be substituted in his place to audit the books of the resigning treasurer-business manager. Dr. Kelsheimer then appointed Dr. A. N. Tissot to this committee.

The annual meeting was adjourned at 10:15 A.M.

A total of fifty-three persons signed the attendance registry.

Respectfully submitted,

LEWIS BERNER,
Secretary

COMPARISON OF DDT, CHLORDANE, AND CHLORINATED CAMPHENE FOR CONTROL OF THE LITTLE FIRE ANT

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The presence of the little fire ant (**Wasmannia auropunctata** [Roger]) in the United States, was first noted by Smith (1929) in 1929, in Florida. Later in the same year Wheeler (1929) reported that he had received specimens of this ant from Florida in 1924. Several years later Keifer (1937) reported that the little fire ant was established in Los Angeles County, California.

Since its discovery in southern Florida, the little fire ant has spread northward into nearly all sections of the peninsula. At the present time it is a serious household pest in many areas, and an important pest to citrus-grove workers in some sections along the east coast of Florida (Spencer 1941, Osburn 1945). Recently Wolfenbarger (1947) reported that it caused disturbance among fruit pickers in a large guava grove near Opa Locka, Fla. According to Wheeler (1929) it is probably that the little fire ant may eventually become established in green houses in many parts of the United States, but will be able to survive out-of-doors only in the tropical portions of the country.

The worker ants visit the citrus trees to obtain honeydew secreted by aphids, mealybugs, whiteflies, and other insects. In heavily infested groves millions may be present. At times the trunks of citrus trees take on a reddish-brown cast, owing to the presence of so many individuals moving up and down the trees. The worker ants are small, and ordinarily not aggressive. They usually sting only when they are pressed or confined between the clothing and the skin. When trapped under these conditions—it is practically impossible to work in a heavily

infested tree without getting them under the clothing — they sting viciously by humping the thorax, lowering the posterior part of the abdomen, moving forward, scratching the skin, and depositing poison all in one operation. Some time may elapse between the actual sting and the realization by the victim that he is literally on fire. Often, the ant has disappeared in the meantime, and the opportunity to crush the tormentor has passed. Citrus-grove workers, especially fruit pickers, have refused at times to work in trees infested with this ant, and in other instances have left trees partially picked or demanded premium wages.

In citrus groves the ant nests in the soil or under fallen branches, leaves, fruit, or almost any type of debris found on the ground. The nests have no definite form, and consist of clusters of ants that vary considerably in numbers. In some of these nests workers, one or more queens (with or without wings), and eggs, larvae, and pupae have been found. In others only workers seem to be present, although the other forms may be farther down in the soil. The nests seem to be temporarily located, and during periods of extreme dryness the ants go deeper into the ground. Under extremely wet weather and flood conditions entire colonies may be found up in the limb crotches of trees or under pieces of loose bark.

DDT sprays and dusts have been very effective in killing the little fire ant and preventing troublesome reinfestations for periods of two months or longer, depending upon the concentration and quantity of material used (Osburn and Stahler 1946). One cooperative growers' association in St. Lucie County, Fla., treated over 400 acres of citrus during the past season in order that its grove hands could work without discomfort.

Since DDT first appeared as an insecticide, other chemicals have been developed which are showing insecticidal properties. Two of these, chlordane and chlorinated camphene, became availaible for experimental work during 1947. After preliminary tests indicated that they were effective against the little fire ant, critical field tests were made to compare their residual qualities.

EXPERIMENTAL PROCEDURE

The tests were carried on in St. Lucie County in an old grapefruit and orange grove that was heavily infested with the little fire ant. The sprays were prepared by dissolving 8 ounces of either technical DDT, technical chlordane, or technical chlori-

nated camphene in one-half gallon of Number 2 fuel oil, adding 19 ml. of phthalic glyceryl alkyd resin to make a stock emulsion, and then diluting the emulsion with water to make 100 gallons. The concentration of 8 ounces per 100 gallons was chosen because this amount of DDT has provided the best control with a minimum of cost. Generally, lesser quantities of DDT are not so effective, and little is gained by using greater amounts. Even though previous work had shown that oil sprays used alone at a concentration as high as 1.6 per cent were ineffective in controlling the little fire ant, a spray containing ½ gallon of fuel oil per 100 gallons of water was included in the experimental setup as a check. The sprays were applied thoroughly with a power outfit to the tree trunks and larger lower branches. Approximately 4 gallons of spray was used per tree.

The experimental design was that of randomized blocks. There were five replications of each treatment, and a single tree in each block received each treatment. Before the treatments were applied, a band 1 inch wide was stenciled with white paint around each tree trunk, below the lowest branch at from 2 to 3 feet above the ground level. The circumference of the tree trunks at this point ranged from 29 to 38 inches. At intervals following the applications, the treatments were compared by recording the number of ants on five of these bands per treatment, or a total area of slightly more than 1 square foot of tree-trunk surface per treatment. The data were analyzed statistically.

RESULTS AND DISCUSSION

A summary of the results is presented in Table 1.

TABLE 1.—NUMBER OF LITTLE FIRE ANTS FOUND ON CITRUS TREES AT INTERVALS AFTER TREATMENT WITH SPRAYS CONTAINING EQUAL AMOUNTS OF DDT, CHLORDANE, AND CHLORINATED CAMPHENE. TREES SPRAYED ON JUNE 27, 1947.

Treatment (8 oz. of specified material in ½ gal. No. 2 fuel oil [1] per 100 gal. of water)	July 10	July 24	Aug. 7	Aug. 22	Sept. 5	Sept. 26	Oct. 27
DDT	1	0	17	126	20	21	3
Chlordane	1	0	29	65	25	7	13
Chlorinated camphene	1	3	6	60	42	51	11
Fuel oil alone (check)	225	294	658	793	884	411	99
Difference required for significance at 5% level	50	60	171	119	112	262	44

[1] Fuel oil in all treatments made emulsifiable by adding 19 ml. of phthalic glyceryl alkyd resin to the oil.

The data, taken at approximately biweekly intervals from the time of application through September 26, and again on October 27, 1947, showed that DDT, chlordane, and chlorinated camphene were equally effective against the little fire ant, and that the fuel oil used alone was of no value. At no time was there a significant difference in effectiveness between the three insecticides; on each examination date all of them were significantly better than the oil alone.

The three treatments reduced and held the infestation to a low level until August 22, when their effects seemed to be disappearing, as more ants were found than on previous dates. Apparently the increases were due to ants that had developed after the materials were applied, and had not been exposed to the spray residues long enough to be affected. In confirmation of this theory, large numbers of dead ants that had not been there on August 22 were found at the bases of treated trees at the time of the next examination. On September 5, fewer ants were recorded in the three effective treatments, whereas the infestation increased in the oil treatment. These reductions were probably due to the residual qualities of the materials.

In the treatment consisting of fuel oil alone the ant infestation increased steadily until September 5. Shortly thereafter, during the week of September 14, a hurricane accompanied by heavy rains caused a reduction in ant activity, so that on September 26 only about half as many ants were present on the check trees as were found on September 5. Continued heavy rains and flooded grove conditions throughout the last of September, and most of October, were responsible for a further reduction in ant activity, as reflected in the records made on October 27.

The results of the work indicate that both chlordane and chlorinated camphene compare favorably with DDT for control of the little fire ant.

SUMMARY

Sprays containing equal quantities of DDT, chlordane, or chlorinated camphene in No. 2 fuel oil were compared for the control of the little fire ant (*Wasmannia auropunctata* [Roger]) on citrus trees. At the rate of 8 ounces per 100 gallons of water, the three materials were found to be equally effective and to reduce infestations significantly for a period of at least 12 weeks, when sprayed on trunks and larger limbs. No. 2 fuel oil used alone at a strength of 0.5 percent was of no value.

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BORDER EFFECTS OF SERPENTINE LEAF MINER ABUNDANCE IN POTATO FIELDS

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The manner in which insects infest plants and distribute themselves in a field is of interest and may be of value in determining control measures. Insects may be in a field prior to seedbed preparation and planting and infest plants as they begin growth. They may infest plants in the seedbed and be dispersed by man during transplanting. They may enter a field from the outside during the growth of the crop and become dispersed evenly over a field. They may, on the contrary, be unequally distributed because more insects stopped along the field border near the point of entry. Equalization of population or small and insignificant differences in distributions of a species over fields are attributable to two factors operating singly or in combination. These are (1) dispersability of an insect species, and (2) small fields or short distances under observation. These factors are considered to be operating where it appears that insects are evenly dispersed.

Interest is directed in this presentation to unequal distribution of insects, particularly to those cases in which more insects were observed nearest the insect sources outside of a field. It is recognized that unequal distribution of insects over a field, or border effects, may result from (1) unequal disper-