Tomato Insect Studies

DDD and DDT in three-year tests with chlorinated hydrocarbons

A. E. Michelbacher, W. W. Middlekauff, and N. B. Akesson

Excellent control of tomato insects with DDT and DDD was achieved during the three-year period, 1946–1949. DDT and DDD were used safely on canning tomatoes and, when properly applied, gave excellent control without creating an objectionable residue problem.

Of the other chlorinated hydrocarbons tested, toxaphene showed the most promise, but unlike DDD or DDT, it has not received much commercial testing.

Tomatoes delivered to the canneries in 1949 were almost free of infested fruit. A large proportion of this reduction probably was due to the use of DDT and DDD in the tomato insect control program.

The decline in 1949 occurred despite indications that the season was more favorable than usual for several species of caterpillars that are important pests of tomato. This was particularly true in regard to the yellow-striped armyworm, which was present in outbreak proportions on other crops. In previous years, outbreaks of these proportions would have resulted in serious loss to the tomato crop.

1949 Investigations

Experiments were conducted in 1949 at Patterson and at Woodland and insect conditions were observed generally throughout the principal tomato-growing regions in northern California. In the two trial localities the treatments were applied with five-row power dusters, and in all cases the coverage obtained was exceptionally good.

The treatments investigated were as follows:

1. Check—no insecticide.
2. 10% toxaphene, 40% sulfur.
3. 5% toxaphene, 3% DDT, 50% sulfur.
4. 5% DDT, 50% sulfur.
5. 5% DDD, 50% sulfur.

In Woodland, the first picking on September 12th showed a total of 16.24% infested tomatoes on the check plot; in all treated plots the damage by insects remained under 1%. At the second picking September 30th the check plot had 11.49% infested tomatoes; treatment with DDD kept it at 2%; DDT, toxaphene and the toxaphene-DDT mixture prevented fruit infestation completely.

The experimental blocks at Patterson showed the following results: The check plot had 12.75% infested tomatoes at the first picking September 6th; 11.25% infestations at the second picking September 16th; 7% infestations at the third picking October 3d. Test plots treated with toxaphene showed 1.32%, 0.99% and 1.00% infested fruit respectively. The toxaphene-DDT mixture resulted in 0.55%, 0.00% and 0.50% infestations. DDD treated tomatoes showed 0.22%, 0.33%, and 0.25% infestations.

Conclusions

The use of DDT and DDD in the tomato insect control program has resulted in excellent control of caterpillars attacking tomato—without apparently resulting in any serious complications that would tend to restrict their use.

Excellent control was obtained with not more than three properly timed and thoroughly applied treatments. In numerous cases satisfactory control was obtained with two well-timed applications.

Because DDD is more effective in controlling the tomato hornworm than DDT, it was used most extensively, particularly in the warmer interior valleys where the tomato hornworm threatens serious damage.

After three years of rather extensive testing a 10% toxaphene dust and a 5% toxaphene—3% DDT dust have both proved promising in controlling caterpillars attacking tomato.

Before these materials can be too highly recommended, they should receive further commercial testing.

Thorough application is extremely important. Excellent control should result where 5% DDT or 5% DDD dusts are applied at the rate of 30 pounds to the acre. However, if the tomato hornworm is a problem DDD should be used.

To insure the control of the tomato mite, these materials should be used in combination with no less than 50% sulfur. If no evidence of the tomato mite is apparent by the first of September, the sulfur can be omitted from dusts applied after this date. A 10% toxaphene dust or a 5% toxaphene—3% DDT dust should also be used in combination with sulfur and applied at the rate of 30 pounds to the acre.

Although the timing of applications will vary somewhat according to the district and season, the following schedule gave very satisfactory control:

Application between July 1st to 15th is directed primarily against the tomato mite, but also will control hornworms and any armyworms present.

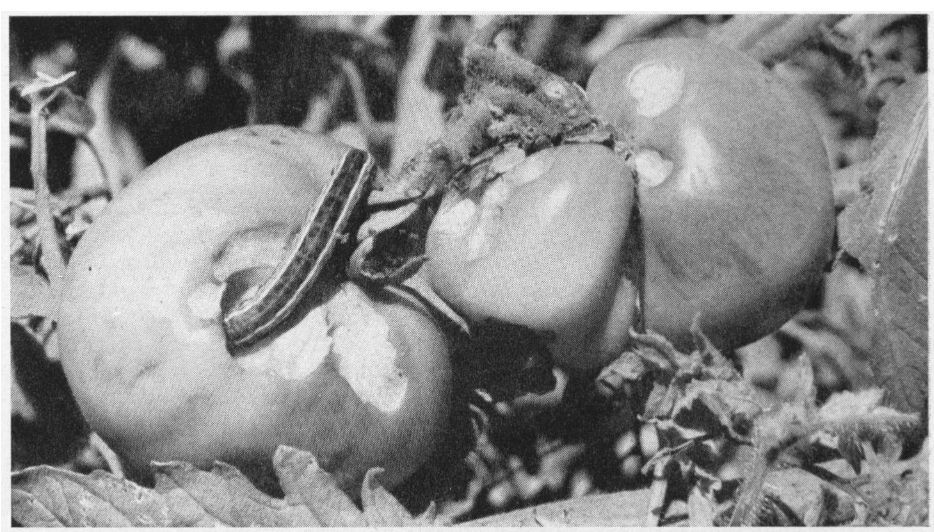
Application between August 1st to 20th is directed primarily against hornworms and armyworms but will continue control of the tomato mite.

Application between September 1st to 20th is directed primarily against the corn earworm, other armyworms, tomato pinworm, and the potato tuber moth, but also will control hornworms if present.

In the central and southern San Joaquin Valley this schedule should be put into operation as early as late May or June, and continued as long as there is evidence of pest damage.

Results in 1949 indicate little injury is likely to be done by the dipterous leaf miner if the pest is not well established

Continued on next page



DDD and DDT are effective against the destructive yellow-striped armyworm.

SPACING

Continued from page 10

and September 16th were highest for the close spacings. The total yields after additional harvests on October 1st and 19th showed little differences between the 1½- and two-foot treatments but these were significantly higher than the three- and four-foot spacings. The fruit size ranged from an average of .277 pounds per fruit on the plots with a 1½-foot spacing to .297 pounds per fruit on the four-foot spacing.

Observations

In every test early yields were higher on the close than on the wider spacings. On the closely spaced treatments a high percentage of the total crop usually was harvested in the first one or two pickings. These higher early yields are probably due to the greater number of plants per acre since the rate of ripening of the individual fruit is not influenced by plant spacing.

Some advantages of high early yields are: *1,* a larger portion of the crop might be harvested before fall rains or early frosts; *2,* quality of the crop is usually higher in the early pickings; and *3,* a higher percentage of the crop is harvested when labor is more plentiful and harvesting costs are cheaper.

In most of the tests the total yield was increased by closer plant spacing. The total yield may be materially influenced by the length of the harvest season. When the harvest season is terminated unusually early by adverse weather conditions, the closer spacings may show a considerable advantage in yield.

Plant spacings did not greatly affect fruit size although there was some trend toward larger size on the four- and six-foot spacings.

Neither did spacing appreciably influence the quality of the fruit. In the 1947 test there was less sunburn on the 1½-foot spacing than on the three- or six-foot treatments. Test four in 1948 showed slightly greater loss of fruit from mold on the one-foot spacing than on the two-foot or wider spacings.

Plant spacings of 1½ to two feet in the row appear to be the most desirable for the Pearson variety grown for canning. In areas where plants normally grow rather large, the two-foot spacing may be preferable. Spacings closer than 1½ feet showed no advantage in yields and in years when fruit set is late and vine growth larger than usual, these extra close spacings may be more difficult to harvest. Close spacings are easily obtained on field seeded tomatoes. On the transplanted crop the change from a three-foot to a 1½- to two-foot spacing will mean increased costs for plants and planting. Therefore, growers are advised to determine for their own conditions if the close spacing will increase net returns.

On changing to closer spacings a tomato grower should watch his field carefully to determine if a change in irrigation practice is necessary. With more plants per acre the crop may require more water, particularly late in the season.

Since these tests were conducted on irrigated crops, the results should not be applied to tomatoes grown without irrigation.

D. M. Holmberg is Farm Advisor, Yolo County.

P. A. Minges is Associate Agriculturist, Truck Crops, in Agricultural Extension, Davis.

M. P. Zobel is Associate in the Experiment Station, Truck Crops, Davis.

CANTALOUPE

Continued from page 9

tip of a leaf, and flew away. Each aphid was moving across the fields in a succession of short flights, feeding for short periods on a large number of plants.

This type of feeding is so very efficient in spreading the virus that an extremely low initial incidence of virus infection was increased very rapidly. Sources of infection may be native gourds, zucchini, or other summer squash plants which are grown through the winter in the Imperial Valley, volunteer melons, or seed-borne infection of melon and squash plants.

Virus infection is extremely rare early in the season. Only one case of seed-borne mosaic was found in the desert areas in 1949, even though a considerable number of plants was scouted. This may be a result of the virus-free seed program. The overwhelming numbers of potential aphid vectors that move over the fields in certain years, pick up this rare and scattered virus inoculum and increase it in an almost geometrical ratio.

It should be noted that the presence of volunteer melon plants in fields in which melons had been grown the previous year may nullify the use of virus-free seed.

Insecticides and Repellents

Attempts were made to control the spread of cantaloupe mosaic by the use of insecticides and repellents. Aphids seemed to be able to fly through insecticide clouds without ill effects. No measurable degree of mosaic control was obtained by any of the treatments tried.

The hope that a repellent could be found was based on the observation that, on approaching a plant, in normal flight, an aphid hesitates for a fraction of a second at a distance of one to 1.5 inches from the plant surface. At this point the aphid appears to be sensing, perhaps smelling, the plant to decide whether or not to land. If the plant could be made unattractive to the aphid, it would fly on without landing, and its potential as a vector would be nullified.

A number of plant oils, known repellents for other insects, and various evil-smelling substances were made into dusts and applied on young melon plants at weekly intervals. The only one of these to show a measurable degree of control was tetramethyl thiuramdisulfide, particularly when used at 10%. But the use of this compound resulted in a delay of only a few days in the appearance of mosaic.

R. C. Dickson is Assistant Entomologist in the Experiment Station, Riverside.

J. E. Swift is Farm Advisor, Imperial County.

L. D. Anderson is Associate Entomologist in the Experiment Station, Riverside.

John T. Middleton is Associate Plant Pathologist in the Experiment Station, Riverside.

The above progress report is based on Research Project No. 1085.

WAX

Continued from page 6

fruit ratio would be comparable, in which increments of growth made after the wax was applied were known and under conditions in which it was suspected that water might be lacking to the fruit during this time. These conditions would evaluate more critically than has been done the effect of the wax upon cherry size.

Reid M. Brooks is Associate Professor of Pomology and Associate Pomologist in the Experiment Station, Davis.

L. L. Claypool is Associate Professor of Pomology and Associate Pomologist in the Experiment Station, Davis.

Fred M. Charles, Farm Advisor, assisted in the 1949 trials in San Joaquin County.

The above progress report is based on Research Project No. 920-F.

INSECT

Continued from preceding page

in tomato fields by the latter part of August. If environmental conditions favor the establishment of the pest in the early season, there is danger that the increased population by mid-summer may result in defoliation to a point where serious sunburning of the fruit may occur.

A. E. Michelbacher is Assistant Professor of Entomology and Associate Entomologist in the Experiment Station, Berkeley.

W. W. Middlekauff is Assistant Professor of Entomology and Assistant Entomologist in the Experiment Station, Berkeley.

N. B. Akesson is Instructor in Agricultural Engineering and Junior Agricultural Engineer in the Experiment Station, Davis.