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TESTS OF SOME NEWER INSECTICIDES FOR CONTROL OF SUBTROPICAL FRUIT AND TRUCK CROP PESTS

D. O. WOLFENBARGER

Sub-Tropical Experiment Station

Insecticide applications are usually made to produce a prompt control and also one which will last as long as possible. An insecticide application that gives a long period of control is desirable to accomplish many objectives; it is, however, undesirable or even harmful in some instances. Results of recent tests for insect control in the subtropical areas of Florida give some information on the length of time of the insecticidal effectiveness obtained. These tests, conducted in the field for control of different fruit or truck crop insects, are very briefly summarized. The data are presented in tables as averages, under the headings of the plants affected, and they are used in a subsequent reconsideration to illustrate the control obtained.

AVOCADO

Avocado lacebug. Recent trials made to control the avocado lacebug *Ancysta perseae* (Heid.),* and the cotton lacebug, *Corythuca gossypii* (F.), gave some interesting information. On *Annona montana* Macfad., two materials, HCH (the terminology used in this paper for 1, 2, 3, 4, 5, 6-hexachlorocyclohexane) and sabadilla, gave promise of satisfactory control of *C. gossypii*. A 5% DDT dust was considered unsatisfactory. In testing for control of a severe local infestation of *A. perseae*, therefore, HCH and sabadilla dusts were tried. Twelve infested trees were divided into four blocks, three trees in each. An application of dust was then made to each of two trees in each block by a rotary-type hand duster; one tree in each block was left untreated as a check. A summary of the results is presented in Table 1.

*Identified by G. B. Merrill, Florida State Plant Board.

GUAVA

Little fire ant. In a large guava grove near Opa Locka, the little fire ant, *Wasmannia auropunctata* (Roger)*, was causing disturbances among fruit pickers. The work by Osburn (1945) (1946) with DDT was known but it was deemed advisable to try some of the other newer insecticides, especially for a length of time for control comparisons on guava trees. A

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TABLE 1. Average numbers of avocado lacebugs per leaf on avocado trees.

Dust material	Days after treatment 1	7	16
HCH, 1% gamma-isomer dust[1]	0.3	2.0	5.8
Sabadilla, 10% dust[2]	2.7	2.6	6.3
Check (untreated)	9.2	7.4	5.4
Least mean significant difference, statistically	2.7	Insig.	Insig.

[1] Obtained from Commercial Solvents Corporation
[2] Obtained from John Powell Company

rectangular area containing 48 heavily infested trees was arranged in a randomized block design for four replications of a total of 12 treatments. The sprays were applied to the trunks and larger branches with a knapsack-type sprayer, and the two dust treatments were applied with a rotary-type duster, also to the trunk and larger branches. In measuring treatment effects each tree was examined for "ant trains"; all found were counted. The number of ants per linear foot was then counted in each train at 6 to 18 inch heights above ground. This method of recording results differed somewhat from that used by Osburn (1945), who counted the ants observed on units of 2 by 2 inches of white stenciled squares on each treated tree. A summary of the observations is presented in Table 2.

* Identified by M. R. Smith, U. S. Bureau of Entomology and Plant Quarantine.

TABLE 2. Average numbers of the little fire ant per linear foot of guava tree trunk.

Treatment materials	Days after treatment 3	11	32	54
DDT spray, 50% wettable,[1] 1 lb. /100 gals. water	8	4	1	16
2 lbs./100 gals. water	1	1	0	6
3 lbs./100 gals. water	2	0	0	0
HCH spray, gamma-isomer content 0.250%[1]	0	7	1	9
0.050%	5	15	18	35
0.025%	1	28	40	50
1068 spray, active ingredient 0.50%[2]	0	12	0	0
0.10%	2	5	3	10
0.05%	4	9	5	29
HCH dust, gamma-isomer content 1.00%[3]	16	24	30	36
0.50%	24	30	42	57
Check (untreated)	103	109	93	55
Least mean significant difference, statistically	17	19	20	18

[1] Obtained from E. I. du Pont de Nemours Company.
[2] Obtained from W-Z Laboratories.
[3] Obtained from Commercial Solvents Corporation.

PAPAYA

Papaya webworm. An experiment was planned in a planting of papayas in which it was reported that the fruit was falling without maturing, owing to infestations of the papaya webworm, *Homalopalpia dalera* Dyar. This experiment consisted of a randomized block plan for five treatments, four replications of nine plants (some plots had one or two plants missing) in each. A knapsack-type sprayer was used to spray the plants thoroughly with each material. In measuring results of the treatments, the webs were examined and that portion of webs containing webworm larvae was determined in each plot for each treatment. They were compared one with the other and are summarized in Table 3.

TABLE 3. Average percentage of papaya webworm webs observed with larvae.

Treatment materials*	Days after treatment 7	14	36
DDT, 1 lb./100 gals.[1]	8.4	6.1	12.8
HCH, 0.10% gamma-isomer[2]	8.4	7.7	23.1
1068, 0.05% active ingredient[3]	14.4	9.5	30.4
Lead arsenate, 4 lbs.; lime, 4 lbs./100 gals.	16.5	19.9	35.6
Check (untreated)	81.7	74.8	44.6
Least mean significant difference, statistically	32.4	13.5	12.7

* A fungicide was added to each insecticide, except lead arsenate, composed of *Fermate* 2 lbs., zinc sulfate 1 lb., and hydrated lime ½ lb. per 100 gals. spray.

[1] Obtained from California Spray-Chemical Company.
[2] Obtained from E. I. du Pont de Nemours Company
[3] Obtained from W-Z Laboratories.

OKRA

Aphids. Plots were marked out in an okra field so there were four replications of each of four dust treatments arranged in a randomized block design. Each plot was a 3-row unit, 40 feet long. The plants, at the time of treatment, were infested with the green peach aphid, *Myzus persicae* (Sulz.), and lightly infested with the southern green stinkbug, *Nezara viridula* (L.), the latter not numerous enough to show differences from treatment effects at this time. Aphids on the blossom buds, however, were counted on the experimental plants at different times after treatment, as listed in Table 4.

TABLE 4. Average number of green peach aphids per okra blossom bud.

Dust material	Days after treatment			
	1	3	6	10
Sabadilla, 10%[1]	12	38	43	35
DDT, 10%[2]	5	3	4	9
HCH, 1% gamma-isomer[3]	2	5	10	14
Check (untreated)	24	30	28	36
Least mean significant difference, statistically	10	11	13	Insig.

[1] Obtained from Kilgore Seed Company.
[2] Obtained from California Spray-Chemical Company.
[3] Obtanied from Commercial Solvents Corporation.

DDT and HCH provided significant aphid control. Sabadilla, however, gave no significant control except one day after treatment.

Southern Green Stinkbug. The numbers of southern green stinkbug remained low on the okra plants for nearly a month. In order, therefore, to determine any difference caused by treatments, a second application was made to the plants 26 days after the first. A larger population of southern green stinkbug was present in the field at this time, sufficient to determine treatment differences. The average number of stinkbugs observed per 3-row, 40-foot-long plot is given in Table 5.

TABLE 5. Average number of southern green stinkbugs per treatment plot.

Treatment materials, dust	Day after 2nd treatment		
	1	4	8
Sabadilla, 10%[1]	2	13	35
DDT, 10%[2]	16	25	38
HCH, 1% gamma-isomer[3]	6	18	27
Check	23	40	33
Least mean significant difference, statistically	10	Insig.	Insig.

[1] Obtained from Kilgore Seed Company.
[2] Obtained from California Spray-Chemical Company.
[3] Obtained from Commercial Solvents Corporation.

The populations of stinkbugs were practically equalized on the plots by the eighth day, indicating termination of treatment effects. A month

after the retreatment, a third application was made to the plants. Some changes were made in the dust materials, as noted in Table 6, which also contains a summarization of the results obtained.

TABLE 6. Average number of southern green stinkbugs per treatment plot.

Treatment materials, dust	Days after 3rd treatment		
	2	7	12
Sabadilla, 10% dust[1]	2	5	13
DDT, 5% Dianisyl trichloroethane (Methoxy DDT)[2] + sulfur	15	13	15
HCH 1% gamma-isomer[2] + sulfur	17	8	24
Check	17	15	16
Least mean significant difference, statistically	10	Insig.	Insig.

[1] Obtained from John H. Powell & Company.
[2] Obtained from California Spray-Chemical Company.

Sabadilla provided excellent stinkbug control after the third treatment, as after the second. The HCH and Methoxy DDT formulated with sulfur failed to equal the control obtained by the use of sabadilla.

POTATOES

Aphids. An infestation of aphids developed in a field of Bliss Triumph potatoes treated regularly with Dithane-zinc sulfate-lime fungicide by a 4-row power sprayer. Insecticides were added to the sprays for aphid control at a time when the plants were nearly grown. This single application of insecticide made possible the determination of the period of effectiveness of the treatments for aphid control. The species of *Myzus persicae* was most abundant, although *Aphis gossypii* Glov. became more numerous late in the season. Results of the aphicide treatments were determined by counting aphids on from 8 to 16 leaves per treatment per count day. The data are presented in Table 7.

* Determined by P. W. Mason, U. S. Bureau of Entomology and Quarantine.

TABLE 7. Average number of aphids per leaf, days after treatment.

Treatment material	Days after treatment		
	4	14	20
DDT-isomers[1], ½ pt./100 gals. spray	10	13	34
1 pt./100 gals. spray	2	40	17
1 qt./100 gals. spray	1	9	9
HCH[2], gamma-isomer content 0.01%	7	19	24
0.03%	4	19	22
0.09%	0	3	12
Check (Fungicide, zinc sulphate and lime)	42	63	30
Least mean significant difference, statistically	4	Insig.	Insig.

[1] Obtained from J. H. Powell Company, termed *JP-70*.
[2] Obtained from E. I. du Pont de Nemours Company.

SQUASH

Melon Aphid. In a planting of Baby Crookneck squash, an experiment was provided in which by a randomized block design of three replicates of each of 12 dust treatments, a test was made for control of the melon aphid, *Aphis gossypii*. Each treatment row consisted of at least 8 hills; most were of 15 or more. The dust treatments were made with a rotary-type hand duster. Five lower leaves from each replicate of each treatment were taken for determination of aphid control for each treatment at each day's count. A summary of the data is presented in Table 8.

TABLE 8. Average number of melon aphids per squash leaf, on days after treatments.

Treatment materials	Days after treatment			
	1	4	8	12
PCH 0.10%, pyrethrins 0.050%[1]	11	13	6	4
PCH 0.40%, pyrethrins 0.200%[1]	1	3	1	1
PCH 0.75%, pyrethrins 0.375%[1]	2	2	3	5
PCH 0.50%, pyrethrins 0.250%, nicotine 0.75%[1]	4	1	2	1
DDT 1%[2]	3	1	1	1
DDT 3%[2]	8	5	5	2
DDT 5%[2]	1	2	2	2
HCH, gamma-isomer 0.05%[3]	4	1	2	3
HCH, gamma-isomer 0.10%[3]	12	9	8	9
HCH, gamma-isomer 0.50%[3]	4	4	4	5
Hydrated lime, *Black Leaf 40*, 9:1	0	0	0	0
Control, untreated	24	26	17	7
Least mean significant difference, statistically	3	4	2	Insig.

[1] Obtained from Chipman Chemical Co. (PCH = piperonyl cyclohexanone).
[2] Obtained from Geigy Company.
[3] Obtained from Commercial Solvents Corporation.

TIME CONTROL EFFECTS

In reconsideration of the control shown above, Table 1-8, inclusive, percentages of control were determined, based on the familiar Abbot (1925) formula. Although there are certain disadvantages to the use of percentages, Wadley (1943), there are certain advantages. One advantage in using percentages is that they serve to illustrate how different tests, insecticides, and different days' counts affected the control. In the following figures, control is based on insecticides and different count days. Different dosage concentrations of the insecticides are combined to give single curves. Studies of these percentage data by means of different graphic schemes, made to determine that which most faithfully illustrates the results, indicated that regular arithmetic spacings were apparently as satisfactory as any other. The regression formula given by Snedecor (Sec. 6.14, 1940) was, therefore, employed to define the positions and slopes of the curves.

Avocado lacebug control was more marked by HCH than by sabadilla, as noted in Table 1. A short-time control was observed as is shown by the data. The young which hatched from the eggs soon (within about a week

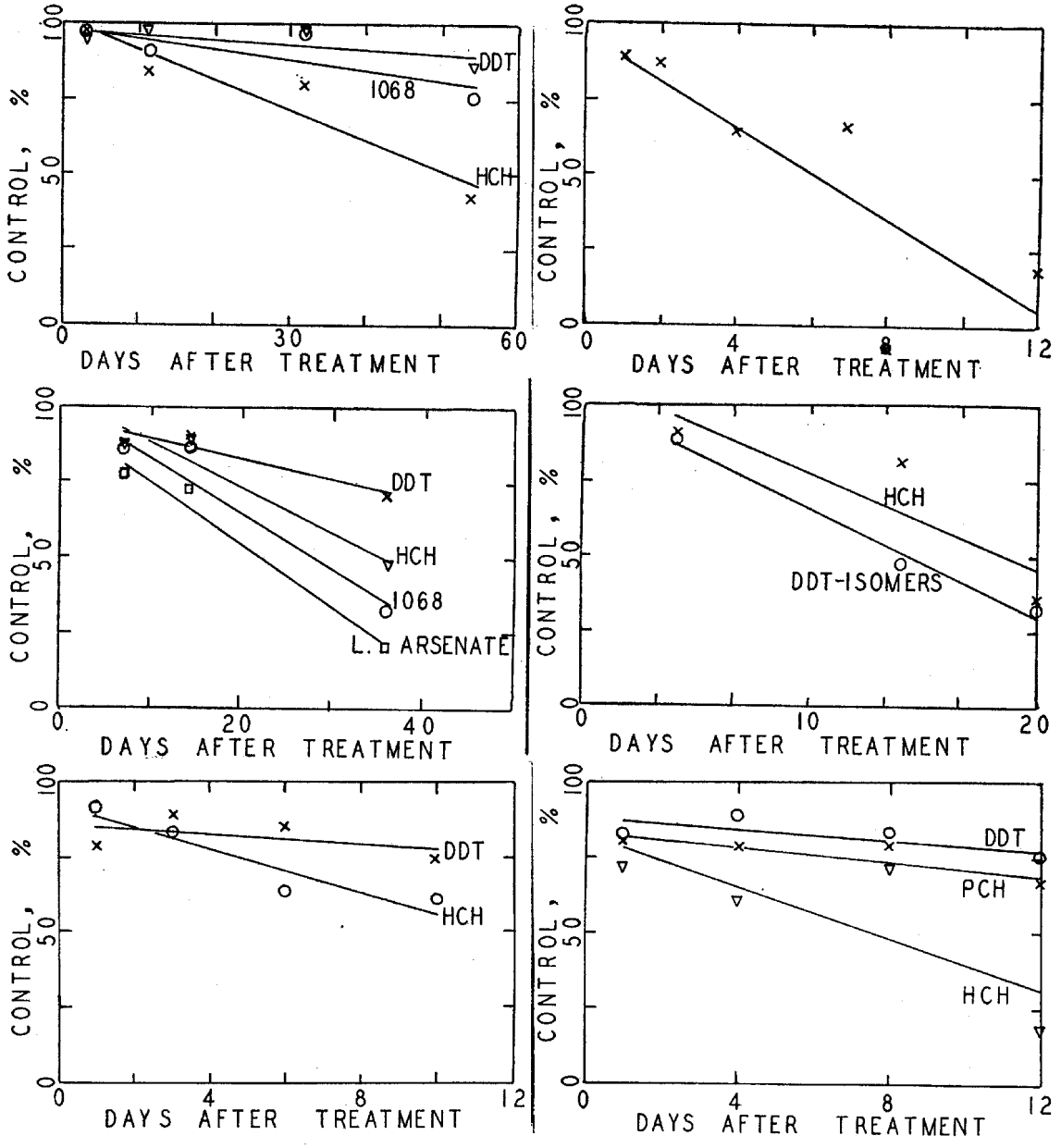

FIGURE 1.—Little fire ant control on guava tree trunks subsequent to treatment.

FIGURE 2.—Papaya webworm control on days following treatment.

FIGURE 3.—Green peach aphid control on okra following plant treatment.

FIGURE 4.—Southern green stinkbug control by sabadilla on days following treatment.

FIGURE 5.—Green peach aphid control on potatoes following spray treatment.

FIGURE 6.—Melon aphid control on squash on days following treatment.

after treatment) repopulated the trees dusted with HCH and sabadilla, and apparently encountered no or little toxic residues of the insecticides.

Longer residual effects of DDT than of 1068 or HCH against the little fire ant, Fig. 1, were observed. The effects of 1068, however, differed little from DDT, HCH on the other hand, appears to have lost its effects most rapidly; six weeks time having reduced its control by about 50 per cent.

Three of the newer insecticides, DDT, HCH, and 1068, were all more efficient and exhibited sustained control on the papaya webworm longer than an older insecticide, lead arsenate, Fig. 2. In this experiment, the DDT curve is flatter than those of 1068 or HCH, indicating its longer residual toxicity.

Insect control on okra plants is illustrated by two control-time effect curves, Fig. 3. One is that showing control of the green peach aphid by DDT and HCH. DDT lost about 7 per cent of its efficiency in 10 days; HCH about 32 per cent. No curve was drawn for sabadilla because of its poor control. Sabadilla gave more efficient control, however, of the southern green stinkbug than DDT or HCH, although the HCH in one test, Table 5, indicated some control of the southern green stinkbug. By the curve slope, 90 per cent control by sabadilla at one day after treatment became 44 per cent a week after, and 5 per cent 12 days after treatment. The data from both dust treatments, Table 5 and 6, were used to determine the curve in Fig. 4, common to both sets of data.

In making comparison of the aphicide treatment materials on potato plants, DDT-isomers and HCH, Table 7, the HCH was found to be more efficient at the concentrations indicated. The slopes of the curves, shown in Fig. 5, however, are so parallel as to indicate similar control-time effects up to 20 days after treatment; each had lost about one-half of its initial control in that time.

Melon aphid control, Fig. 6, is shown to have continued at levels of near 90 per cent or about with DDT, about 70 per cent with PCH, but to have dropped to near 30 per cent with HCH in 12 days time. In as much, however, as plant injury was observed from all three treatments, these results are presented for any academic interest they may have. Aphid control was nearly perfect by the use of the hard-to-obtain and older insecticide material, nicotine sulfate, and no chemical burn attended its use.

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REPORT OF THE ANNUAL MEETING OF THE FLORIDA ENTOMOLOGICAL SOCIETY FEBRUARY 14-15, 1947

The 1946 meeting of the Florida Entomological Society, originally slated for December, 1946, was postponed until February 14, 1947, because of certain unforeseen schedule conflicts. The two day meeting was held on the campus of the University of Florida in Gainesville, on Friday and Saturday, February 14 and 15.

The meeting opened at 1:30 p. m. on Friday with President H. K. Wallace presiding. Each person present was asked to introduce himself, giving his name, chief entomological interest, and his place of residence. This introduction was followed by the presentation of the following papers:

"Some New Insect Repellents and Toxicants." W. E. Dove.

"Tests of Some Newer Insecticides for Control of Subtropical Fruit and Truck Crop Insects." D. O. Wolfenbarger.

"In Addition to Your Other Duties." G. W. Dekle.

"New Water Beetles from Florida." F. N. Young.

"Miscellaneous Notes on Pests and Sprays." W. W. Yothers.

"A Critical Appraisal of Aerosol Bombs for Home Use." E. G. Kelsheimer.

The Annual Dinner was held on Friday evening at the Primrose Grill, with fifty-eight members and guests present. A most interesting and thought-provoking address, "Opportunities for Entomological Research in Florida", was given by the president, Dr. H. K. Wallace.

The first part of the Saturday morning session was a continuation of the Friday meeting with the presentation of papers. They were:

"Some Notes on New Insecticides for Insect Control on Citrus" W. L. Thompson and J. T. Griffiths.

"The Effects of the Use of DDT on Florida Red Scale Populations on Citrus." J. T. Griffiths.

"A Preliminary Report of the Use of DDT for the Control of the Gulf Coast Tick." A. N. Tissot.

Following the presentation of papers, the business meeting was called by the President. The first order of business involved the raising of associate members to full membership and the election of new members. The following associates were raised to members: A. E. Pritchard, A. L. Smith, F. L. Thompson, and D. O. Wolfenbarger.

The following were elected to associate memberships: R. E. Bellamy, Jr., J. M. Bellows, I. J. Cantrall, C. M. Crutchfield, C. J. Goin, J. T. Griffiths, A. B. Grobman, E. R. Jones, Jr., R. B. Kleinhans, D. Maughn, W. H. Merrill, T. Smyth, and H. V. Weems, Jr.

Fourteen student members were also elected: R. Capeluto, D. U. Duncan, W. G. Genung, W. B. Gresham, Jr., J. H. Heidt, J. L. Herring, P. J. Hunt, J. D. Kilby, D. E. Miller, M. M. Milligan, C. L. Remington, R. K. Strawn, W. H. Thames, Jr., and A. F. Van Pelt, Jr.

The nominating committee proposed the names listed below for the various offices of the Society and they were accepted unanimously by the organization.

President — Max Osburn
Vice-President — E. G. Kelsheimer
Secretary — Lewis Berner
Treasurer-Business Manager — J. M. Crevasse, Jr.
Editor of the *Florida Entomologist* — H. K. Wallace
Associate Editor — G. B. Merrill
Member of the Executive Committee — J. C. Goodwin

A discussion of the aims, scope, and plan of the *Florida Entomologist* revealed considerable interest and support for increasing the size of the publication, adding a cover, inducing the entomologists of Florida to publish their research in the journal and in securing additional funds to defray added costs that these changes would entail. As a result, membership dues were raised to two dollars per year and the subscription rate for the journal was also increased to two dollars. In order to increase the dues and subscription rates, it was necessary to change Article IV, Section 1 of the by-laws. This change was adopted unanimously.

A very successful and interesting meeting was brought to a close at 11:50 a. m., February 15, and the society adjourned until its next annual meeting. The total number of persons registering for the meeting was fifty-five.

LEWIS BERNER, *Secretary*

RESEARCH REQUEST

Mr. J. B. Gerberich, Department of Biological Science, Michigan State College, East Lansing, Michigan wants to obtain reprints, copies of unpublished manuscripts, and results or observations made in connection with the biological control of mosquitoes. This material will be brought together in the form of annotated bibliographies.

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