Tests on Girdling Olive Trees

indicate practice most effective when done in February before flower parts of the olive begin to develop

H. T. Hartmann and R. M. Hoffman

Experiments on girdling olive trees were conducted during the 1949 season in orchards in Tulare, Madera, Solano, Butte, Glenn, and Tehama counties.

As information becomes available it seems girdling may be most useful in increasing yields with vigorous olive trees which bloom heavily but fail to set fruit. In such cases, girdling is effective because it apparently reduces the number of nonfruitful staminate flowers and increases the number of fruit-producing perfect flowers.

Girdling may benefit orchards that are not alternate-bearers—but produce a fairly uniform crop each year—by raising the level of production.

Trees which tend strongly toward alternate bearing are not expected to be benefited by girdling. If they are girdled just before the *on* year it will be likely to promote the undesirable tendency toward overbearing. Girdling just before the *off* year is of no value because in such cases, the lack of a crop is due usually to the lack of a sufficient amount of bloom. Flower clusters are normally developed in the bud during the previous summer, so girdling in the winter can be of no value in increasing the number of perfect flowers, because no flower clusters are present within the bud. A better approach for overcoming alternate-bearing in olives is early thinning of the overloaded trees during the *on* year.

Experiments so far have indicated that closely planted, weakly growing trees with a limited leaf area will not respond to girdling. Vigorously growing trees with a heavy leaf area—and amply supplied with nitrogen and water—are the ones which have had their yields increased markedly by girdling.

Girdle in February

Preliminary tests made several years ago showed no benefits when girdling was done during or immediately preceding the blooming period.

All tests since that time have indicated that the practice is most effective when done during the winter months, especially in February.

Girdling done in March has not been effective.

As the flower parts of the olive begin to develop in the bud during March, girdling done some time previously, in mid-February, presumably causes an increase in the carbohydrate supply available to the flowers and results, therefore, in the production of greater numbers of flowers of the fruit-producing type.

The girdling cut provides a temporary dam, lasting about six weeks, which blocks the normal downward movement of carbohydrates that are manufactured in the leaves. This increased amount of carbohydrates remains in the top of the tree during the period of flower-bud development and becomes available for the nutrition of the developing flowers.

Care Against Olive Knot

Many olive orchards in California have the disease, Olive Knot, and it was believed that the organism would become established in the girdling cuts. To learn whether it would be possible to prevent this, tests were made in a Sevillano orchard in Corning which was heavily infected with Olive Knot.

When the cuts were covered immediately after girdling with an asphalt emulsion grafting compound only, they became almost 100% infected with the disease, although the cuts healed over fairly rapidly.

When a paste, prepared from powdered Bordeaux mixture, was used directly on the cuts, which then were covered with the asphalt emulsion grafting compound, no infection became established. However, the Bordeaux paste applied directly on the tree tissues was so toxic that there was considerable injury, and healing of the cuts required several months.

Mixing the asphalt emulsion compound, 1 part, with Bordeaux paste, 1 part, and covering the cuts with this mixture gave fairly good results. No infection became established in the girdling cuts, but there was an appreciable amount of injury to the tree tissues. Perhaps a mixture of 2 parts of the asphalt emulsion compound to 1 part Bordeaux paste would be more satisfactory.

The best method tried, from the standpoint of freedom from infection and nontoxicity, was to cover the girdling cuts first with hot grafting wax, then with Bordeaux paste, and finally with the asphalt emulsion grafting compound. Healing of the cuts was excellent and no infection appeared.

Yields

As an example of the results obtained in a case where girdling was beneficial, the data from a test orchard at Corning are given. Yields and size grades for the 1948 and 1949 crops were secured from girdled and nongirdled trees in five plots in a fairly vigorous 35-year-old Sevillano orchard.

In Plot 1 the trees were girdled preceding the 1948 crop only. In 1948 these trees—girdled on October 15, 1947—averaged 147 pounds per tree in comparison with 127 pounds per tree for nongirdled trees. In 1949 the yield from these trees was not significantly different from the check trees—indicating that there is no holdover effect of girdling from one year to the next.

In Plot 2 the trees were girdled preceding the 1948 and the 1949 crops. In 1948 these trees—girdled on December 15, 1947—averaged 173 pounds per tree in comparison with 127 pounds for the check trees. The 1949 yields were 123 pounds per tree against 28 pounds for adjacent check trees.

In Plot 3 the trees were girdled also preceding the 1948 and the 1949 crops. In 1948 these trees—girdled on February 15, 1948—yielded 193 pounds per tree as compared to 127 pounds for check trees. The 1949 yields were 96 pounds per tree in comparison with 28 pounds for the check trees.

The trees in Plot 4 were girdled pre-

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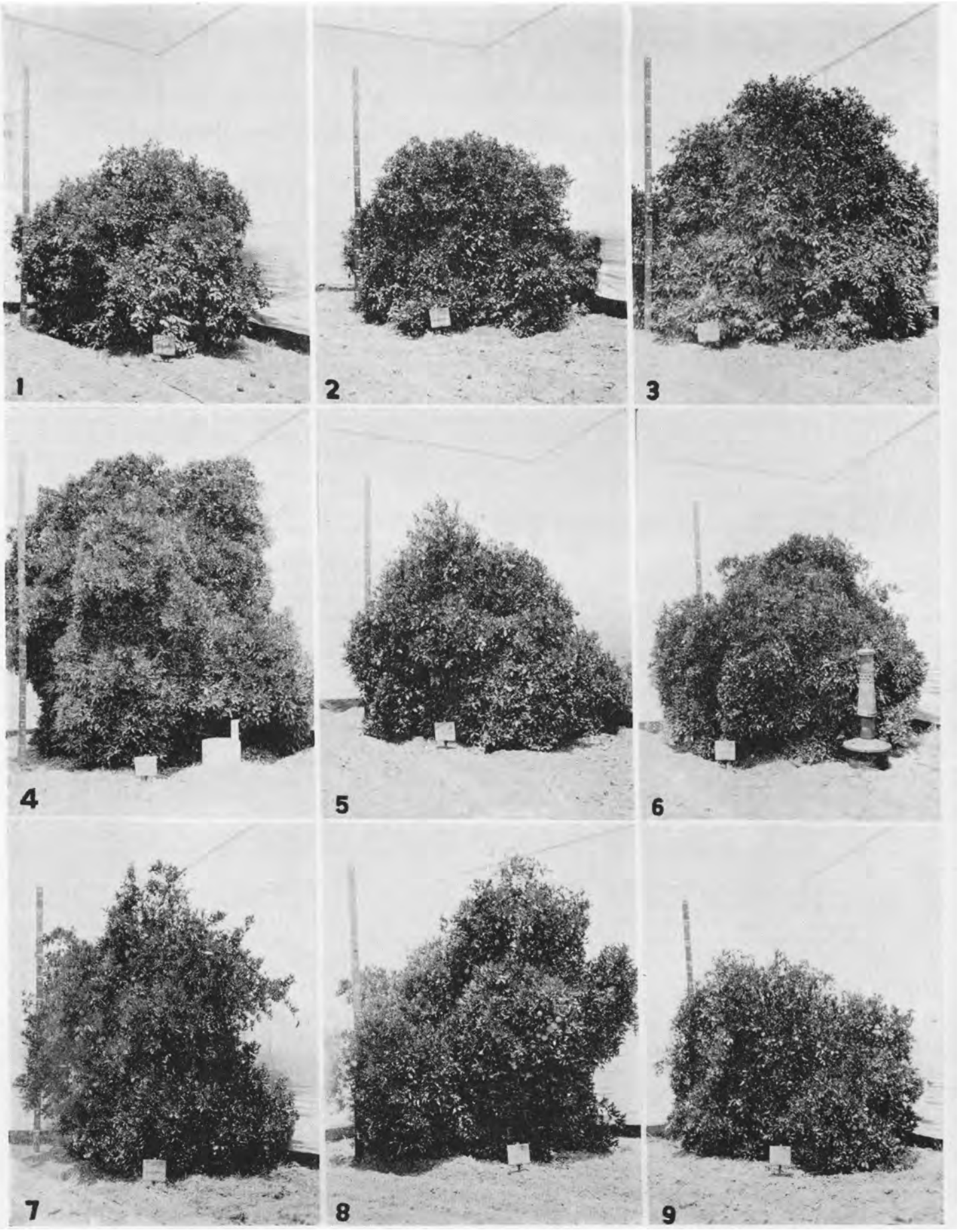
Manzanillo olive tree. Girdled December 17, 1948, with grape-girdling knife. Photograph taken November 1, 1949. Cuts covered with asphalt emulsion grafting compound. One branch was not girdled.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DROP

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teresting to speculate on even how much more effective 2,4,5-T in the amine form might be.

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DWARFING

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are very sensitive to cold and at Riverside have shown more damage from cold than any of the other combinations. Fruit produced on this stock is very low in acid and has a tendency to be somewhat insipid. The stock itself is very susceptible to gummosis. It is questionable if this stock has sufficient merit to warrant its usage in California.

The Cuban Shaddock produces substandard sized trees. Marsh grapefruit trees on this stock after 14 years of age are 70% as large as trees 17 years old on sweet root. They produced as much fruit in the first 10 years as the trees on sweet root, but in the last six years have yielded only 71% as much. Washington Navel orange trees on this stock at 14 years of age are 45% as large as 17-year-old trees on sweet root. Production for the first 10 years is about the same as on sweet root, but in the last six years has dropped to 80% of the check trees. Eureka lemons on this stock in 1947 were 48% as large as trees on sweet root which were three years older. They produced 66% as much fruit for the first 10-year period as trees on sweet root. Unfortunately, there were no trees on sweet root of the same age for comparison, but obviously the difference in size and production of the two combinations cannot be entirely accounted for by the three years difference in their ages. Trees on this stock tend to have a heavy early production, but this is not maintained in later years. This rootstock appears to be fairly susceptible to footrot. In general, its effect on the top is to produce poorer fruit quality and a tendency toward greater damage from low temperatures than when conventional rootstocks are used.

Eureka lemon cuttings budded to Valencia oranges were also part of the orange rootstock trials. After 18 years these trees approximate 8½ feet in height as compared to comparable trees on sweet root which are 16 feet in height. They have produced 60% as much fruit in the first 10 years, but only 42% as much in the last six. Fruit quality is below average and the combination is easily damaged by low temperatures. In addition to being susceptible to gummosis this rootstock is susceptible to shellbark. It may also be another source of psorosis if the parent lemon trees were carrying the disease. As a rootstock it has little to recommend it other than the dwarfing tendency.

Most citrus growers in California prefer those combinations which produce large or standard sized orchard trees. While in general tree size and fruitfulness are associated, they are not always correlated. Long-lived, healthy, and productive dwarfed combinations may have a definite place in plantings made by the home grower and perhaps the orchardist.

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OLIVE

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ceding the 1949 crop only and bore 124 pounds per tree as compared with 28 pounds for the check trees. All the 1949 girdling in this orchard was done on February 15.

There was a reduction in fruit size of the heavier crop on the girdled trees, but this was offset easily by the greatly increased yields.

Using the yield records and size grades, and computing on an acre basis from the 15 girdled trees in this test orchard the increase in gross return in 1949 over non-girdled trees would amount to approximately $620 per acre at 50 trees per acre.

Girdling of olive trees is not recommended at present for use as a genreal practice but it may be worthwhile to try—in an experimental manner—on a limited number of trees in orchards which have a habit of blooming heavily but failing to set good crops.

Under such conditions the following suggestions are made:

1. The primary scaffold branches should be girdled about the middle of February, with one or two branches on each tree left ungirdled to supply the roots with carbohydrates until the girdling cuts heal over.

2. Girdling cuts are made most easily with a grape-girdling knife in areas with smooth bark. The soft bark should be removed down to the hard inner wood in a strip, not to exceed one fourth inch in width, completely around the branch.

3. The cuts should be covered immediately with either hot grafting wax or with an asphalt emulsion grafting compound. In orchards infected with Olive Knot provision should be made to prevent infection starting in the cuts. Also the girdling knives should be dipped after each cut in a disinfectant to prevent spread of the disease.

4. To determine accurately whether the girdling has been beneficial it is desirable to obtain yield records during harvest from the girdled trees and from adjacent trees of comparable size.

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INJECTIONS

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tity of dilute acid soluble phosphorus and potassium in this soil is very low and correlates well with the low phosphorus and potassium content of the leaves.

Lemon orchards with the leaf spotting referred to here have been noted in parts of Santa Barbara, Ventura, Tulare, and San Diego counties. More recent analyses show that the leaves obtained from these same areas are also very low in phosphorus.

Apropos of leaf analysis as a diagnostic tool, it can be stated that so far, responses to tree injection of phosphorus and potassium have been obtained only where exceedingly low levels of these elements were found in the leaves. Previous tree injection work using mono-calcium phosphate and di-potassium phosphate in Ventura, Orange, and Riverside counties failed to produce response in trees having phosphorus and potassium levels considered adequate by current standards.

This is the first time in California that citrus trees in the field—with leaves of a known low phosphorus and potassium content—have responded to phosphate and potassium treatment.

This response of citrus to phosphorus in southern California is of interest in the light of previous failures of many field trials with citrus to show responses from these elements.

It remains for future work to determine whether the response of lemons to phosphorus and potassium injections reported in this article can be duplicated by soil treatments.

It seems certain, based on the extensive leaf analysis surveys and soil studies of phosphate and potash in citrus groves made previously, that many groves are amply supplied with these constituents.

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