Earlier experiments had emphasized the extreme care needed to insure chemical cleanliness of the test cups. It was found that washing in tap water followed by two rinsings in benzene sometimes left a toxic residue. The entirely satisfactory method finally employed was to rinse the cups in tap water, scrub them three times with paper toweling and hot detergent solution, and place them in a drying oven for an hour at 100° C.

Toxicity tests comparing parathion with DDT are given for *C. incidens* in table 1 and for *A. squamiger* in table 2. Mortality was determined by assuming on the basis of previous tests that larvae which were unable to coördinate their movements; that is, to come to the surface, to go to the bottom, or to swim in a normal manner, were destined to die and would not survive even if transferred to ideal rearing conditions.

As shown in table 1, parathion is completely toxic at a dilution of 1–50 million as compared with DDT at 1–10 million. The median lethal dose for parathion falls between 1–100 million and 1–200 million, whereas that for DDT falls between 1–30 million and 1–50 million.

Aedes squamiger appears to be more resistant to DDT than *C. incidens* under conditions of the test as shown in table 2, but the two insecticides have the same relative position. Parathion is completely toxic at a dilution of 1–50 million as compared with DDT at 1–1 million. The median lethal dose for parathion falls between 1–100 million and 1–200 million, whereas that for DDT approximates 1–50 million.

The feasibility of using parathion as a mosquito larvicide will depend on numerous factors still unknown. Two important items are the cost of the material and its residual properties. The effect of parathion on fish and other beneficial water life, and its pupicidal qualities are other points to be investigated.

Spring Dwarf Nematode

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THE SPRING DWARF NEMATODE, *Aphelenchoides fragariae* (Ritzema Bos), causes a disease of strawberry that is commonly known as dwarf or crimp.

The nematodes infest the leafbuds and cause distortion and crinkling of the leaves as well as reduction of the leaf size. Fruit buds are also attacked resulting in blinding of the buds, accompanied by reduction in fruit yield. The spring dwarf nematode does not invade the plant tissue but feeds upon the external leaf surfaces within the folded buds. This nematode has been found infesting strawberries in fields located at Escalon and Irvington. It is also reported to occur in strawberry fields in Centerville, Morgan Hill, and Watsonville. At Escalon and Irvington approximately 80% to 95% of the plants are infested with this pest. The number of nematodes per leafbud varies from a few to as many as 8,000.

There is, at the present time, no satisfactory method of controlling spring dwarf nematode in the field. Clean planting stock and rogueing of infested plants are suggested as the most practical control methods by workers in the eastern United States where this nematode is an important pest of strawberries. Rogueing does not appear to be practical in California because of the high percentage of plants infested with the nematode.

Preliminary laboratory tests indicated that parathion was toxic to larvae of the root-knot nematode. Since the nematicides that are commonly used in the fumigation of soil are extremely toxic to living plants, it was thought that parathion might be a possible means of controlling spring dwarf nematode on infested strawberry plants in the field. On October 23, 1947, a single row of strawberries was sprayed with 15% wettable parathion powder, at the rate of 0.45 pound of parathion per 100 gallons of spray mixture. Four ounces of "Ultrawet" wetting agent were added per 100 gallons of spray mixture. This spray was applied at 200 pounds pressure. Samples from treated and untreated plants were examined three weeks after application of the parathion. Fifteen leafbuds from the sprayed and unsprayed plants were dissected in a syracuse watchglass and the number of nematodes per bud recorded. When large numbers of nematodes were present, aliquot samples were taken. The sprayed buds averaged 108 nemas per bud as compared to 498 nemas per bud in the unsprayed plants.

On November 13, 1947, one half of the previously sprayed row was treated with parathion at the rate of 0.5 pound of parathion per 100 gallons. The parathion was contained in a 25% wettable powder. Four ounces of Du Pont spreader-sticker were added per 100 gallons of spray mixture. This spray was applied at 200 pounds pressure. On November 24, 1947, 11 days after the last treatment, the plots were again sampled and the number of live nematodes per bud recorded. These results are given in table 1.

TABLE 1

Number of Live A. Fragariae in Strawberry Leafbuds from Single Sprayed, Double Sprayed, and Unsprayed Plants

Bud No.	Untreated	Single treatment 0.45 lb. Oct. 23	Two treatments 0.45 lb. Oct. 23, 0.5 lb. Nov. 13
1	625	2680	0
2	9280	30	0
3	189	340	0
4	172	0	0*
5	1760	0	0
6	2	0	0
7	1280	920	1
8	0	0	0
9	0	0	0
10	2280	280	0
Average per bud	1558	425	0.1

* Nematodes not present in sample.

TABLE 2

Number of Live A. Fragariae per Leafbud in Untreated and in Treated Plants Receiving Two Parathion Sprays, One Oct. 23 and One November 13

Bud No.	Untreated	Two treatments	
		Sample 1	Sample 2
1	960	7060	0
2	1620	782	200
3	1100	1	0
4	440	0	87
5	1860	0	7
6	480	300	4
7	21	2	0
8	320	0	280
9	118	1	20
10	436	5	780
Average per bud	735	815	137

Additional buds were examined from the plants that had been sprayed with two applications of parathion. Occasionally buds were found that contained a few *A. fragariae* that exhibited slight movement. However, these nemas appeared to have been affected by the treatment since this species is normally very active when placed in water.

On December 3, 1947, 20 days after the last treatment additional samples were taken from the strawberries that had received two spray treatments with parathion. Results obtained from these samples are given in table 2.

Additional counts were made on the sample taken on December 3, 1947, by tearing apart 10 sprayed and 10 unsprayed buds in 400 ml. of tap water and counting the number of nematodes

in a 10 ml. aliquot part of each. The average number of nematodes per treated bud was 148 as compared with 656 nematodes per bud in the untreated buds. These counts are comparable to the averages recorded in table 2.

The row that had received two applications of parathion was resampled December 31, 1947, 48 days after the last spray application. The results of these counts are recorded in table 3.

TABLE 3

Number of A. Fragariae per Leafbud 48 Days after Strawberries Were Sprayed with Parathion

Bud No.	Unsprayed		Sprayed
	Sample 1	Sample 2	
1	8	2320	0
2	6920	170	3
3	1800	300	680
4	240	141	0
5	0	1700	2
6	3270	2920	0
7	1450	3480	5
8	2800	0	855
9	60	1300	7920
10	20	280	17
Average per bud	1656	1261	948

The results obtained in these preliminary tests indicate that parathion is toxic to the strawberry spring dwarf nematode, *Aphelenchoides fragariae*, when applied as a spray in the field. Observations made during examination of the bud samples showed that parathion applied as a wettable powder in water kills the nematodes in partly opened buds. In nearly all instances in which large numbers of live nematodes were present in sprayed buds it appeared that the buds were tightly closed at the time the spray was applied. Further investigations with parathion in various spray formulations will be necessary before definite conclusions can be made regarding the actual effectiveness of this material as a control for *A. fragariae* on strawberries. The results obtained in the present experiments are not considered satisfactory, and parathion should only be applied experimentally for nematode control until sufficient data are available to permit accurate evaluation of its effect on nematodes and strawberry yields.

A study of the trend of salinity under the influence of irrigation, differential cropping and different climatic conditions, as well as an investigation of the trend of salinity in the ground waters of the South Coastal Basin is underway in the Division of Soils and Plant Nutrition, Riverside.

OLIVE SCALE

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AR60 were used a condition intermediate between the two previously described treatments had resulted.

Although the treatment of four pounds of 15% parathion showed 18% of the olives to be infested, the degree of infestation was very light so that few, if any, of the olives would have been culled out because of scale spots.

On August 8, 1947, two Mission olive trees near Fresno were sprayed with four pounds of 15% parathion per 100 gallons. A power sprayer was used. At the time of application there were many immature stages present though many of the scale had not yet completed oviposition. The fruit was already nearly 100% infested. Examinations were made on September 4, 1947, and again on January 7, 1948. In November, 1947, all the fruit showed purple spots due to scale infestation. The results are summarized in table 4.

From these experiments it would appear that HETP holds little promise for control of olive scale. On the other hand, parathion appears very toxic to olive scale eggs and young. While slow in action, it is also toxic to adult female scale. A great deal more work is needed to determine dosages, affect of high temperatures on the reaction of parathion on both scale and trees, persistence of residue, and penetration into olive fruit.

APHIDS

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spray application. Many of the brown apricot scale were apparently affected by the spray but remained alive for two to three weeks before dropping off or drying up. The black scale (in a more advanced stage) were not so affected. Results are given in table 6.

TABLE 5

Control of Bud Moth Larvae in Hibernaculae

Dosage of 15% parathion per 100 gals.	Per cent mortality	
	Oct. 28	Nov. 25
½ pound	66	93
1 pound	82	100
2 pounds	96	100

TABLE 6

Control of Brown Apricot and Black Scales Per Cent Mortality

Dosage 15% parathion per 100 gallons	Brown Apricot Scale, weeks after spraying			
	1	2	3	4
½ pound	5	..	..	33
1 pound	6	..	76	92
2 pounds	4	13	88	100
3 pounds	8	23	94	100

Dosage 15% parathion per 100 gallons	Black Scale, weeks after spraying			
	1	2	3	4
½ pound	7	..	..	7
1 pound	6	..	10	12
2 pounds	7	8	17	..
3 pounds	5	10	27	30