

Meeting of the Variety Committee of the California Avocado Association

Held at 2 P.M. Friday, March 12, 1937, at 4803 Everett Avenue, Los Angeles, California

Present:

A. J. Thille	Archie Courtney	Ernest Braunton
J. Eliot Coit	C. S. Crawford	F. F. Halma
Vincent F. Blanchard	A. G. Hazzard	A. D. Shamel
Agnes Hardaway	A. C. Adams	C. S. Pomeroy
Jas. D. Hoffman	H. H. Gardner	M. B. Rounds
Jean C. Miller	O. A. Murray	Knowles A. Ryerson
Dean F. Palmer	B. C. Stephens	Robt. W. Hodgson

Barrett—The primary discussion today will be the effects of the freeze. I will ask the man who has been making a study of this situation to lead the discussion this afternoon. He will discuss his observations.

Halma—Stephens and Hodgkin know more about it than I do. What we did at first was to see where we could start. The first thing was to get a standard that would pass the law and then we went out and tried to find out some way of identifying frozen fruit. We failed in this. Our chief discussion was about the stem—whether the fruit would hang on or not. Last, we went out and tried to classify the trees on the basis of tree damage. We made out a tentative classification but it is too early to judge how accurate this is. But it is probable that very few trees will have to be replaced. We went around with the Calavo fieldmen. They know more about the varieties than I do. We couldn't get exact temperature records. The temperature sometimes varied as high as 15 degrees in one orchard.

Hazzard—The damage wasn't as severe as you mentioned. About one-third have fruit damage. The other two-thirds didn't.

TEMPERATURES CAUSING DAMAGE

Halma—The trees in good condition suffered less. We thought that 27 degrees affected the stems and the inside of the fruit; 25 degrees resulted in partial foliage damage; 23 to 22 degrees caused either complete defoliation or part defoliation and some stem injury.

Below that temperature there were various degrees of injury to the trunk. We also noticed practically no difference in hardiness between the Puebla and Fuerte. In some orchards the Puebla was more hardy and in other orchards it was just the reverse.

Barrett—Does the effect on the Fuerte and on the Puebla seem to be the same? My impression in 1922 was that the Puebla showed much more heavy burn in the actual leaves themselves, without destruction to the growing tip, whereas the Fuerte was hurt on the tips but not on the leaves.

Halma—There is something to that. I believe your observation holds good. The Mexican seedlings in some temperatures that went down to 18 degrees, were hardly touched. The fruit stem and condition of the fruit is not an indicator of fruit injury. We do not know yet just what is injured fruit. Some fruit is still coming in that shows the vascular bundles black and with apparently good flavor. We had some trouble with fruit dropping which showed no stem injury. We found that this was due to the temperature, because where the temperature was higher on the next terrace above, the fruit dropping stopped. We had no precedent to go by, and therefore our opinion of one week will probably be changed the next week. No one knows exactly how internal brown tissue will affect the tree. I asked people that went through the 1922 freeze but they were not certain. There are different degrees of discoloration. Some is brown, some chocolate brown, etc. In some cases the young wood is hurt. In other cases the soft tissue underneath the epidermis. I don't know just how it affects the stem.

Coit—I recently had occasion to saw off a lot of my trees for grafting. In certain varieties, such as the Kashlan and Thompson, the cambium had become brown but had already built up a new layer. There was good new tissue in between. Yesterday, in sawing off a Mexican, the cambium was brown and there didn't seem to be any rejuvenation to it.

Halma—We looked into the seed situation to see if they could be used. We got some fruit that was badly injured and planted some of that seed. That was about a month ago and some of those seeds are sprouting. I think in cases where the cotyledons are discolored, it would affect the growth of the seed. Apparently it was safe to sell the seeds that were partly injured. I don't know whether Fuerte would make good root-stock unless watched carefully to see that no Guatemalan strains are mixed in with it.

Coit—On that point it would be interesting if you could make some observation on what happens to the cambium when it begins to reorganize itself and rebuild.

Halma—I have some students working on that.

Coit—Have you any frozen trees at Westwood?

Halma—Not to any great extent. I have gotten material from Whittier and the boys have made sections, but it is a big job. We divided them into trees that were not injured and trees that showed partial foliage injury. This is a very complicated and expensive investigation that I could hardly handle myself. (Displays fruits which have been cut transversely, and shows a dark ring about one-fourth inch from the outside circumference.) I don't know what causes this. There is apparently a great accumulation of tannin in the tissues and also more fat globules in those tissues. Those things may become more significant than the academic changes.

FRUIT FIBRES DISCOLORED

Miller—Have you had any experience with frozen sweet potatoes? Would there be any correlation between blackening fibro-vascular bundles of a sweet potato and of the avocado? There is an old idea that if you don't cut off the vines of a sweet potato after it has been frozen, there will be a discoloration in the fruit. Is there any basis for that?

Halma—Is the sweet potato a fruit?

Miller—I don't know whether it is a fruit but you have a similar comparison. In the case of the sweet potato, if the top of the plant has been frozen the fruit stem carries that injury to the sweet potato.

Halma—Are you trying to correlate the sweet potato injury with this fibro-vascular bundle? It doesn't seem to make any difference in the case of avocados whether you clip off the fruit or not. The fibers probably freeze first because there is less oil in them.

Barrett—I will ask Archie Courtney to give us some information.

Courtney—On this tree survey, I believe it is complete for the time being, and I think Mr. Stephens has the figures on it. I tried to determine the frost resistance of a number of varieties. The more individual groves I saw, the worse off I was. I came to the conclusion that with thinskins leading in group 3, and in group 4 I might say there was Dickinson, Challenge, Queen, Buttons and Sharpless, with Anaheim last. There isn't much more I can say on this because we change our minds quite frequently. Some of my observations cover waterlogged fruit on property at Brea. They packed some fruit that had been in the garage for 12 to 15 hours. It was dry when they picked it. There had been no rain. I noticed the fruit about 15 hours later and there was moisture seeping out of the stems and the button of the fruit, and the fruit was saturated with water. Every one of the fruit was waterlogged inside and had discolored. That water seeped out because there was still water in the seed cavity.

Barrett—I understand you to believe that at present the Nabal is slightly more resistant than other Guatemalans.

Courtney—Yes, of most of the commercial Guatemalans.

Barrett—Did you notice any difference in regard to the manner in which certain Guatemalan varieties are coming back over others which were affected by the freeze under much the same conditions?

Courtney—I would say that the Guatemalans are not coming back as well as the Puebla and Fuerte.

Barrett—They naturally wouldn't; they would be hit harder. But you might have observed a particular reluctance on the part of some of them to start.

Courtney—It is too early to tell. We had occasion to notice in a great many topworked trees, of original Mexican root-stock that had been budded to Guatemalan and since then topworked to Fuertes or Pueblas, and we did a great deal of cutting on the trees and trunks. In most every case where the damage was really severe, the top of the Fuerte tree came out OK. In every case where the trees were grafted high above the original bud union, they were completely dead or discolored.

Halma—How dark is it?

Courtney—On the Guatemalans the cambium seems darker every time I look at them. It is sort of fibrous. With the wet weather we have had it is full of water. I would say it will just rot away eventually.

Barrett—Did you make any particular observation in regard to this?

Courtney—As Dr. Halma stated, we are getting fruit that is cutting black. It seems to come from groves that have had severe cold weather. In the Heights we are not getting any black fruit. It is always from the groves that have showed a condition of frost damage.

COIT'S VARIETY OBSERVATIONS

Coit—I have a few observations to make from my own variety collection at Vista. I have no thermometer in there but, judging from the thermometers in the vicinity, it was 16 in the lowest part of the variety collection.

The Duke, Benedict and all those hardy ones were killed.* The Duke was the hardiest of all varieties. The Benedict was in full bloom and was much more seriously hit than the Duke. The Topa Topa and Puebla were both much harder hit than the Duke. The Leucadia was a little hardier than the Fuerte. The Edranol was killed to one and one-half inch wood, at 18 degrees, but in other places it is among the hardier of the Guatemalans. It is about the same as the Taft and Nabal. At C. J. Daily's place it has demonstrated itself as one of the hardiest Guatemalans in the list. In fact, I am beginning to question whether it is a Guatemalan. It is almost as hardy as the Fuerte. The Mac Arthur withstood the cold very well. The foliage was all killed back on Challenge, Queen, and Itzamna, but the MacArthur growing alongside was not hit at all. This MacArthur is a new variety. It is now grown chiefly on the old Yaggy place in Santa Barbara. The MacArthur was relatively hardy at Goleta.

Barrett—I would like to have you explain about this MacArthur fruit, why you place so much emphasis on it.

*Editor's Note: The Duke and Benedict were not killed after all. Though severely injured and apparently dead, they have since March made a truly surprising recovery.

THE MacARTHUR FRUIT

Coit—In Ventura and Santa Barbara, there has been difficulty with the Fuerte not bearing regularly and satisfactorily. There is perhaps more objection to Fuertes in Ventura than anywhere else. I noted that this MacArthur bore heavy crops every year; they were easy to bud and graft, and were vigorous in growth. I thought that if it bore regularly, the thing to do was to find out how good it was on the market. So I requested the present owner of that ranch to send in to Calavo Growers all of the MacArthurs in one lot. There were about 40 boxes. I came in personally and asked Mr. Stephens if he would submit them to just as much of a market test as he could. Calavo did the best they could. They put them through the laboratory test and the tasting committee test.

(Dr. Coit gave a thorough description of how taste tests are conducted.) The MacArthur was put through the test and came out OK. A few thought that the flavor wasn't particularly good. As for myself, I still think that it has an exceptionally good flavor. It is a small, green fruit of good appearance, it hangs on through the summer to Thanksgiving, and Stephens says there were no kicks or comments one way or the other from the trade.

Stephens—There were actually 30 field boxes. There were no comments one way or the other.

Coit—I have an idea if and when it is produced in sufficient quantities to come in here with several hundred field boxes the petition would be made to Calavo Growers to give it Calavo rating. As long as they don't kick on it, it is all right. It isn't a very high oil content fruit.

Stephens—One series of tests in 1933 ranged from 13.36 to 16.12, all from September 12, to September 24.

Barrett—One of the interesting things about this variety is the fact that this tree originated either at or very close to Sheddon's property in Monrovia, and for years received no recognition at all. In fact, I was unaware of the fruit until Dr. Coit called it to my attention. It is a fruit that originated in the foothill area and because of conditions there was not outstanding at all; but put it in a direct coastal influence and it becomes outstanding. Don't get the impression that we are pushing the MacArthur. We are simply bringing this up for discussion. Have you a second report on that?

Stephens—I have reports of two years, but both are the same. There were none last year.

Hazzard—Did you say that this was as hardy as the Duke?

Dr. Coit—No. It is the hardiest of the Guatemalans. It would come ahead of Nabal or any other Guatemalan, but it is not as hardy as the Puebla or Fuerte. I don't know whether it is as hardy as the Edranol.

Barrett—If you go to the "Yaggy property" you can spot the MacArthur trees almost as far as you can see, on account of their vigorous growth. Whether that would have any direct bearing on frost resistance would be hard to say, but we would be willing to admit that the more vigorous trees had come through the freeze better than those in a weakened condition. I will now call on Vincent Blanchard to give a few words.

VENTURA OBSERVATIONS

Blanchard—I haven't been making any special study of the avocado. My work in the past has been on citrus. I am, however, interested at this time in seeing how closely the avocado follows the principles that we developed for citrus, from the standpoint of handling these trees. I may have an opportunity on my own place in watching this situation pretty carefully. I am especially interested in seeing how sensitive the avocado is to sunburn influences; whether you can protect it with whitewash and reduce injury. This is one of the things that should be watched carefully. My observations would indicate that avocados are more sensitive to sunburn than other trees. The Fuerte was

injured to a moderate extent. I don't know the temperature, but I would say that it was a little under 25. However, it didn't stay that low for very long. While there was a reportedly high ceiling, we had the Itzamna and Nabal that are both tall trees, where the skirt of the trees was badly injured and above that the trees were normal with fruit uninjured, indicating that our conditions there were different from other sections. I think the Nabal came through under our conditions very well. On Daily's place the Nabal looked pretty sick. Why there should be such a great difference in just a matter of a few feet, I don't know. Daily's trees were not quite as vigorous and not perhaps in as good condition and consequently were more sensitive to frost injury. We are watching the variety plot on Daily's place very closely.

Barrett—What are your Itzamnas doing there, if anything?—I mean as far as production and growth are concerned?

Blanchard—They are very vigorous, with the exception of a few trees. My orchard has been a consistently poor producer until this year.

Barrett—The next speaker is Albert Thille.

Thille—Blanchard has covered Ventura County very well. We didn't have very much damage. We weren't anticipating any damage so we didn't have any thermometers. The Kashlan and the Dickinson suffered worse than the Itzamna. The Nabal and Fuerte were just about equally resistant and had very little damage.

Barrett—The next speaker is Marvin Rounds.

LOS ANGELES COUNTY

Rounds—I have not been making trips outside of the county. We are going to look at the worst places last. We have also started some rebuilding experiments—plots where we are taking some trees and pruning them right away and comparing them with trees which are not being pruned. We are going to have some whitewash plots, so we can tell Carter something about whitewash. Maybe we will be able to check with you. Wherever I have observed that growers have both pruned and whitewashed, I have been making notations of those orchards and attempting to correlate those trees with nearby orchards, to see if we can find any comparable condition. There were comparable conditions in two or three cases. There are also plots where Whitewater paint is used instead of whitewash. Insofar as comparison of varieties for their frost resistant qualities are concerned, my observation checked pretty much with those who have discussed the subject. We found the Anaheim about as bad as the worst, which is the Lyon—perhaps not quite so susceptible. The Nabals were not quite so bad and in the areas we have visited the Fuertes and the Pueblas of the commercial varieties got through the best. Wherever the Fuertes were in a position to take advantage of the heat from heaters, they got through in good shape. In comparing the Puebla with the Fuerte, they both might look from the distance as though they had been affected about the same. In examining the shoots, the growth is not nearly so badly affected.

WHITEWASHING, PRUNING

Blanchard—In connection with whitewash and sunburn—I was interested in Dr. Webber's article in the Citrograph in which some of the conclusions were based on mean temperatures being low and high humidity. I was interested in the records obtained within the last few days which were quite the reverse of previous records. I am wondering whether, with the conditions we have had this year, that period of hot weather might have given them trouble. I found at Rancho Sespe and at the Forestry Station at Ojai that the temperatures there had ranged from 77 to 88 on two and three different days with very low humidity. Professor Hodgson has a recording instrument in Oxnard (which is a region of high humidity) and he takes a reading on that in the morning and afternoon. It was very interesting to read this record—it showed humidity down to 10. We have quite a different picture in this freeze than following some of the freezes that were reported on by Dr. Webber.

Rounds—We don't have much information on the effect of whitewash on avocado trees. I was told of an orchard that has already been painted with whitewash, that is, on a limited number of trees, since the freeze. The statement was made to me by one of the officials that the whitewashed trees were putting out much more vigorous growths than the non-whitewashed trees.

Barrett—There are many factors entering into a situation of that sort. I don't say that whitewash may not prove to be the thing, but at the present moment I am not doing it.

Hoffman—We had a 22 degree temperature at two different times. It was down there for 4 or 5 hours. We had it down to 26 at 8 o'clock in the morning. Practically everything I have will be defoliated. The Duke probably stood the cold the best of any of my trees. My Leucadia trees were slightly burned in the lower branches but the upper parts of the trees were in good shape. I think it will come out in blossom, this spring. As for the Duke, the first freeze caught the blossom; but the buds came out and were caught again by the second freeze. The Anaheim was frozen clear down. I have a Knight which was frozen to the ground.

Barrett—Hoffman's place is in Pasadena.

WEST OF LOS ANGELES

Mrs. Hardaway—We had about 10 per cent of the trees that we had some trouble with. The Fuerte was not touched at all. Our Nabals were in the same fix.

Barrett—How did the tender growth stand up?

Mrs. Hardaway—It didn't freeze at all. There was no fruit drop at all. I have a few cherimoyas; they lost a little foliage but didn't affect the fruit.

Barrett—I visited Oakley's property. After the first freeze there was no damage shown. At this time, most of the trees around the houses are in good shape. A few bananas have been hit. I don't think the coffee bushes were hit. These were up around the house on the knoll at Brentwood. In the canyon, where the trees are generally larger than in the orchards, a good many of the Guatemalans, particularly the weaker trees and those that carried a heavy crop, got scorched quite a bit more than I have ever seen in 15

years. I didn't go inside of the fence. Perhaps Courtney can tell you about this.

Courtney—I haven't been on the place.

Barrett—My impression was that there was some difference between the tops and bottoms of the trees. Some looked hurt up above. Some of the very tender tropical plants came through in good shape.

Hoffman—At our place, the elevation didn't make any difference. Some Lyons, which are around 1400 feet, have the leaves all frozen.

Barrett—We should discuss this before we get through. The impression now is that elevation played a small part. But on the other hand, I think elevation in some cases meant a good deal. Anybody who has any observations on that as we go around the table should bring those points out.

ELEVATION'S RELATIONSHIP

Adams—On the subject of elevation, there is one place where it did make much difference. The higher strata of air were much warmer and even from terrace to terrace you can see the difference on some growths. Within a distance of probably 200 feet elevation there is a difference between defoliation of the trees (Fuertes) and trees that were not touched at all, with fruit still on, intact, without a brown stem on the whole tree. The section I am thinking of has excellent air drainage and there are a number of thermometers there. I can't give any exact information. I have been told what different growers have observed on their places, but I don't recall what the lowest temperatures were, whether it got down to 18 or 19. I am sure it did, however. Some of you are familiar with Colonel Stewart's place. The upper part of his place, it was said, got down to 31 degrees, whereas down below, 200 feet, the trees are completely defoliated.

As regards the variety, I was interested in Dr. Colt's and Mr. Hoffman's mention of Leucadia because I have a Leucadia. My observation checked with theirs, namely, that it was even more hardy than the Fuerte. I have a Leucadia right alongside of the Fuerte and neither one was very badly hurt, but the Leucadia was slightly better off than the Fuerte. Some of you may be interested in the Hass variety which originated in La Habra Heights and on which there has been a great deal of interest in that section. It is a Guatemalan. It didn't stand up alongside of the Fuerte or the Puebla, but Griswold told me that it was somewhat hardier and came through better than any other Guatemalan. Even better than Nabal. These are somewhat limited observations for the reason that we have a limited number of trees to observe. Mr. Hass' place was heated. That probably saved them. The Hass variety is not a hardy tree but it is one of the hardier of the Guatemalans.

Rounds—Regarding the Hass—I was in Brokaw's Nursery. He has some in the nursery that he wrapped in paper. Many of them didn't freeze down much below the top of that paper, even though they were not protected. In the same small section where he was heating his Lyon trees, 4 or 5 years of age, the Lyons were badly touched by the frost. He had about 72 heaters per acre. Another thing I would like to say in regard to the foothill section—there is plenty of difference between the higher levels and the lower levels as indicated by the condition of the trees. Judging from the temperatures that

were mentioned, the temperatures got down to a mean of 26 to 27 degrees. Where Giles Hart lives, they probably attended prayer meeting that night because it is hard to find any leaves that were frozen there. The farther you go up into the Canyon the colder it is. This would indicate that there is that difference between the foothill section, comparing high and low ground, and that hilly section in Puente Hills that is far removed from the foothill section, near the mountains.

GOOD AIR DRAINAGE ALSO NECESSARY

Barrett—I think the question of elevation had little bearing, unless there definitely was very favorable drainage condition in connection with it. At Christie's place, which is on a sharp ridge, the Lyons and Nabals were untouched. All the orchards on that ridge came through with practically no damage. As you look in other places in La Habra Heights, you will see that even points that are much higher were caught, if they happened to lie in just a slight hollow. Any chance to collect the cold air seems to do the damage. On the Wilde place, there was much difference between those trees on the hillside and those in the hollows. Have you any comments to make on windbreaks?

Blanchard—My own place gave a good check on windbreaks. I think they are a wonderful asset. The thing I am interested in is what influence opening up the lower part of the windbreaks would have in letting in a draught.

Barrett—We found in San Fernando that the second and third row lemons on the south side of the windbreaks were much more protected and less damaged. The same observation was made in Orange County.

Gardner—We were not able to bring our Farm Advisor up today. Anything I would say might be prejudiced. My own windbreak is one and one-half miles long. The Dickinson trees are apparently dead. The Fuertes are not hurt. The whitewashing question, or rather coldwater paint—I have done some of that for many years and I think it is a good thing to keep trees from sunburning. My policy has been to wait and do the whitewashing just before a very hot day. The temperature is so spotted, however, that it makes us guess quite a lot. I have a plot with three fairly small trees. They were one foot apart and the branches were mixed up. One is a Mexican seedling and had blossoms on at the time of the freeze. The Lyon tree is dead and the Fuerte, which was just partly injured, and the Mexican trees are coming up. They were subjected to the same temperature.

I observed one small orchard at Olive that showed no injuries. Not far from there, an orchard of Anaheims and Fuertes looked like all the trees were killed. About windbreaks, I have a lumber windbreak and air can circulate through it; but it seemed to protect the trees from the frost to a certain extent. At another place, towards the foot of the slope, it seemed to shut off the air and the freeze damage was quite severe.

Barrett—I have two fruit that came from our newly registered seedling, the Juan. It comes from Stone Canyon, above the University at Bel Air. This fruit won't be ready until next September. It's a good green fruit and produces fairly well. It is either seven or eight years old. This is the third crop. The bottom of that tree, up to about 10 or 12 feet was frosted, but the upper part of the tree was practically unharmed. The fruit is hanging

there in good shape. It is a seedling which originated on the Oakley place. It was moved to its present place when it was about three feet high. It seems to have some possibilities in the coastal area. It started off to a good bearing record, and made a good test as to quality.

VARIETIES IN ORANGE COUNTY

Murray—It seems the more I look, the less I know. Most of the trees on the Irvine Ranch have been interset with citrus. The Challenge were badly hit. Some of the Hass and Fuertes were badly hit. In some orchards they are interset with lemons. The Fuertes and lemons were both hit about alike. In another orchard on a small hill, exclusively avocados, we have planted on two sides of the hill, Spinks, Challenge, Dickinsons, Lindas, Queens, and a few other varieties. They all seem to be hit about alike on the flats but the hillside—I think even the Spinks—fared better there than they did on the flats. Perhaps there is a difference in elevation of not more than 75 feet. One of the reasons might be that there was a windbreak on the ridge of the hill. I think practically all of our trees—avocados and citrus—fared better close to the windbreak on both sides, north and south. The windbreaks offered protection for about 100 to 150 feet. We haven't whitewashed yet, but I have some trees that were badly frozen two years ago and at that time we gave a good dose of whitewash.

Barrett—Can you notice any greater effect on those trees that were badly frozen two years ago over those that were not frozen this time? Do you think they were weakened then to an extent that would make them more susceptible now?

Murray—No, I don't think so. After the freeze two years ago they came through and put out new growth and set a good crop this year. We whitewashed two years ago. We didn't notice any bad effects from the whitewash.

Crawford—I thought for awhile I might be able to tell something about the relative resistance of Guatemalan fruit. But I don't think I can tell you very much about this difference because I think they are all gone. I don't think there is much difference that we can notice now. They seem to all be hit about the same. We had all the varieties that have been mentioned here today except the Mayapans.

Barrett—In some cases I have found that Mayapans stand up a little better than other varieties. There is a possibility in some places that a Mayapan might not be so bad. They do pretty well in Riverside. I have one or two in San Fernando; they are certainly standing the cold much better. They fruited much better. But it is such a bad fruit from a marketing standpoint that it shouldn't be considered for anything but home use.

GUATEMALANS HARD HIT

Crawford—I have Kashlan, Cabnal, Carlsbad, Itzamna, Nabal, Sharpless, Spinks, Queen, Linda and Lyon. As near as I can tell they are all gone. I am located near Mr. Gardner, near Villa Park. They looked to me as though they were killed back to the main trunk. I cut some this morning before coming down here; I cut an eight inch Queen and there was frost damage in that trunk.

Rounds—Didn't you find any difference in the different size branches?

Crawford—The farther out on the branches the browner it is.

Rounds—Aren't there some varieties that show less damage?

Crawford—My planting has been hit so hard that I can't tell the difference. It got so cold that the difference is not recognizable. Practically all the Fuertes are defoliated. The average die-back is about one inch. The only trees that got through are right below a very tall windbreak.

MEXICAN VARIETIES

Barrett—Before leaving Orange County, I want to mention one thing more. I have a letter in my files from an owner near Hughes Park. She has 5 acres of Fuertes, part of them on not too favorable soil condition. She says that when she did have a crop there wasn't any price. Her idea was that this might be the psychological moment to topwork the majority of those trees to a good Mexican variety. Of course there are a good many arguments on that question. The first is that we haven't any satisfactory Mexican for any such location. There is some question as to how far we can go with Mexicans. Her argument was that if she had had those trees in a Mexican variety she could have gotten a good crop with reasonable regularity, and the crop would be off before the cold could get them. I give you this for whatever value it may have. There is going to be a decided danger if too many people get such an idea as that; however, for certain individual cases there may be some merit in such a proposition. I feel that we have been remiss in our study of the Mexican situation in the last 10 or 15 years because we are not competent to give any satisfactory answer regarding the Mexicans. The Leucadia is showing up fairly well as a coastal tree of the Mexican type. The Duke is showing up well in the interior sections but for anything in the intermediate section, it is hard to name a Mexican that would prove satisfactory where you had a quantity to market. I feel that for various reasons it would be well to keep our eyes open for Mexicans that have any real promise because there are a great many people who could grow Mexicans in their yard where they can't grow anything else. In that connection, there being nobody to report from that area, I will give you a word on what has come from Alta Loma. They had 21 degrees according to the temperature records. I don't know anything more about it, than the manager's statement. Their planting is largely composed of Fuertes. A good many were pretty well cleaned up. Their Dukes are blooming. It shows the great hardiness of that variety. The Duke and the seedling of the Fuerte which is locally known as the Hoyt, and the one other Mexican came through with no trouble on the upper portion of Sheldon's property; on the lower portion his Fuertes were hard hit. That is up in San Bernardino County.

VARIETIES IN SAN DIEGO COUNTY

Hazzard—The temperature on my own place at Vista was 24 degrees. I don't know for how long. The Lyon, Leucadia, and Henry varieties all came through O.K.

Barrett—Has anyone else any observations on the Ryan?

Courtney—I think it shows up about as well as the Fuerte. The only observations I made were on Smith's place at La Habra Heights. It doesn't show a great deal more difference than the large Fuerte tree. The Ryans are small and are on the lower end of the grove. He also has some Ryans on the terraces which were not touched at all. The Fuertes alongside of them were not touched either.

Hazzard—The second group is composed of Fuertes and Edranols. The stems of the fruit were not hurt. There was no foliage damage. The Fuerte had a little of the foliage hurt but the stems were not hurt.

Coit—You wouldn't put Edranol in the same class as Fuertes, would you?

Hazzard—Yes. The third class is Millie C., Nabal and Puebla. The Pueblas were burned quite a bit. The Queen is in number four. The last group is Spinks, Carlsbad, Anaheim, Hazzard, Prince, Princess and Marion. All the foliage was killed and also all the twigs, back to the size of a pipe stem. The Bearss limes—about half were hurt and possibly 2 per cent of the fruit still remained. The Bearss lime is more resistant. Trask has his divided into three groups. The hardest group is composed of Edranol, Henry, selected Fuertes, and Leucadia. The second is Nabal, Itzamna, Millie C., and Carlsbad. The last is Taft, Spinks, Stephens Choice, and Anaheim.

Barrett—How about nursery stock? How did it stand the freeze?

Hazzard—It was higher up, and the cold didn't hit it. About the Dukes and Benedicts, one of them is in a new grove, that was all killed back. There is one part that got burned bad. It is all coming out into bloom. The Fuertes were hit a little and Nabals and Anaheims were hit badly. A dark discoloration on the stem didn't seem to make any difference. I haven't lost any buds completely.

Miller—It was just as erratic in San Diego as in other places. In Fallbrook 26 degrees would be considered the temperature for most of the groves. There are a few places where it dropped below that. On Anthony's place the Guatemalans were damaged to the extent of some foliage injury. Outside of that there wasn't much damage.

The area north of Fallbrook, where I would say the temperature was about 26 degrees, although we didn't have any definite readings, the Fuertes were in blossom yesterday, showing considerable bloom and little or no damage. Right alongside of them, Nabals were severely damaged. Dickinsons weren't hurt as much as the Nabals but the Dickinson tree was a more vigorous tree which might account for the difference. Generally speaking, Rancho Santa Fe got by pretty good. Temperatures got down to 22 and 24 in most of the groves. One grove got to 14 in a low pocket and the Fuertes were killed to a point where the trunk showed discoloration in the cambium layer for a diameter of 6 and 8 inches. We are assuming those trees are killed, at least down to that point. There is a question as to whether to try to rebuild them or to pull them out and put new ones in.

ICE IS DAMAGE INDICATOR

At La Mesa, a great deal of the upper portion of the Calavo Gardens got by O.K. The morning after the bad freeze, while in that grove, I cut fruit going up the hill. We got to a

line half way up one of those hills and we no longer found ice around the seeds. We found that same condition around the Vista area. Where we didn't find ice, there was no damage. Apparently where ice forms around the seed cavity it is a good indicator of future damage.

In the El Cajon area, the temperatures ranged at the top of the hills from 28 and where most of the groves are, at $21\frac{1}{2}$, and at the bottom of the hills it got down to 14. There was some damage to some Fuertes in what I would consider a 21 to 22 degree strata. You will note by that, that we did have different temperatures depending on the altitude and air drainage. In temperatures of 22 degrees we found avocado trees of 2 to 3 years of age killed back to within a foot of the bud. In that same place, the Puebla didn't have all its leaves completely off, which was rather unusual. The trees were about 50 feet apart and the Puebla trees might have had a little different air current.

There is one point that it might be well to bring up here, and that is the injury that we appear to be taking from this long period of heavy rains. Some of the boys have been trenching their low spots 2 weeks after this last rain and water was running freely from these trenches. In some groves, water was standing 6 inches from the surface, and the trees will apparently stand in that condition all winter. So perhaps this excessive amount of moisture will be just as dangerous as the freeze damage.

As far as windbreaks are concerned, we found that the trees immediately under them and for four and five rows above them were protected; that is, there was less damage, generally speaking. In the area in the northern part of the county, just south of the Palomar Ranch, it ranged between 18 and 24. Avocados were not severely damaged—I would say 50 per cent defoliation resulted on Fuertes. As I say, it is a very erratic picture. You can find anything you want there. You will find spots on the south side of the hill badly damaged and less damage for the same type of fruit further down the hill. There is something peculiar about the damage that will frequently be greater on the south side of the slope than on the north. We had a northeast wind, which might have had some effect there.

Hazzard—Might it be the sun striking it when it is frozen?

Miller—There is that possibility.

Miller—There are a good many groves that show a very definite difference in damage according to altitude. The top of the hills were not damaged; in the middle of the hills 50 per cent were damaged as to foliage, and at the bottom of the hills 100 per cent of the foliage was damaged and also some wood.

FUERTE STRAINS

Barrett—You spoke of El Cajon. I ran out Tuesday morning after the meeting. I was very much interested in one thing which I want to call to the attention of Shamel and Hodgson. Mr. Hathaway has a Fuerte tree which is a consistent producer. It is the largest tree on the property, and it stood the frost the best. Furthermore, it had two crops that averaged about 400 pounds and in this year's freeze, he picked 99 pounds and there are approximately 50 or 60 more pounds on the tree. That tree was budded from one of his neighbor's trees and that tree has been consistently a good bearer.

Furthermore, you will have a chance in the next few years to observe something else because Trask has grafted a number of trees in Hathaway's grove from this outstanding tree.

Adams has an observation to make in connection with that Burgess tree at Brea.

Adams— I grafted over a number of stumps from that tree three years ago. I noticed that they seemed to stand out, while other trees around them were badly hurt. I saw Burgess last Friday night and asked him if he noticed any difference. He said that he hadn't noticed any difference but that he hadn't given it any thought. He had some stumps grafted over from this tree and he said that he recalled now that they weren't nearly as badly hurt as the others. That may be due to the thriftiness of the tree. I wouldn't say that is the case, but it is probably the reason.

Barrett—It is an interesting correlation, at any rate. We have another outstanding strain that we are following in Ventura County and I would like to know whether anybody has made observations in that connection. Read letter from C. J. Daily of Camarillo.

Coit—He has one tree that had one limb grafted to that Cole strain. The Cole has borne much better. I tried to observe it for frost-resistance but it was raining too heavily. This is located in C. J. Daily's front yard in Camarillo.

Barrett—That is the thing that you want to watch closely. This tree of Hathaway's hadn't the record behind it that others have had, but it is outstanding in that grove. As I understand it, the original tree that the Hathaway tree was budded from, came from Armstrong's as a nursery tree and the Cole strain also came from Armstrong's Nursery.

BURLAP FOR TREE WRAP

Palmer—Jean has covered the county very well. In Carlsbad we were quite favored. The minimum temperature was about 28 degrees. We had very little damage. One thing that has interested me in observing some of the orchards elsewhere, in which the Fuertes have all been practically frozen to the ground, is that in some orchards you will find one tree that is green, standing in the middle of the orchard, while other trees in that same orchard will have their foliage entirely frozen. I am reluctant to believe that it is due to the nature of the strain. I would rather believe that it was more the condition of the tree. Nevertheless, this same condition exists in a number of orchards and is a very interesting thing. In regard to whitewashing I am inclined to side-step the issue. But I would suggest in some cases that the main trunks and larger branches be wrapped with burlap. In wrapping the tree with burlap I can't see where it could do any damage. Of course there is the cost that enters into that, but many plantings are small and the grower would do almost anything to help the trees without regard to the cost factor. I think wrapping the tree with burlap is a real protection and I can't see where it could do any harm.

Adams—In that connection, Dr. Webber mentioned last Friday night that whitewashing in the case of citrus trees kept the trees cool, so that the trees that were whitewashed were about 3 weeks later in putting out foliage and as a result suffered more damage than trees that weren't whitewashed. Now it wouldn't necessarily follow that the same thing would apply to the tree protected by burlap, would it?

Palmer—I don't know. I had another self-recording thermometer that I put outside the tree and I think there was something like 8 degrees difference. The thermometer right inside the wrapping material that I used on the trunk of the tree was about 8 degrees cooler than the thermometer just outside.

Adams—In other words, it would keep the tree cooler in the daytime.

Hazzard—How about wrapping the horizontal branches?

Palmer—I don't think so.

Gardner—I like to use date palm leaves to shade instead of whitewash. They will shade just enough to keep from sunburning, and still let the air circulate.

Barrett—I have used burlap a good deal. My feeling is that burlap might be more absorptive of heat if only one thickness were used, but I would question rather seriously a material applied directly to the tree because it would malform the shoots as they came up. You can't tell always where the shoot will originate.

Palmer—You don't want the shoot to come out of the trunks. If you would wrap with a spiral wrapping, leaving spaces in between there would be room enough for one or two shoots to come out and one is all you want.

Barrett—I would be inclined to lean toward palm leaves.

Coit—Read letter from Henry R. Dakin of Santa Cruz on frost damage there.

PICTURES TO RECORD RECOVERY

Barrett—Shamel, are there any remarks you want to make?

Shamel—I haven't much more to say than what has been said. I have one suggestion to make. In 1913, I took pictures of groves of orange trees. I went back to the same location where I had taken pictures in 1913, in January, 1915—two years later. Those pictures proved to be very interesting bits of evidence. If we don't have another freeze in the avocado industry for 24 years, some pictures taken now, and then again a year or two later, would be very interesting evidence some years from now.

Barrett—I think Knowles took some pictures in 1922 and showed very tall trees killed to the ground, and while out last year he took the pictures in the same places and they showed fine, green trees. Those were seedlings and varied greatly in their resistance. But what you suggest should be done with Fuertes and Nabals. In fact, arrangements have been made to do that very thing.

Coit—On the whitewash question, I don't know anything about whitewash for avocados. In topworking citrus trees we have a lot of that, and I am sure that the observations point to the absolute necessity of whitewashing citrus trees when the tree tops are taken off in June and July, because I have seen definite evidence of injury where there was no whitewashing.

Barrett—Jean Miller brought up a good point on the rain situation as it affects soils that have very poor drainage. Some farmers will irrigate their groves. I don't believe that in most cases there will be much need for water for many months.

Shamel—Another point I brought out is that orange groves that were fertilized immediately, came back with good crops of fruit. But where the care was not so good, the trees did not respond.

Gardner—Farm Advisors have warned us against fertilizing too much for citrus.

Shamel—Some nitrogen fertilizer should be applied.

Adams—Might not the fact that these trees came back better be due to the fact that they had better care before the freeze?

PHOTOS OF NEW VARIETIES

Coit—I suggest that we prepare a letter and circularize the whole committee on this point. There is need for more and better photographs of newer varieties for publication in the Yearbook. The other night in San Diego I had the pleasure of sitting beside an avocado grower who was also a professional photographer in San Diego and he assured me that he would be willing to take an interest in this and help in every way he could. So this morning the Board of Directors appropriated a small sum of money to be available for this purpose. This photographer stated that he could take care of the photographs at any time. So I would like to notify all the members of the committee that they will soon receive a list, which Barrett and I will work out, of varieties we desire photographs of. Any time this summer when any member of the committee sees fruit of any variety in that list, which is ripe and mature, and is an ideal fruit in size, and everything, get a photograph of it and get in touch with Barrett. Mail the photographs in here. As fast as those varieties are photographed, we will notify you from time to time as to how the plan is progressing. We want to accumulate some good, clear-cut photographs of a number of newer varieties and some of the older ones.

Shamel—What kind of picture do you want of the fruit?

Coit—Our plan was for 5"x7" photographs. We should have a view of the fruit on a transverse cut, showing the flesh and seed when it is just about ready to eat and another photo showing the skin side. Leave a little of the stem on, but no leaves. The pedicel in the case of the avocado varies greatly according to the variety; some of them have quite a swelling.

Mrs. Hardaway—Should the MacArthur be grafted on Nabal or would it be better to graft it on Fuerte?

Coit—I don't believe I know of any MacArthur grafted on Nabal. Lots of them have been grafted on Fuertes. It takes fine on Fuerte. There has been a tendency in past years to favor a "sandwich" in the trunk for the reason that grafted trees won't grow as big as seedling trees. In other words, the union has a dwarfing tendency and also has a tendency to increase fruiting. One, two or even three of those sandwiches in the trunk of a Nabal or Fuerte might be a good thing.

Barrett—I will appoint a committee of five to re-draft the Annual Report.