, on the lower elevations beginning several blocks from the hills, signs of frost begin to be noticeable.

The Wagner place, located at 1295 Fairfax Avenue, showed almost no damage to Fuertes, while a Sharpless next to it was nipped quite a bit. In the hills above Beverly and Brentvvood there was no damage done, while in the flats near the Beverly Hills Hotel, at the Haldeman Place and the one across the street from it, there were perceptible signs of frost on the tender varieties, while Fuertes in a young stage just escaped being frozen.

Several blocks below the center of Sawtelle on the Armacost Place, the thermometer recorded 22 degrees on Jan. 20th, too cold for avocados.

April 10, 1922.

The visit to the Miller Place was to inquire about the Dorothea, a promising seedling, which was not affected at all. The tree was just breaking into full bloom at this date. I could not learn from the owners the minimum temperature, but from effects on other trees and nearby ornamentals I should judge about 28 degrees was the lowest in that section, which of course is no test for mentioned avocados of the hardier races.

SAN FERNANDO VALLEY

April 5, 1922.

The MCNAGHTEN PLACE, located on the State Highway to Sunland some little distance from La Canyada, has suffered quite noticeably. Large Sharpless trees as well as Taft and the Knight varieties suffered very severely, some of them killed to the bud. Fuertes and Pueblas escaped, except for damage to foliage and tender twigs. Temperature about 24 or 25 degrees.

The T. J. WALKER PLACE along the hills this side of San Fernando City had similar temperature. Mr. Walker tells me he lost about 300 young trees which he had planted in the open (east slope). His nursery stock which was protected by lath and smudge pots did not suffer.

The WATSON PLACE, formerly the Stuart Ranch, located on Renedo Street several blocks from the San Fernando Mission, escaped frost damage entirely as did a considerable area planted to oranges and lemons in that section.

VENTURA COUNTY

(Reported by Dr. W. R. Manning, Fillmore, California)

After looking over the frost conditions I find that Ventura County escaped much better than any section which I have seen.

Mr. Libby in Ojai has the only real damage in the County, five acres of Spinks practically ruined.

Mr. Thatcher had a little damage to a few Colorados, Dickeys and Tafts.

The district between Ventura and Latroy was untouched. Dickinsons, Tafts and Dickeys never turned a leaf, while mangos and bananas show no injury whatsoever.

The Guatemalans on my old ranch were pretty badly frosted, Fuertes and Pueblas came through in pretty good shape. My new ranch did not turn a leaf, even on one year old Guatemalans.

Mr. Trotter, King and Overton of Fillmore had very slight damage to outside foliage on Guatemalans.

SANTA BARBARA

March 6, 1922.

(Reported by A. F. Yaggy, Santa Barbara, California)

The lowest temperature recorded in Santa Barbara was 29 degrees. My recording thermometer in the orchard, about two feet above the ground, showed 31 degrees. Several nights the wind was cold enough to freeze ice ¼ to ½ inch thick.

What damage there was seems to be confined to young trees. I have seen several plantings of trees here over five years old that showed no sign of frost, regardless of varieties. My own place seems to show more damage than any other that I have seen this side of the Ojai Valley. About ten per cent of my younger trees were more or less injured. I figure that half of the injured ones will have to be replaced. The others simply had the leaves turn brown but the trunks are perfectly green.

The damage was not confined to certain varieties, but hit some trees of Linda, Queen, Fuerte, Sharpless, and Puebla. Certain trees seemed to be picked out of the rows -often one tree or two trees in a row—the others around them showing no sign of damage. None of my first planting which will be five years old this Spring showed any indication of frost. This planting included Taft, Fuerte, Blackeman, Surprise, Lyon, Nutmeg.

The Sexton planting at Goleta is perfectly green and shows no sign of damage. The trees have quite a little fruit on them. The planting of Taft trees on the Bishop Ranch west of Goleta did not turn a leaf.

I believe that the damage to the young trees on my place corroborates what Dr. Webber and others reported in former annual reports of the Avocado Association, i. e., that when the ground is saturated with water and a cold wave hits the young trees those that are in most vigorous, green growth and those that are sickly will be hardest hit, and that those trees that are in good healthy condition but partly dormant will show no sign of distress.

In the Ojai Mr. Libby's planting looks as though a fire had gone through it. At the other end of the Valley the small trees show more or less serious injury but some of the larger ones of Mexican stock show but little damage.

ALHAMBRA

March 25, 1922.

The PHILLIPS PLACE in Alhambra certainly looks very discouraging from an avocado standpoint.

I noticed large Queen and Linda trees as well as some of the Spinks completely killed to the bud union near the ground, some of them having trunks 5 inches in diameter. The Fuertes and Pueblas froze back into the heavy wood, but are at this date breaking out with new growth on the heavy limbs and trunks. A number of Mexican thin-skinned seedlings were absolutely free from any sign of frost damage. I was unable to find out from the owners, the minimum temperature, but from experience, I should judge about 16 or 17 degrees. It certainly shows up good the hardiness of some of the thin-skinned seedlings.

SAN GABRIEL

March 10, 1922.

W. F. MOOMAW'S PLACE, 116 E. Live Oak.

Mr. Moomaw tells me the temperature on his place reached the low level of 18 degrees on Jan. 20th; 22 degrees on Jan. 21st; and 24 degrees on Jan. 22nd, and registered from 3 to 5 degrees below freezing point the following two or three days.

The planting is practically all Fuertes with the exception of a few young trees of the Knight varieties, which latter were killed.

To my surprise, on the Fuertes (which of course lost all of their foliage) the wood was not frozen as far back as I had expected. It seems remarkable that young sappy trees, such as these, were not killed by the temperatures mentioned. It shows very plainly the valuable quality of what we think is a natural hybrid, namely, its hardiness.

The high state of cultivation in which this orchard was maintained kept the trees in a healthy condition and consequently more resistant to frost.

Second Visit, April 18, 1922.

The wood on the Fuertes in the Moomaw Orchard is frozen back from 2 to 3 feet into the limbs. The balance of the tops of the trees appears to be healthy. A great number of young sprouts are breaking through the bark, some of them about one inch long at this date.

On examining the trunks which are 3 to 4 feet high, and without protecting limbs hanging to the ground, I noticed black bark through to the cambium, except nearest the ground where there were accumulated leaves about 3 to 4 inches high which gave protection enough to save that portion of the trunk. This should indicate clearly that it is a mistake to prune up young avocado trees and so remove the sole protection of the trunks.

The reason for high pruning in this case was simply to accommodate an irrigation system with the sprinklers placed under the trees. Having limbs hanging to the ground the water could not spread far enough to make efficient irrigation.

Here I would like to say a few words to express my honest opinion about the future of the avocado industry in California.

The California Avocado Association should at once educate all of its members who have not had the sad experience some of us had during last January but who are intending to plant avocados in the near future, along the following lines:

All of the varieties recommended by the California Avocado Association, as well as all of the promising varieties, some of which have been on the recommended list as well as some that would have gone on the recommended list in the near future, cannot be planted with safety below the frost line unless the orchard can be equipped with a sufficient quantity of first class orchard heaters.

For those of you who have established orchards in the less protected localities the orchard heater will be the only salvation. Those of you who are intending to purchase land for avocado planting I would advise to pay the extra price and get above the frost line.

The frost line however, is very difficult to designate. It appears that most of the steep hillsides, as well as the tablelands with plenty of air drainage on one or more sides, are well adapted to avocado culture so far as frost protection is concerned.

There are a number of orchards in the lowlands which escaped remarkably well during the last freeze. This however, is no indication that avocados can be grown safely at all times in those places, because Jack Frost does not always visit the same localities with the same degrees of severity.

Some sections which were affected very much in 1913 escaped practically unharmed in 1922. On the other hand sections which were hit severely last January experienced very little damage in 1913.

Orchard heating is not only expensive, it is a constant worry during the winter months

and a very unpleasant occupation. The expense of equipping an acre with modern heaters is $500 more or less, according to the kind of heaters selected. My recommendation to the persons located in the most exposed places would be at least 80 seven to nine gallon castiron pots to the acre.

As far as the avocado industry is concerned in a general way it is well to say the freeze came in time to serve as a warning. Five or ten years from now the planted acres of tender varieties would have been much larger and naturally the damage corresponding.

To sum up my paper, I have one very important recommendation to make to you and I hope you will pass a resolution to that effect at this meeting.

THE RESOLUTION

The President of the Avocado Association take the proper procedure at his earliest convenience to ask the United States Department of Agriculture or the University of California or both, to send one of their best men to Southern California and immediately begin at the proper time to artificially hybridize the hardy Mexican thin-skinned variety of avocado and the more tender large fruiting thick-skinned variety of avocado, which without any doubt would produce a small percentage of hybrids able to withstand considerable cold weather and at the same time produce a fair sized good and rich flavored fruit, with a skin of sufficient thickness to be a good shipper to all parts of the United States.

As I traveled over the highways to visit all the different places, I noticed a number of Mexican Seedlings scattered through the country, with no damage done to them by the last cold spell, while orange trees next to them were frozen severely.

With such hardy stock as this and a great number of good and large fruiting thick-skinned varieties at our command, we ought to be able to produce the required hybrids, and if we succeed, there will be thousands of acres available for planting avocados in the less protected sections.

Some of you might think it a slow progress in having seedlings come into bearing. The most efficient way to handle this process is to take buds of the young seedling as soon as they are large enough to take, and insert in large trees which will save from four to six years to bearing time. One large tree would accommodate at least from 10 to 15 varieties of buds of different seedlings. In this way the process is much shorter. I have used this method for several years and found it quite satisfactory.

With such places as W. A. Spinks, the J. M. Elliot, as well as the Hart and Barber places, then the Whedon and Popenoe and other places it would be an easy task for any first-class man the Government or the University might choose to send, to immediately upon arrival at the proper time begin hybridizing. All of those places mentioned have plenty of material in both Mexican thin-skinned, Guatemalan and other thick-skinned varieties. I am certain any one of the gentlemen mentioned would be only too glad to help boost along this much needed work.

The University of California through its Citrus Experiment Station, has been carrying on some very valuable experiments for the citrus grower in the line of propagating, cultivating, fertilizing, pruning, fumigating and in many other ways. Why not investigate as to whether or not similar experiments can be made for the avocado grower.

Let us make these experiments now while the industry is young. The benefit derived from it would help hundreds of future growers, and would eliminate a great number of erroneous ideas about the cultivation of the avocado.

Now Ladies and Gentlemen, I am one of the less fortunate of the avocado growers, on account of locality, but I have great faith in the future of this industry and if we all hold together and act together, I am certain as a unit we will succeed.