Small Size Citrus Fruits May Be A Genetics Problem

(Continued from page 1)

ments—zinc, copper and manganese. In California they are zinc and possibly manganese.

One of the important aspects of the widespread elimination of these deficiencies in Florida in recent years has been a substantial increase in average fruit size.

A not inconsiderable part of the sharp increase in yield, which has resulted from the use of the new fertilization and nutritional spray program, is to be attributed to increase in fruit size rather than to increased number of fruits, though the latter has also occurred.

Organic Nutrition

For trees not suffering from lack of mineral nutrients, adequacy of organic nutrition almost certainly is concerned primarily with carbohydrate supply per fruit.

Virtually without exception, investigators have shown that fruit size—or weight—increases with increase in number of leaves, up to a maximum, beyond which no further increase in fruit size occurs, regardless of the number of leaves.

There are conditions under which an excessively large crop of small sized fruit on normal healthy trees may be reflected in undesirably small sizes in the following crop, even though it is considerably smaller in amount.

Trees lacking in vigor, irrespective of cause, are characterized by reduction in both amount and size of leaves. In many cases, impairment of leaf health occurs.

In such trees the supply of organic nutrients is undoubtedly sharply reduced—to the point where it becomes limiting in relation to fruit size.

There is much speculation and difference of opinion as to the causes which have led to the development of the current small fruit size problem in California.

One factor which probably has played an important part, in certain areas, is cumulative injury from the long continued use of oil sprays. It is both interesting and puzzling to note that this effect seems not to have occurred in Florida, where oil sprays have been used even longer than in California. Presumably the environmental conditions there are not favorable to the absorption of oil.

Among the other possible causes which have been suggested are:

(1) That trace element deficiencies are much more widely prevalent and important than hitherto appreciated.

(2) That the influence of soil reaction (pH) on the availability and intake of mineral nutrients is much more important than hitherto realized.

(3) That a gradual accumulation of salines has occurred which is increasingly interfering with the intake of water and mineral nutrients.

(4) That nematodes or other soil organisms have built up to the point where root growth and activity are increasingly curtailed.

In view of the importance of the situation, research work already under way on these hypotheses has been materially expanded and all of them, and other, are now under intensive study.

Weather

Adequacy of heat during the growing period is unquestionably the aspect of weather most closely related with fruit size problems.

Variety for variety, all citrus fruits average much larger in Florida than they do in California.

The effect of heat on fruit size appears to be influenced by atmospheric humidity, which if low tends to restrict attainment of maximum size.

Only in the hottest districts of California do the Valencia orange and Marsh grapefruit ripen by the beginning of the next growing season.

Elsewhere, part of the growing succeeding season is required to bring the fruit to maturity. The small fruit size problem is rarely of importance in the former but all too frequently so in the latter, and notably so in the late coastal districts.

That the past four or five years have comprised a period of pronounced deficiency in total heat is generally recognized and readily demonstrable and, significantly, it has witnessed the most acute occurrence of the small fruit size problem in many years.

There is evidence that time of bloom and favorableness of temperature conditions during the early part of the growing season may be of special importance in relation to fruit size. Thus in districts or seasons of earlier than average bloom the crops are usually characterized by better than average fruit size.

The earlier bloom which irrigation produces in Florida, following warm, dry winters, is doubtless mainly responsible for the large sizes and earlier maturity which have been attributed to irrigation there.

Other Factors Studied

Since, for healthy trees, heavy crops is the factor common to the small fruit size problem in both states, and usually the most important, ways and means by which the number of fruit increased, would seem to afford the greatest promise for its solution.

Unfortunately, the limited evidence and experience accumulated thus far are not very reassuring.

Fruit Thinning

The fruit thinning experiments conducted to date all seem to have increased fruit size somewhat, but the reduction in crop and the costs of the operation have rendered it highly unprofitable.

In most comprehensive and best conducted experiment reported thus far, it was found that the effect of a thinning carries over into the succeeding crop. One thinning increased fruit size in the current crop, though at the expense of amount of crop, and at the same time increased fruit size in the succeeding crop, even though as large or larger than the thinned crop.

This practice, if applied to Valencia orange trees in the "on-crop" years, might conceivably give a response sufficient to make it profitable. It seems worthy of further study.

Girdling

Among the results reported from girdling experiments have been increased fruit sizes, though the use of this practice, in California at least, has been primarily for the purpose of increasing fruit set.

It seems probable that the time of treatment should be different for the two objectives.

While not considered promising, and likely to be depressing to tree health and vigor, it seems desirable to give this practice more study.

Blossom-thinning Sprays

Perhaps the most promising field for study in this connection is the use of blossom-thinning sprays, of which a number of kinds are now available. The use of such sprays is receiving widespread attention in connection with experimental work on the problem of alternate or biennial bearing in the temperate zone fruits.

Tree Vigor

There is much disagreement as to the causes for the widespread lack of tree vigor in some districts, which almost certainly is related to the small fruit size problem.

The evidence is strong that in certain districts, a contributory, if not causal factor, is the cumulative effect of the long continued use of oil sprays. This can not be the sole cause, however, for this condition exists over wide areas where oil sprays have been comparatively little used.

There is much reason for concluding that some general condition exists which is interfering with the normal intake of mineral nutrients directly, or indirectly.

It is hoped that research now under way will soon clarify this situation and provide the information necessary for its correction.

Nitrogen Fertilization

In view of the long known and utilized effects of nitrogen fertilization on yield, some growers have resorted to the use of extra nitrogen in the hope that it would improve fruit sizes. No convincing evidence has been reported to date in support of this conclusion. Not infrequently the heavier crop which results from increased applications of nitrogen actually causes a decrease in average fruit size.

The best conducted experiments, in which the extra nitrogen has been made available after fruit-set has ended, have failed to show an appreciable effect on fruit size.

Plant Breeding

A permanent solution to the small fruit size problem in California undoubtedly can be provided only by an adequate plant breeding program with larger-fruited varieties as its objective. It would appear highly important that such a program be got underway as early as practicable.

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Spring Pruning And Fertilizing Of California Live Oak Trees Cause Increase Of Tip Mildew

P. A. Miller

The tip mildew or "witches broom" disease of the California Live Oak trees is increased by early spring pruning and fertilization. These are common practices which should be discontinued or avoided.

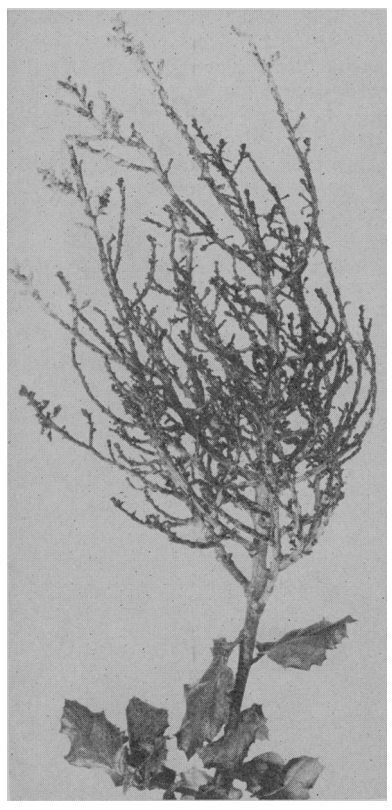
Trees of this kind may appear to be weak or in poor condition in January or February if the tip mildew disease had attacked them severely during the previous year. The leaves which were produced during the previous spring, fall or are shed normally at this time. The only mature leaves remaining on the trees are those which grew during the summer or were produced during the shorter, less active growth period of the preceeding fall.

Due to the severe mildew attack, "witches brooms" may be abundant throughout the trees. At this time, they are mostly dry, brown, dense masses of stunted, distorted shoots and leaves. In the active stage they are enlarged or swollen and covered with a powdery white growth of fungus. They may comprise the terminal growth of normal shoots or may involve part or all of the growth from an old "broom." Many entire shoots or suckers originating from the trunk or main limbs of the tree may be stunted and distorted into "witches brooms."

Spring Pruning A Mistake

The thin foliage, the apparent lack of normal growth and the many clearly visible "witches brooms" give the impression that these trees are lacking in vigor.

Pruning to improve their appearance and feeding to promote growth would seem to be logical recommendations for the treatment of such trees. Removal of the old "brooms" in pruning would seem to eliminate some sources of mildew infection.



Typical "witches' broom" growth of California Live Oak shoot.

Spring pruning of trees severely affected by tip mildew may sometimes be recommended in the mistaken belief that the removal of the old diseased growth will materially reduce the disease on the new growth which develops later. The application of high nitrogen fertilizers is advocated to promote growth at that time and restore the vigor and health of the trees.

The California Live Oak trees normally produce their greatest flush of growth during February and March. The mildew fungus attacks only the tip growth of new shoots and leaves. Weather conditions of temperature and humidity are most favorable for the infection of this new growth at this time of the year. Ample soil moisture for sustained growth during the spring months may be provided by late rains during some years or by irrigation or drainage water.

Severe pruning or liberal applications of high nitrogen fertilizers result in increased growth of young shoots and leaves susceptible to infection by the mildew fungus.

Oak trees susceptible to this disease if pruned or fertilized at this season will have more infected leaves and tip shoots than trees which had been neither pruned nor fertilized. Those which are both pruned and fertilized at this time will be most severely attacked by the mildew fungus.

Fire May Promote Growth

Much evidence of the relation of pruning and fertilization to the severity of tip mildew of oak trees was obtained by observations in the field. Forest, brush or grass fires sweeping through native stands of these trees may not kill them. Only the foilage and twigs may be burned or heat-scorched. The damage to the trees in such cases would be roughly equal to severe pruning.

Fire-scorched trees in two areas which had burned over the previous summer were observed to be severely attacked by tip mildew the following spring. Much of the new growth consisted of large "witches brooms."

Spring Growth Stimulated

Many park, garden and roadside oak trees which have been severely pruned at this season of the year have been observed to be more seriously affected by this mildew than they were in previous years. The same results have been observed to follow spring fertilization of trees in the field.

The transfer of seedlings from crowded flats or nursery rows to fertile soils in pots or in the field will likewise provide stimulation of new growth and a consequent increase in mildew infection.

Experimental work upon the various possible control measures for this disease have been in progress since 1939. After two years trial, spring pruning was abandoned as an aid to mildew control. The results showed that the trees requiring much pruning to remove all of the old diseased growth or "brooms" had more mildewed tips and leaves during the following flush of growth than had been noted prior to pruning.

In the fall of 1939, a group of twenty trees about 14 years old were fertilized with a mixture containing 7.63% nitrogen. Each tree received about 1.1 pounds of nitrogen. During the eight months following this fall application of fertilizer no differences either in the amount of growth or mildew between the fertilized and the unfertilized trees could be detected. These results indicated that a light application of nitrogen at this season of the year had no adverse effect.

Fertilizer Tests

In February of this year, five young oak trees about five years old and approximately equal in their susceptibility to mildew were given application of ammonium sulfate. Each tree was given an amount equivalent to one pound of nitrogen per tree.

Counts of the mildewed tip shoots or "witches brooms" which developed during the spring flush of growth showed an average of 15 more "brooms" per tree than on a comparable group of five trees which had not been fertilized.

A similar group of five trees which had been pruned but not fertilized developed approximately the same average number of mildewed tips per tree as those that were fertilized but not pruned.

Both the pruning and fertilization of these trees should be deferred until late in the summer or early fall months. The weather conditions at that season are less favorable for the mildew fungus. Growth is less active and of shorter duration. There is less young growth of shoot tips and leaves exposed to mildew infection.

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ABSTRACTS OF NEW PUBLICATIONS

ARTICHOKE PRODUCTION

PRODUCTION OF THE GLOBE ARTICHOKE IN CALIFORNIA, by A. A. Tavernetti. Ext. Cir. 76, revised October, 1947. (20 pages).

In the commercial production of the globe artichoke, climate should be moist and cool in summer, as near frost free as possible in winter. A plentiful supply of irrigation water is essential. Soil should preferably be deep, fertile, and well-drained. Climate, however, is more important than soil fertility, and poor soil can be improved by fertilization.

Harvesting begins in the fall, and pickings are made weekly until April or May. Peak of production comes in early spring. Sorting and packing are done on the ranch rather than at a central packing-house, the better to utilize labor.

Growers may wish to plant a part of their acreage to other vegetables, since many artichokes move from California in mixed cars.

Field sanitation is the best known method for controlling pests of the globe artichoke. Aphids are controlled by nicotine sprays or dusts.

Climate and soil requirements, varieties, cultivation, harvesting, packing, and marketing are covered in this circular, which is now available at the College of Agriculture.

GROWING ASPARAGUS

ASPARAGUS PRODUCTION IN CALIFORNIA, by G. C. Hanna. Ext. Cir. 91, revised July 1947. (23 pages).

ASPARAGUS ECONOMIC STATUS

CALIFORNIA ASPARAGUS ECONOMIC STATUS 1946-47, by Sidney Hoos and H. Fisk Phelps. Cir. 373, September, 1947. (20 pages).

HAY HOISTS

THE ELECTRIC HAY HOIST, by John B. Dobie. Ext. Cir. 139, September, 1947. (11 pages).

AVOCADO ECONOMIC SITUATION

AVOCADO SITUATION IN CALIFORNIA 1947, by Wallace Sullivan. Cir. 372, September, 1947. (14 pages).

DONATIONS FOR AGRICULTURE RESEARCH

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California Fertilizer Association Division of Plant Nutrition	2,000.00