ft as compared to 7.8 and 9.4 for spacings of 12 and 8 cut seed pieces per sq ft. In 1962, 9.3, 10.7, 10.6, and 12.7 serviceable shoots per seed piece were obtained for plantings of 16, 12, 8 and 4 seed pieces per sq ft.

To check the possibility of sugar depletion in the seed pieces—which could result in poor shoot production—sugar analysis of the seed pieces was made in 1961. Samples were taken for analysis prior to planting and again approximately two months after planting, when the study was terminated.

Sweet potato roots contained an average of 59.4% starch, 14.9% total sugars, and .27% reducing sugars on the dry weight basis prior to planting. During the period of shoot production both total sugars and the reducing sugars increased as expressed as per cent of dry weight. The starch content decreased from 59.4% to approximately 43.0%. The per cent starch content of whole roots and cut roots at the termination of the trial was very similar, as shown in Table 3.

TABLE 3. THE CHANGE IN CARBOHYDRATE CONTENTS IN SWEET POTATO ROOTS USED FOR THE PRODUCTION OF TRANSPLANTS, 1961

		After harvest			
	Preplant	No. whole roots per sq ft of bed	No. cut roots per sq ft of bed		
		8	16	12	8
		Per cent dry weight			
Starch	59.4	43.3	44.3	40.5	38.3
Total sugar	14.9	23.8	24.5	23.9	25.0
Reducing sugar	.27	.50	.50	.57	.54

The results of these studies suggest that planting 12 cut pieces per sq ft would be most advantageous to the growers. From the practical standpoint this would be approximately ½ inch between seed pieces. No advantage was gained by planting 16 seed pieces per sq ft as compared to 12. At the same time, no loss of production was observed at the closer spacing, although the production per seed piece was reduced. As judged by the number of shoots remaining on the seed pieces when the trials were terminated, it appears that larger yields would be obtained from the closer spacings if subsequent pullings are to be made. Planting less than 12 seed pieces per sq ft reduced the yield of serviceable transplants.

F. H. Takatori is Associate Specialist in Vegetable Crops, University of California, Riverside; Norman Welch is Farm Advisor, San Bernardino County; and J. I. Stillman is Laboratory Technician, U.C., Riverside.

J. H. BLACK · C. S. DAVIS · V. E. BURTON · K. W. HENCH

Thrips CONTROL ON NECTARINES

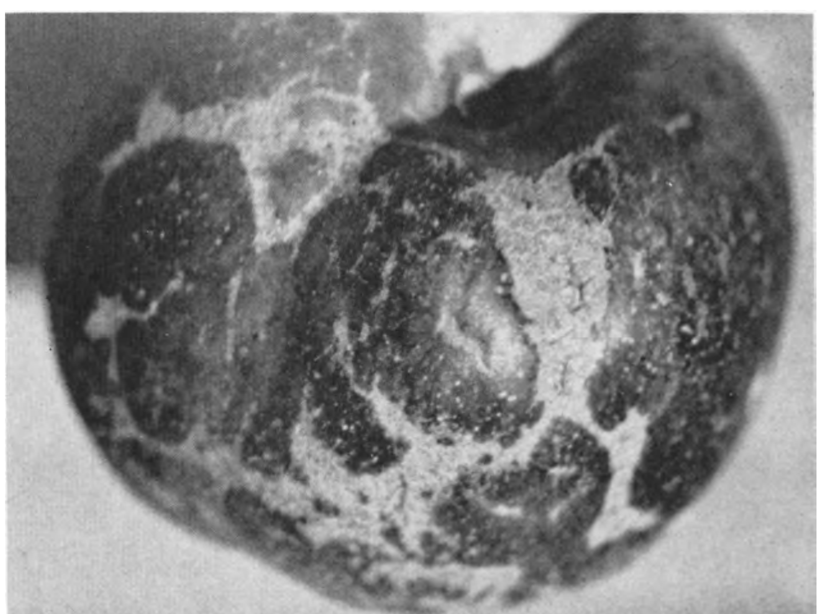
In years of heavy thrips populations, the choice of proper materials, including the more effective organic phosphates, and timing of applications are extremely important to avoid damage in nectarines. In a year of low thrips populations, and especially when the one-thrips-nymph-per-blossom level does not occur until late in the bloom period, choice of material and timing of applications are not as critical; and treatment may be unnecessary or of little economic value. This report summarizes four years of research in Kern County.

FLOWER THRIPS, *Frankliniella occidentalis* (Perg.), have long been a problem in the production of nectarines. Adult thrips may move from the cover crop or other nearby crops into nectarines and deposit eggs as soon as blossoms appear. Upon hatching, nymphs begin feeding at the base of the pistil (developing fruit) and continue to feed until the calyx or jacket drops. Thrips feeding on fruit from bloom to jacket stage results in scarred fruit which lowers the market quality.

The standard treatment for thrips control on nectarines for many years was 2 lbs. 50% DDT wettable powder per 100 gallons of water. In 1958, the fruit in several orchards in Kern County receiving this treatment was severely damaged by thrips, which indicated that this treatment did not give satisfactory control. The question to be answered was whether the failure of DDT on nectarines was due to improper timing, DDT resistance or to improper application.

In 1959, a test was conducted to establish the relationship of heavy thrips populations to blossom drop. Large paper bags were sealed onto the tips of 20 branches during the pre-bloom period. Into each of ten paper bags were placed 25 adult flower thrips and the remaining ten bags were treated with DDT and parathion dust to eliminate all insect life that may have been on the branches at the time of bagging. At the end of the bloom period,

Typical scars on skin of nectarine caused by flower thrips feeding on fruit from bloom to jacket stage.



the bags were removed and the dropped blossoms were counted. In the bags containing thrips, 86% of the blossoms were dropped. Of the 14% of the blossoms from which fruit developed, 13% were damaged and only 1% was left clean. In the ten bags containing the DDT-parathion treatment, only 8% of the blossoms dropped, and the balance produced clean fruit. This test demonstrated that thrips may cause blossom drop and fruit injury—and that insects are not necessary for nectarine pollination.

In 1960, a timing study was also conducted using one to four applications of parathion as compared with parathion plus DDT, Trithion and Delnav beginning at 10% bloom and continuing to 95% petal fall (see table 2).

In 1961, treatments were made when the thrips population reached an average of one thrips per bloom. Thrips populations were late in developing, and the level of one thrips per blossom did not occur until full bloom. A second application was made during the jacket stage.

Twenty paper bags were sealed onto the tips of nectarine branches during the prebloom period in tests to determine relationship of thrips population to blossom drop. Half of these contained flower thrips and the remaining 10 were treated with insecticides to kill all insect life.

Further tests were conducted in 1959 to investigate the effectiveness of DDT, Dieldrin, parathion, and Diazinon applied at three- and six-day intervals, starting at 10% bloom and continuing through petal fall. The three-day schedule received seven applications and the six-day schedule received four applications. Results are shown in table 1.

Thrips populations during bloom were directly related to the percentage of marketable fruit at harvest time. Therefore, per cent of marketable fruit was used as a measure of effectiveness in 1959 and subsequent tests. Equally effective control was obtained with parathion applied at either three- or six-day intervals. DDT. Dieldrin and Diazinon did not give satisfactory control (table 1).

There is a correlation between degree of control and the volatility of the insecticide. This is not surprising, because the entire developing fruit is enveloped by the stamens, petals, and sepals, protecting thrips inside the blossom from direct contact with the insecticide.

Insecticide comparisons in 1962 were made with emphasis on materials of low to moderate toxicity to honeybees. The thrips population was extremely low, and an average of one thrips per blossom was not reached until full bloom. Only one application of each material was made as the populations did not return following the first application. Materials used in the test were Dibrom, Delnav, Ethion, parathion, Tartar emetic, Trithion plus Kolospray, Thiodan plus Kolospray and Thiodan plus Pyrenone. Due to very low thrips populations, the variability within each replicated material and the check resulted in no significant differences between treatments (test to be repeated).

J. H. Black is Farm Advisor, Kern County; C. S. Davis is Extension Entomologist, Berkeley; V. E. Burton is Extension Entomologist, Davis; and K. W. Hench is Farm Advisor, Kern County—University of California Agricultural Extension Service. *Assistance with plot design and statistical analysis for this project was obtained from Edward S. Sylvester, Professor of Entomology and Entomologist in the Experiment Station and Gordon A. Rowe, Extension Economist, Agricultural Extension Service and Assoc., Giannini Foundation of Agricultural Economics, U. C., Berkeley.*

INSECTICIDE TRIALS FOR CONTROL OF FLOWER THRIPS ON NECTARINE BLOSSOMS

TABLE 1, 1959 TESTS

Material	Interval days	No. of applications	Marketable fruit %
DDT, 2 lbs. 50%/100.....	3	7	44
DDT, 2 lbs. 50%/100.....	6	4	31
Dieldrin, 1 lb. 50%/100..	3	7	56
Dieldrin, 1 lb. 50%/100...	6	4	54
Parathion, 1 lb. 25%/100.	3	7	93
Parathion, 1 lb. 25%/100.	6	4	90
Diazinon, 1 lb. 25%/100..	3	7	75
Check	–	0	18

TABLE 2, 1960 TESTS

Material	No. of treatments	Treatments started	Marketable fruit (%)
Parathion, 1 lb. 25%/100 plus DDT, 2 lbs. 50%/100	4	10% bloom	97.3
Parathion, 1 lb. 25%/100		10% bloom	95.9
Parathion, 1 lb. 25%/100	3	50% bloom	96.1
Parathion, 1 lb. 25%/100	2	50% petal fall	92.3
Trithion, 1 pt./100.. (4 lbs. per gal.)	4	10% bloom	86.6
Delnav, 1 pt./100... (4 lbs. per gal.)	4	10% bloom	79.8
Parathion, 1 lb. 25%/100	1	95% petal fall	71.9
Check	0		40.1

Parathion plus DDT in four treatments was better than parathion in two applications, but was no better than parathion alone in three and four applications. Parathion at one application and Trithion and Delnav at four applications did not give satisfactory control. Contrast of means was by Duncan's Multiple Range Method.

TABLE 3, 1961 TESTS

Material	No. of treatments	Treatments started	Marketable fruit (%)
Parathion, 2 lbs. 25%/100	2	50% bloom	91
Guthion, 1⅓ pts./100	2	50% bloom	81
Dibrom, 1 pt./100..	2	50% bloom	79
Parathion, 1 lb. 25%/100	2	50% bloom	79
Parathion, 1 lb. 25%/100	1	Jacket	74
Thriptox, 1½ gal./100 plus 5 lbs. sugar	2	50% bloom	63
Zectran, 1 qt./100..	1	Jacket	61
Check	0		52

Two applications of 2 lbs. 25% parathion wettable per 100 gallons of water was not significantly better than either one or two applications of 1 lb. 25% parathion wettable, or 1 pint Dibrom or 1⅓ pints Guthion. Parathion at 2 lbs. was significantly better than Thriptox, Zectran and check. Thriptox and Zectran were not significantly better than the check. Although there was a wide range in percentage of marketable fruit between treatments, the inability to show significant differences was due to extreme variability within treatments and low thrips populations. Contrast of means was by Scheffe's Method of Linear Contrast.