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OBSERVATIONS ON COLD DAMAGE TO AVOCADOS IN DADE COUNTY 1

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From time to time the annals of this Society record disastrous damage to our crops from a freeze. I'm sure the proceedings of the present meeting will equal the best of their predecessors in this respect, both as to the magnitude of the damage and as to the completeness of the record. Knowing that the data will be presented in other papers I will nevertheless tax you with a brief summary of the facts of the freeze that damaged crops of all kinds on the night of Feb. 4-5, 1958, as they pertain to Dade County.

On that date, as the culmination of four successively colder nights, our trees suffered ruinous temperatures that ranged from 24 to 27 degrees. These readings were obtained from reliable instruments, situated in the open at heights of one to three feet above the ground. At Rockdale, two miles northeast of Perrine, the minimum was a scant 27 degrees, while at the University of Miami South Campus, five miles to the west, one reading of 24 degrees was obtained. A recording thermometer at the South Campus registered temperatures of 25.7 degrees or slightly lower for five hours. There were isolated but not absolutely reliable reports of readings of 22 and 23 degrees at various places in South Dade.

So you can see that in regard to severity of cold this freeze was comparable to the worst experienced previously, in 1917, 1934 and 1940. Moreover, the freeze occurred quite late in the winter, when many of the trees had started growth (the freeze of 1917 occurred on Feb. 6).

The result was heavy damage to the trees and to the crop. Part of the fruit that was on the trees at the time was salvaged, as I will describe later. The next crop — that which we are harvesting now was reduced to about 30% of normal. This reduction varied, of course, with the individual varieties. The West Indians produced only about 20% of a normal crop, while it looks as though the crop of the later varieties will be about 35% of normal.

The general facts about the resistance to cold of the various races and varieties of avocados have been documented before. Observations of damage from this freeze tend more to confirm previous findings than to add to them. We found, as before, that Lula and Taylor will stand considerably more cold than will most of the hybrid varieties. Taylors were rarely injured beyond burning of the leaves and occasional killing of small twigs, while the damage to Lulas ranged from none in old, vigorous, thickly planted groves, to killing of wood up to an inch or more in diameter in the younger groves in locations where the temperature went down to 25 degrees or lower. On the other hand, our second most important variety, the Booth 8, got a reputation for tenderness which it may never live down.

Where Lulas were merely nipped, Booth 8's were killed to half inch wood; where Lulas were killed to half inch wood, Booth 8's were killed to two inch wood or even more. Actually, part of this damage was due to the Booth 8s being debilitated from heavy crops. Where they were in good condition they seemed to stand the cold about as well as many of the other hybrids. The trouble is that this variety is frequently in poor condition from overbearing. Certainly we must regard it as among the more tender of the hybrids. As to the others, Mr. Steffani's observation in these proceedings after the 1934 freeze, that there was more variation in damage from grove to grove than from variety to variety, still seems to be true.

I have not read of any previous observations on the hardiness of the Choquette, Hall and Hickson varieties. They seem to be about the same as the other hybrids. Hall may be among the hardier hybrids and Choquette and Hickson possibly a little more tender, other things being equal.

Whatever the variety, however, we can make this statement as never before: the old groves — the good groves — the groves most susceptible to damage from hurricanes — are the groves to have when it gets cold. With a few outstanding exceptions, young groves were hurt severely; some will require as long as three years to recover to their condition prior to the freeze. On the other hand, in groves of about eight or more years of age, even the most tender West Indian varieties were seldom damaged more than can be restored in a single season, and the hardier varieties came through sufficiently well to produce about a third of a normal crop this season. By next year these groves, which have accounted for most of our production in the past, will be sufficiently recovered to produce a crop of normal size. But most of the younger groves, on which we depend for replacement of production of old groves lost to disease, hurricane damage, housing projects etc., were hurt so badly that it will be several years before we can expect any significant production from them.

I mentioned that there were a few out1 standing exceptions to the generally severe damage suffered by young groves. These were groves which were completely clean of any kind of weed cover. Where the temperature did not fall below 27 degrees, and the trees were in good condition, damage even to young trees was not severe. The hardier varieties, particularly Lula and Taylor, escaped with little except leaf damage. Damage to the tender varieties was limited to branches of half an inch or less in diameter, which can be replaced in one season. I must say that even in clean cultivated young groves, where the temperature fell below 27 degrees for any appreciable period there was much greater damage.

One thing to remember after a freeze is that it is difficult to estimate the extent of injury with any degree of accuracy for several days. The early consensus of damage almost always has to be changed, either up or down. In the case of this latest freeze our estimates kept slowly increasing for several weeks as more injury showed up. This may have been due to the unusually cold weather that prevailed during the rest of February all of March and most of April, but I'm inclined to think the story was written that one night, if we could but have read it. The cold weather delayed new growth and, coupled with frequent rains, it reduced the set of fruit on the trees that were able to bloom, but it seems to me that such weather should tend to minimize further dying back rather than to aggravate it.

However that may be, we could not assess the full extent of the damage for several weeks. This did not affect the pruning out of the cold-killed parts particularly, as we have found it is best to wait until summer to prune. In this respect avocados are similar to limes and other citrus, but in the actual nature of the damage they differ from citrus. For one thing, avocados are less subject to localized injury in crotches and in patches on the trunk and main limbs. Also, small dead twigs and branches do not persist on the avocado tree as long as they do on citrus, and as far as I know they do not complicate disease control measures the way dead wood on citrus does by encouraging melanose. Together, these differences make pruning less important and also easier. When branches larger than half or three quarters of an inch in diameter are killed they are frequently infested with wood borers which travel on into the live wood. This is the most important reason for pruning out branches of this size. With larger limbs there is of course the problem of wood-rotting organisms invading the live wood. Standard pruning practices for citrus, as to method and wound treatment, are also applicable to avocados.

In spite of the late date, several thousand boxes of Lulas and a smaller quantity of a few other varieties remained un-harvested at the time of the freeze. The market was good, and after rather poor returns most of the season we needed to takes advantage of it if we could. So we did something that we had never tried before to any extent: market fruit from badly damaged trees. In this we profited from the experience of the growers in the Ridge section. The avocados there were badly injured by a freeze in December which missed us. Some of the growers rushed their fruit to market immediately, before it could show any damage. Others, with commendable restraint, waited to see how badly the fruit was injured. It turned out that the stems were usually killed but much of the fruit was not hurt. In effect, the cold "picked" the fruit but left it on the trees, and it lasted there about as long as if it had been actually severed from the stem; then it softened and dropped. So the irresponsible growers saved some of their fruit and the responsible growers lost theirs.

When our groves in Dade County were similarly injured in February we felt justified in picking the fruit, where the stems were killed, immediately after the freeze. Numerous samples were kept to see how the fruit would soften, and the result was the same as it was earlier in the Ridge. In one grove where a minimum of 26 degrees was recorded and four year old Lula trees were killed back to inch wood, the whole Lula crop was harvested within two days following the freeze, and almost all of the samples taken from it softened with no trace of injury, either external or internal. We found that where the fruit was injured the damage could be identified by discoloration of the skin and rapid softening of the flesh, usually at the stem end. This showed up sufficiently by the second or third day to permit grading out the damaged fruit before it left the packing house. In this way many thousand boxes of Lulas and a smaller quantity of other varieties were salvaged.

This did not apply in equal measure to every variety, and it most certainly does not apply to the fruit we harvest earlier in the season. Observations in freezes occurring: earlier in other winters show definitely that while Lula fruit will stand the cold well even early in the season, many varieties cannot be salvaged at all if the temperature drops as low as 28 degrees. The damage is not always manifested in the way just described, either. Fruit which appears perfectly good on the outside may "cut black" around the

seed. And some varieties will drop badly after a cold spell which did not even damage the leaves. Oddly enough, some of the varieties which are quite susceptible to cold damage in November or December came through this cold as well as the Lula. I have in mind particularly the Booth 1, which will rain off the trees after temperatures no lower than 29 or 30 degrees early in the season; the fruit of this variety stood the cold in February as well as did the Lula. There may be a change in the fruit associated with full maturity which makes it able to stand more cold.

Any discussion of cold injury should include the subject of protective measures. Actually, in Bade County, aside from the clean cultivation of young groves, and keeping all trees in healthy condition, there are not many things to do. In young groves if the plants are small enough to be covered by hampers this should be done. It will prevent injury from mild freezes and will save the life of the plants at temperatures as low as 27 degrees. Older trees can be protected by firing, as in citrus groves, but this is not often done as the need for it is not frequent and the expense is great. The few groves that were protected by oil heaters last February came through with little damage, but where old automobile tires were burned, as is frequently done for truck crops, I could not see that they afforded much protection. Whether or not oil-firing is economically justified as a general practice would require a careful cost study; the answer is not available to us now.

We have no experience with wind machines, but it seems to me that this device may prove to be a valuable aid in protecting from most of our freezes.

I will conclude with the sober observation that except for what we have learned about keeping the trees healthy, the value of keeping the groves clean, and the possibility of salvaging fruit from injured trees, we are in about the same position that we were 25 years ago, when it gets cold.