

# Citrus Tree Freeze Damage

## possible effect of the January 1949 cold spell on the 1950 crop and recommended treatment of injured trees

J. C. Johnston

**Damage to citrus trees** by the January freeze now appears to be slight—when the State is considered as a whole.

Lemons and young orange trees were seriously damaged in limited areas, but injury was much less than in 1937. In some cases it was less than in 1948.

The long duration of temperatures below the danger point and the extensive loss of fruit might indicate more tree damage than is now apparent. This is likely due to the long period of cold weather which preceded the freeze and caused the trees to become more dormant than usual. As a result they were more able to withstand low temperatures.

Some large orange trees which showed very little early leaf injury had split bark on limbs four to six inches thick. It will be August or later before it is known how much these trees were injured.

An unusual feature of the cold wave was the heavy snowfall when as much as 18 inches were reported from orchards at the higher levels. This caused extensive breakage which exceeded the damage from cold.

Exposure of fruit to snow, ice and rain weakened the rind and caused an unusual amount of water spot—an injury caused by water soaking into the rind. In many navel orchards the loss of fruit from water spot will be greater than the loss from frost.

### Possible Effect on 1950 Crop

There is some concern as to the effect of the freeze on the 1950 crop. In this connection a study of yield following past freezes is encouraging. The record for oranges is as follows:

The 1913 freeze was preceded by a 15,273,000-box crop. The 1913 crop was 6,870,000 boxes and the 1914 crop was 19,688,000 boxes.

The 1922 freeze was preceded by a crop of 23,771,000 boxes. The 1922 crop was 14,021,000 boxes and the 1923 crop was 21,283,000 boxes. The 1923 yield in this comparison looks low, but only two previous crops—1917 and 1921—were greater.

The 1937 freeze was preceded by a 32,809,000-box crop. The 1937 yield was 29,827,000 boxes and the 1938 yield was 45,941,000 boxes. In each case the crop after the freeze was average or above.

The situation with lemons is different. Because of extensive tree damage, the 1913 and 1922 freezes were followed by yields below average. The 1937 freeze was followed by a crop which was greater than either 1936 or 1937 but not far from average. The lemon yields were: 1936—7,787,000 boxes; 1937—7,579,000 boxes; 1938—9,304,000 boxes. This would indicate that where there is no extensive tree damage the crop following a freeze at least will not be reduced.

In view of this record and the fact that current indications are that tree damage will be a minor factor, it is reasonable to expect a crop in 1950 which will be average or above.

### Treatment of Injured Trees

If the fruit has no value it will usually pay to get it off as soon as possible. Experiences following the 1937 freeze indicate that the succeeding crop will be increased if the fruit is removed promptly.

No pruning of injured trees should be done for six months to a year after a freeze.

Sufficient time always should be given for new growth to take place and for the dying back to cease so that the extent of the damage is clearly defined. Experience has shown that early pruned trees do not recover so soon as trees pruned later.

Where foliage and small twigs only were injured, trees require no special treatment other than that ordinarily given the grove. In general, all foliage should be retained to nourish the root system and support the crop that develops.

Where a considerable part of the top was killed but the trunk and main crown limbs showed little damage, no pruning should be done until the full extent of the damage is visible. It is important to save as much of the framework of the tree as possible but the old limbs must finally be cut back below all serious bark injuries.

Nothing is lost, however, by delaying the pruning a full year.

Where the top and crown limbs were mainly killed but the trunk showed little injury, no action should be taken until the full extent of the damage is visible—usually after midsummer. The entire top of the tree should be removed then, cutting below all large areas of injured bark.

All sprouts should be left until a balance between root and top is established. The new top should be developed by favoring the growth of one or more of the most vigorous shoots. Other sprouts can be held back by occasionally pinching out the tip growth.

Trees killed to a point below the bud union should be replaced by new trees. In special cases where it is deemed necessary to retain such trees, a new trunk and head may be produced from a strong shoot. The shoot must be budded to the desired variety as soon as it is large enough to take a bud—about  $\frac{1}{4}$  to  $\frac{3}{8}$  inch in diameter.

In cases of severe injury, trees frequently lack sufficient vigor to make a good recovery. Interplanting with new trees may be wise. This will double the number of trees in the orchard and will increase returns during the recovery period.

Bark on injured young trees may crack and curl, and patches of dead bark may show up on large limbs or on trunks of injured trees of various ages, where no splitting has occurred. When the extent of these injuries becomes clearly visible, the areas of dead bark should be cut out smoothly and the exposed wood disinfected and painted.

Covering injured bark with wax, sealing paints, or other materials like budding cloth which prevent drying out may prove injurious, favoring the development of gummosis and wood rots.

Whitewashing exposed trunks and large limbs on defoliated trees to prevent sunburning may be desirable. Whitewash delays the appearance of new growth, but it does not appear to affect total tree growth.

Whitewash on citrus trees favors the development of red spider mites. For this reason applications should be limited to exposed trunks and main branches.

Citrus trees usually have a wilted appearance immediately following freezing temperatures but that is not an indication of need for irrigation.

Water removed from the soil by the trees is lost through leaves. Since most of the leaves are destroyed in a freeze, less than the normal amount of water will be required until a new crop of leaves has been developed.

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# Walnut Aphid Control

## studies in northern California of effectiveness of addition of aphicide to codling moth spray

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**Investigations on the control** of the walnut aphid in northern California were expanded in 1948.

The insecticides investigated at Linden and at San Jose included Lethane 60, benzene hexachloride containing 10% gamma isomer, 25% wettable parathion, 14% dry nicotine concentrate and 20 or 40% tetraethyl pyrophosphate.

Population trends of the aphid were determined from time to time during the growing season.

At Linden two blocks of 100 trees were sprayed with Lethane 60, used at the rate of  $\frac{1}{2}$  gallon to 100 gallons of water. The application was made April 1, with sprayers having 25-foot towers, equipped for automatic spraying. Approximately 43 to 44 gallons were applied per tree. Growth had only recently started and an occasional catkin was open and shedding pollen.

At San Jose in a 15-acre orchard, all but a block of 49 trees were sprayed with Lethane 60 on April 2 and 3. Application was made with manually operated spray guns. The trees were smaller than those at Linden and approximately 11 to 12 gallons were applied per tree.

Some tip burn of the leaves occurred both at Linden and at San Jose. It appeared to be more severe where applications were made at elevated temperatures.

The Lethane spray resulted in a marked reduction in the walnut aphid population, and this suppression remained evident

until well into the season. However, the control obtained, based upon a single season's investigations, does not appear to be any better, if as good, as that which resulted where an aphicide was added to the codling moth spray.

At Linden the aphid population was slow in developing, and the control was definitely better where aphicides were used in conjunction with the codling moth spray. After the middle of May the aphid population in the check started to increase rather rapidly and by June 10 the average number per leaflet was 54.91. This compares with 23.11 for the Lethane 60 treatment and 0.43 for the aphicide-codling moth combination.

The results obtained at San Jose were not so clear cut. This was due in part to the fact that additional aphid control was applied to the Lethane 60 treatment on May 25. This resulted in lowering the aphid population to a level similar to that encountered in the treatment where an aphicide was incorporated in the codling moth spray.

At Linden in 1947 highly satisfactory control of the aphid was obtained when aphicides were added to the codling moth spray. The materials and the rates per 100 gallons were as follows: 14% dry nicotine concentrate 1 pound; or benzene hexachloride wettable powder containing 6% gamma isomer, 1 pound; or 10% tetraethyl pyrophosphate  $\frac{1}{2}$  pint.

The materials used and the rates per

100 gallons in 1948 were as follows: 14% dry nicotine concentrate, 1 pound; benzene hexachloride containing 10% gamma isomer, two-thirds pound; tetraethyl pyrophosphate, one-eighth pint of 40% or one-fourth pint of 20%; and 25% wettable parathion, one-third pound. These aphicides were used in combination with arsenicals and DDT in codling moth spray programs.

The sprays were applied with conventional sprayers having 25-foot towers, equipped for automatic spraying. Approximately 55 gallons of material were applied per tree.

All the aphicides resulted in excellent control of the walnut aphid, and this occurred whether they were used in combination with arsenicals or with DDT.

These plots received no further aphid control although it would have been desirable to have treated the entire area with an aphicide prior to the peak population that occurred in July. This was not possible because the orchard was under irrigation and by the time the area could be treated, it was obvious that natural enemies were rapidly depleting the aphid population.

The decline that occurred in September was due to the killing action of a tetraethyl pyrophosphate smoke that drifted through the experimental area.

All sprays were applied on May 10 and 11. The average number of aphids per

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### TREE DAMAGE

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Irrigations should be less frequent than normal and less water applied at each irrigation. The reduced need for soil moisture may continue during the entire growing season following the freeze.

Water should be applied only after careful observation of the soil moisture shows it to be required.

Fertilization of frozen trees should be considered carefully.

There is no evidence to indicate that frozen trees respond to any special fertilizer which is supposed to stimulate growth. Those materials which are customarily used in citrus orchards should be sufficient.

Slightly injured trees will require ade-

quate nutrients to permit satisfactory growth and fruiting. The best results will be obtained when normal fertilizer applications are made.

Severely injured trees will usually produce an abundance of vigorous sucker growth which is difficult to control. Application of fertilizer to such trees is unnecessary and most likely will increase the difficulty of rebuilding the trees. Fertilizer applications should be omitted or reduced below the normal amount until a balance has been established between root and top.

### Nutritional Sprays

Following serious loss of leaves and during the periods of unusually vigorous growth such as occur after a freeze the

trees should be watched for evidences of deficiencies of zinc, copper and manganese. Deficiency of zinc is most likely to develop.

These materials should be applied as sprays and they should be used as often as symptoms are observed. Two or more applications may be required the first year.

Copper sprays frequently cause injury. They should not be used unless a deficiency is definitely known to exist.

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*Recommendations concerning individual problems in various districts may be obtained from the Office of the County Farm Advisor or the University of California College of Agriculture, Agricultural Extension Service.*