next attempt. These irons were only lightly applied but again, after two to three months, the brands were difficult to read. Some of the brands were blurred and others were very faint or impossible to read, unless the hair was clipped.

In another trial, the branding irons used were 6 inches high and made out of ⅜-inch rake tooth. Only three irons, T, I and V, were used (photo 2). The symbols were used to represent numbers 0 to 9 by rotating to different positions as shown below:

For example, animal No. 347 would be branded ⊥ ⊢ ∧. Thus, numbers 0 to 999 could be branded by using only 3 irons in 1 to 3 places on the loin. The hair was clipped from the area to be branded. Lanolin was applied to brands of half the animals about every third day for 30 days. The treated brands peeled more cleanly than the nontreated; in fact many of the nontreated brands had a curled scab with open raw wounds that were very susceptible to fly strike and had to be treated with fly repellent. Within 5 months all brands were healed and apparently lanolin had had no effect on the legibility of the brand. For example, the brand on animal No. 101 (photo 3) was not treated but was very legible even after 15 months. Animal No. 52 (photo 4), treated with lanolin, also has a good brand which is partially concealed by long hair after 15 months.

Clipping prior to branding, while not necessary, was very helpful. For example, the brands on animals not clipped were as legible as brands on clipped animals observed 6 weeks after branding. When the hair is clipped, it is easier to apply uniform pressure and to observe the progress of healing and susceptibility to fly strike. The branding iron should be applied when it appears the color of white ashes. The pressure should be uniform but excess pressure should be avoided.

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Insecticides and Integrated Control in Peaches

L. E. CALTAGIRONE
W. W. BARNETT

Guthion gives excellent control of both the Oriental fruit moth and the twig borer in peaches. When used at reduced rates the mortality of beneficial insects and mites is greatly reduced. There are good possibilities for using this chemical in an integrated control program for peach pests.

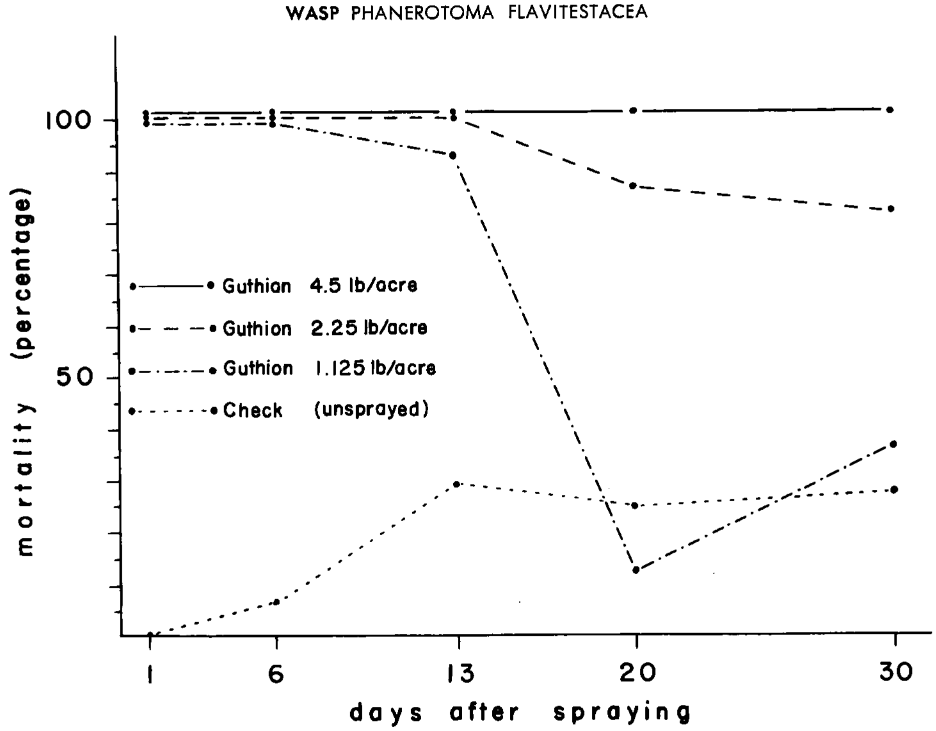
CURRENT PEST CONTROL practices in peach orchards are not entirely satisfactory, with infestations sometimes left too high, or other pest organisms increased. Investigations toward the development of an integrated control program for pests of peaches will hopefully result in a series of practices that will economically control the pests while keeping undesirable effects at a minimum. In any integrated control program there is a great need for chemicals that are both effective against the pest at which they are aimed, and as innocuous as possible to the non-target, beneficial organisms.

The two most important pests of peaches in California are the Oriental fruit moth (*Grapholitha molesta*) and the twig borer (*Anarsia lineatella*). These two moths are responsible for "wormy peaches."

A series of chemicals were tested for control of both the Oriental fruit moth and the twig borer. The effect of these chemicals on the two-spotted mite and on beneficial insects was also measured. The series included Biotrol BTB (a formulation of *Bacillus thuringiensis*), Diazinon, Geigy S13005, Guthion, Imidan, Niagara 10242, and Ryania. The treatments were applied to three-year-old trees of the Halford variety in plots of four trees. Each plot was replicated three times in randomized blocks. Treatments were applied June 4 and July 13, 1965. Shoot strikes were counted June 30 and August 18; mites were counted on August 23; and infested fruit was checked at picking time, August 26.

The parasitic wasp *Phanerotoma flavitestacea* was used as the test species to measure the effect of treatments on beneficial insects. Cylindrical screen cages 9 × 3 inches were sprayed, each with a different chemical. After the spray was dry, ten specimens of the parasite were placed in each cage, with a supply of pure honey as food. All specimens were of the same age. Each cage was hung in the plot that had been treated with the same chemical. The cages were examined

EFFECT OF DIFFERENT RATES OF GUTHION ON THE SURVIVAL OF THE PARASITIC WASP PHANEROTOMA FLAVITESTACEA



at 1-, 5-, 12-, 19-, 26-, and 39-day intervals after the treatment. Each time the dead parasites were counted, the food was replenished, and 10 additional specimens were added to each cage.

All treatments substantially reduced the infestation in shoots and fruit. Niagara 10242, at 1.5 and .5 lb per 100 gallons, gave the best results in controlling worms in the fruit—1.96% and 2.74% infestation respectively, compared to 20.64% in the untreated check—but its desirability for use in peaches diminishes because it induces an increase in the mite population. The next best treatment was with Guthion at 1.5 lb per 100 gallons, which reduced the infestation in the fruit to 3.84%, and controlled the mites efficiently—36.6 mites per leaf compared to 108.9 mites per leaf in the check trees.

All these chemicals, except Ryania and Biotrol, had a devastating effect upon the parasite *Phanerotoma flavitestacea*. The first survivors were found 24 days after the application in the plots treated with Geigy S13005 at ¼ lb per acre, but even then the percentage of mortality was very high (90%).

As Guthion is one of the most commonly used insecticides to control Oriental fruit moth and twig borer, a further test was run to measure the effect of reduced dosages upon the pests and the parasites. Three dosages (4.5, 2.25, and 1.125 lb/acre) were tested in non-replicated plots of 5 by 9 trees each. The chemical was applied with a Turbomist air blast sprayer in dilutions of 90 gallons per acre. The trees were sprayed May 28 and July 7. The parasite *Phanerotoma flavitestacea* was exposed to the insecticide after the second spray in the same procedure indicated previously. In the parasite test, three replicates per plot were run. The effect of the treatments on the pest, measured as percentage of fruit infested, was 0.1 for the high, 0.3 for the medium, and 0.7% for the low dosages. The high dosage of Guthion caused 100% mortality to the parasites for the 30 days the observation lasted, while in the plots treated with the lowest rate, the mortality dropped sharply after the 13th day, and after the 20th day it was comparable with the untreated check.

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Controlling During

Rapid cooling after harvest, and continuing protection from heat during transit and marketing, are essential to avoid fruit shriveling and quality deterioration of sweet cherries. Delays of four hours or more between harvesting and cooling were particularly damaging, according to tests at Davis. Rapid cooling by forced air was found superior to slower methods in common use. Cherries exposed to hot, dry air during transit on open trucks lost weight rapidly in comparison to similar fruit protected by a wet canvas cover. Whenever excessive losses of moisture occurred, sweet cherries soon shriveled and became dull and unsightly.

W. C. MICKE

LOSS OF MOISTURE from fresh fruit can cause shrivel and reduce consumer appeal. Previous studies with nectarines have shown that weight losses of only 4 or 5% can impair fruit appearance. Furthermore, when weight losses occur after packing, fruit can loosen within the container, allowing movement and transit bruising. To study the effect of delayed cooling and adverse environmental conditions on sweet cherry quality and to determine the requirements of good handling procedures, a series of tests were made in 1964 and 1965. Particular attention was given to moisture losses during handling delays, in transit from the orchard to the packinghouse, and during cooling and holding.

Delays before cooling

The effects of delays before cooling on weight loss and shrivel were studied during 1964. Fruit was obtained soon after harvest, sorted for defects and placed in wire baskets designed for accuracy in weighing. Delays between sorting and cooling were 0, 1, 2, 4, 8, 16 and 24 hours. Fruit was held at 80° to 86°F for the first eight hours of delay. For the two longer delay treatments (16 and 24 hours) fruit was held at 80° to 86°F for the first eight hours and was then placed at ambiant night and morning temperatures to simulate actual field conditions. Following the delay treatment, all fruit received rapid cooling and was then held for a simulated shipping period of five days at 39°F and a simulated marketing period of three days at 68°F. These samples were weighed periodically and all fruit was evaluated for deterioration at the conclusion of the test.

Moisture loss occurred rapidly during the first eight hours of delay before cooling (graph 1). As much weight was lost during this period as during the subsequent eight days of simulated shipping and marketing. The length of the delay before cooling and the amount of initial moisture loss had little effect on the amount of additional weight loss which occurred during the shipping and marketing period.

The effect of these cooling delays on visible fruit shrivel is shown in graph 2. Little shriveling could be detected in fruit cooled within two hours of harvest. However, the amount of shriveled fruit increased sharply from 8% after four hours' delay to 33% after eight hours' delay. Thus, serious shrivel was observed

GRAPH 1. EFFECT OF DELAYS ON WEIGHT LOSSES BEFORE AND AFTER COOLING BING CHERRY—1964