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Mottle-Leaf and Sun-Blotch Disease Control

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E. R. Parker: Ladies and Gentlemen: First, I will speak on Mottle-leaf or frizzles. In the avocado we occasionally encounter trees, the leaves of which show symptoms resembling those of citrus trees affected with mottle-leaf. The initial stages of these symptoms consist of yellowish areas between the veins. This symptom in avocado trees is sometimes too indistinct for accurate diagnosis. However, in a more severe form, the leaves of some of the twigs are small and close together, and the twig growth is reduced. The result is a rosette appearance resulting from the bunching together of leaves. This condition caused Dr. Coit in his early discussion of the disease to call it by the very descriptive name of "frizzles." In this distinctive stage it is probably familiar to many of you. This symptom frequently fluctuates greatly in severity in different growth cycles of the avocado.

During the past three years several species of fruit trees affected with somewhat similar symptoms have recovered upon application of materials containing zinc. The condition of citrus trees known as "mottle-leaf" is an instance in which the trees are sometimes very severely affected.

In a number of citrus orchards affected with mottle-leaf, we have occasionally found avocado trees affected with mottling of the more extreme symptom, "frizzles". There is thus some evidence that the symptoms in citrus and avocado trees are brought about by the same environmental conditions. In some of these mixed plantings the Citrus Experiment Station has established experiments dealing with the method of treatment. It appears that both species of trees, when affected, respond to treatment with zinc compounds. Extensive trials have been made with citrus trees on the details of treating, and it appears that these apply to avocado trees as well.

SPRAYING FORMULA GIVEN

Briefly, the method of treatment with which we have had most experience, consists of spraying with zinc compounds. Spraying may be done with zinc sulfate and hydrated lime in the proportion of 5 pounds zinc sulfate and 2% pounds hydrated lime to 100 gallons of water. The addition of 4 ounces of blood albumin spreader per 100 gallons may be an advisable addition if spraying is done in the winter time, as it acts as a sticker. This spray is applied lightly, wetting all the leaves, but not necessarily covering them thoroughly. On very severely affected trees the formula may be doubled.

(Sun-blotch.) The subject of sun-blotch will take the major portion of my time this morning.

The work which has been done at the Citrus Experiment Station by Professor Home and myself indicates that this disease is caused by a virus. It is propagated to the stock by budding and grafting—operations which involve the growing together of affected tissue with the healthy tissue of the stock. Although the possibility is not entirely precluded, we know of no evidence which indicates that the virus is carried by insects, pruning tools, or other means.

The control of such a disease is, of course, a difficult one, particularly when symptoms are sometimes obscure, as is frequently the case. Prevention is the only adequate remedy for the disease. Prevention, of course, involves in this case the selection of healthy parent material. We have little evidence that the disease is carried by seeds. However, that is a bare possibility—at least in a small proportion of cases—and we suggest as a matter of precaution that seeds be chosen from disease-free trees. This is easily possible. The selection of healthy trees which supply bud or grafting wood is essential. The inspection of the parent trees should be done repeatedly, since symptoms are somewhat difficult to evaluate and fluctuate in intensity from time to time. Furthermore, it is highly desirable that the progeny of budded trees be examined from time to time in the nursery and that affected or suspicious trees be discarded. A great deal of responsibility is thrown upon the nurseryman in regard to this selection of seed, stock, and to selection in the nursery. In buying trees, it would be very desirable to inspect them in the spring of the year after the cold weather, and particularly after they have been topped. Cold weather and topping brings out symptoms very much more quickly and clearly than would otherwise occur. I have here some specimens of nursery trees which are affected. These show symptoms with which possibly some of you are not so familiar, the patches of yellowish or light green color on the bark. These patches indicate the presence of sun-blotch. It is our belief that trunks or branches showing these patches will eventually succumb entirely.

I think it will be readily seen that topworking of affected trees is not a feasible procedure. Such topworked trees almost invariably show intensified symptoms in the new growth very soon after new shoots develop. Affected trees, in my opinion, should be removed when the vigor of the tree is so reduced that the average production of normal fruit cannot be expected from the tree. The economic aspect of the disease is paramount in arriving at the decision to remove the tree.

PRUNING SUN-BLOTCHED TREES

Now it frequently happens that we have in older sun-blotch trees certain limbs which are obviously severely affected and others which are only slightly affected or in which no sun-blotch symptoms are visible. We do not know if the normally appearing wood harbors the virus and whether the appearance of the symptoms is merely delayed. We have evidence to show that this is sometimes the case. It may be also that some condition within the tree inhibits the development or movement of the virus or the appearance of symptoms. Such trees represent a most difficult problem in control. It is a matter of judgment as to what should be done with those trees providing they are not yielding fair crops of normal quality fruit. If the main upright or main scaffold limbs begin to show small yellowish patches on the bark, or if a large number of small affected twigs

develop from them, our experience indicates that such limbs or uprights will eventually succumb, and that time might be saved by removing the entire tree as soon as possible. The removal of affected wood in such severely affected trees cannot be expected to eradicate the disease from the rest of the tree or from the new growth. It is very probable that the virus has penetrated the bark of the main trunk, low down, and may be systemic in the tree. In the case of secondary or smaller branches, however, the removal of affected limbs may provide more room for the growth of the more normal part of the tree, and that normal growth would be stimulated. If sun-blotch growth is produced by such cutting, the tree should be removed. Subsequent pruning may be expected to result in similarly affected growth.

I think we can summarize these remarks on sun-blotch by saying that prevention is, in our opinion, the only satisfactory remedy for the disease. The likelihood of success as a result of pruning out affected tissue appears to depend upon the amount of such tissue and the severity of pruning necessary. The rate of new growth which is made as a result of such cutting seems to have some effect on the amount of sun-blotch which develops later. If light cutting suffices, the chances of success appear to be higher. Pruning of older trees to remove sun-blotch, therefore, seems more hopeful than pruning of small trees. Removal of small affected trees in the nursery and in the orchard seems logical.

CAUSED BY INSECTS?

Question: We have some trees twenty years of age—Taft variety. They came from the original Taft orchard. Now the original Taft tree was not affected by sun-blotch but it died from over-watering. These trees of ours came from there and they grew up, and chances are that they were Mexican seedlings which were budded. I have seen out-croppings from bottoms at the root, some of those had sun-blotch. What I want to know is why. From some of them I took away the very badly sun-blotched area. They produce very fine limbs above these gnarled and burned areas and had many fine fruits on them without sign of sun-blotch, and occasionally you will find a little indication of sun-blotch. Where did the sun-blotch come from?

Answer — Parker: These are difficult questions. We have seen some cases similar to that but, of course, we seldom know the history of the trees in detail.

Questioner: They came from the original Taft.

Parker: There is a possibility that sun-blotch was carried in the seed. Our experience hasn't found instances of that kind, but it is a possibility. Then there is the possibility that that seedling before it was worked to Taft might have been worked to another strain. That has occurred in some instances that we have looked up. There is still another possibility—that it was carried by insects.

Chairman: Thank you, Dr. Parker.