

of research and accomplishment. The necessary experiments can be begun as soon as the National Arboretum is put on an operating basis.

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CHEMICALLY Treated Bands Effectively Aid Codling-Moth Control The successful culture of the apple in the United States is dependent upon the surmounting of many obstacles, one of the most serious of which is injury by the codling moth or apple worm.

This insect, in its larval or worm stage, eats its way into the apple and consumes much of the flesh, rendering the fruit practically worthless for commercial purposes.

As early as a century ago fruit growers discovered that the codling moth could be partly controlled by trapping the larvae in bands applied to the trunks of apple trees; prior to the use of poisonous sprays, banding was the only practical means of reducing the infestation. The bands were usually made of straw or rags.

The codling moth lays its eggs on the leaves and fruit during the growing season. After hatching, the larvae seek the fruit for feeding, and when mature they usually spin their cocoons under the loose bark of the trunk and the larger limbs. The fruit grower takes advantage of this habit by scraping off the loose bark and applying a band which serves as an attractive place for the spinning of these cocoons.

By using suitable banding material and scraping the trees well, it is possible to capture from 40 to 50 percent of the worms that have fed within the fruit. In order to prevent the emergence of moths, however, it has been necessary to "hand-work" the bands at intervals of from 1 to 2 weeks during the summer. This operation involved the removal of the bands from each tree and the mechanical killing of the worms that had cocooned in contact with them. Cloth bands were sometimes run through a clothes wringer, and those larvae that remained attached to the trunk were crushed with various types of blunt instruments.

The destruction of codling-moth worms by hand is still practiced by many orchardists, especially in regions favorable to the codling moth, as a supplement to control by spraying.

Banding would undoubtedly have been more widely practiced in the past had it not required so much hand labor. The chemically treated band, a recent invention of the Bureau of Entomology, eliminates much of the labor involved in orchard banding, as it automatically kills the worms that spin cocoons in contact with it.

In order to make such a self-working band practicable, the chemicals to be used had to meet certain requirements. They had to kill the worms by contact and yet be noninjurious to the tree; they had to be cheap, readily applied, insoluble in water, and adhesive to resist washing by rain; they had, likewise, to be sufficiently nonvolatile to prevent too-rapid loss by evaporation; furthermore, it was necessary that they be nonrepellent to the larvae.

Effective Chemicals Found for Banding

After considerable experimentation it was found that a mixture of beta-naphthol (technical grade) and lubricating oil (red engine type) fulfilled all these requirements, and a band treated with these materials

is now available. The band is tacked to the tree trunk early in the spring, and is effective without further attention for the entire season.

The bands are prepared by coating strips of single-face corrugated paper with beta-naphthol and oil. Strips of burlap or cheesecloth were used in the earliest experimentation with the self-working bands, but it was found that in such bands the chemicals caused injury to the tree. The corrugated-paper bands provide less contact with the tree trunk and afford greater opportunity for air circulation than cloth bands, and are safe to use on bearing trees old enough to have developed rough bark. The corrugated paper is now cut by the manufacturer into rolls 250 feet long and of any desired width, usually 2 to 4 inches. Thus, by dipping a roll of corrugated paper in either a hot solution or a cold especially prepared mixture of beta-naphthol and oil, 250 feet of treated band material can be quickly made.

Orchardists are now making bands at a cost, exclusive of labor, not exceeding 1 cent per linear foot for a 2-inch width. These bands are also being offered commercially at a somewhat higher price.

Chemically treated bands are now widely used by fruit growers, and it is expected that the practice will be considerably extended from year to year. A recent survey has shown that one third of the bearing orchards in one of the fruit districts of the Pacific Northwest are now equipped with treated bands.



FIGURE 32.—Demonstration of method of making chemically treated bands on a commercial fruit farm.

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CITRUS Fruit Resists Stem-End Rot Better By Newer Borax Treatment

Stem-end rot is one of the major forms of decay of citrus fruits produced in humid areas, oranges being especially susceptible. It results from infections that occur while the fruit is still on the tree. The sources of this infection are in dead twigs, from which the rot-producing organisms are spread by dew drip and rain spatter.

Although this rot can be lessened by spraying and pruning, there are no economical control measures that can be employed while the fruit is on the tree. The rate of advance of the fungi into the fruit depends upon the maturity of the fruit and other conditions. During the early part of the shipping season the fruit is less subject to rapid development of stem-end rot than later, but dead-ripe fruit rots very rapidly.

Ordinarily there are no visible signs of infection at the usual harvest time; hence even by the most careful inspection during the packing operations it is impossible to cull out all of the infected fruits.