Table 1.—Control[a] of cowpea aphid and tobacco thrips on southern peas with chemical insecticides.

Insecticides formulation (lb AI/acre)	Aphids		Thrips		
	No. on[b] 60 plants	% reduction	No. on 60 plants	% reduction	Damage[c] rating
Acephate 75 WP 0.5	5 a	99.1	5 a	93.7	1.2 a
Acephate 75 WP 1.0	14 ab	97.5	3 a	96.2	1.2 a
Chlordimeform 4 EC 0.5	197 c	65.5	35 d	55.7	

[redacted]

2 = slight to moderate; and 3 = moderate to severe.

The insect data were analyzed as a split plot in time; treatments as the main plots and sampling dates as the subplots. The numbers of surviving aphids per plot were transformed to log (X + 1) to reduce variance caused by colonization on infested plants; the number of surviving thrips per plot was transformed to $\sqrt{X + 0.5}$ because only 1 of 30 frequency distributions of thrips per plant departed significantly (5% error) from Poisson expectations.

The chemicals tested were acephate, chlordimeform, leptophos, methomyl, resmethrin, and Ortho 9006 (*O,S*-dimethyl phosphoramidothioate). Endosulfan and parathion were used as standards for comparison.

RESULTS.—The infestation of cowpea aphids was reduced significantly by all treatments (Table 1). Acephate, methomyl, Ortho 9006, and resmethrin were as effective as the standards; chlordimeform and leptophos were less effective than the standards.

Also, all treatments significantly reduced the thrips population. In comparison, parathion gave better reduc-

[redacted]

fective as endosulfan, but they were not as effective as parathion.

Little or no insect damage occurred on plants treated with acephate or Ortho 9006; in this respect, these compounds were superior to all of the others. Endosulfan, leptophos, methomyl, and parathion had equal damage. Resmethrin gave poor protection. Chlordimeform caused severe phytotoxicity (chlorotic effect and leaf distortion) and these plots could not be rated for insect damage. Parathion caused some burning to the plant foliage.

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Laboratory Evaluation of Insecticides Against Larvae of *Diaprepes abbreviatus*[1,2,3]

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A single weevil discovered near Apopka, Fla., in 1964 was identified as *Diaprepes abbreviatus* (L.), a serous pest of sugarcane and citrus in the West Indies (Woodruff 1964, 1968). By 1968, the species had infested ca. 2500 acres of citrus plantings (Selhime and Beavers 1972). We therefore evaluated the effectiveness of chemicals as larvicides against hatchling larvae of the pest in tests from September to November 1971.

MATERIALS AND METHODS.—Effectiveness of materials was determined by using 1 of 2 methods or both. For the filter paper test, 5 discs of Whatman® filter paper (7 cm diam) were each treated with 0.6 ml of either aqueous solutions of formulated materials or water suspensions of granular materials. This amount was sufficient to saturate the paper. Five similar discs moistened with 0.6 ml of water were used as the control for each test series. After the filter papers had dried 24 h, the 5 papers treated with the candidate material were placed in disposable petri dishes (7 cm diam) and a thin slice of carrot was placed in the center to provide food, moisture, and a place of concealment for the larvae. Ten 1-day-old larvae of *D. abbreviatus* from the Apopka laboratory were introduced into each dish, and the dishes were covered. Mortality counts were made 24 h later.

For the soil test, 20 ml of sandy soil screened through a 20-mesh sieve was placed in each of 5 disposable petri dishes (7 cm diam), aqueous solutions of a candidate chemical were applied, 8 ml/dish, and the soil was allowed to dry 24 h. A thin slice of carrot was placed in each dish, and the dish was infested with ten 1-day-old larvae. The control

[1] Coleoptera: Curculionidae.

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[3] This paper reports the results of research only. Mention of a pesticide or a proprietary product does not constitute a recommendation or an endorsement by the USDA.

was a dish of soil treated with 8 ml of water. Dishes were covered and left for 72 h. At that time, the petri dishes were flooded with water, and the larvae, which floated readily, were recovered with a pen brush and placed on a dry filter paper to absorb excess moisture. Live larvae could be counted as they moved off rapidly under a bright light. Abbott's formula was used in computing percentage mortality for all tests. Dosages were based upon manufacturer's suggestions or amounts used in general grove schedules in most cases. Only those giving 100% mortality were considered effective in this experiment.

Materials tested that did not have approved common names were: Shell SD-9098 (*O*-[2-chloro-1-(2,5-dichlorophenyl)vinyl] *O,O*-diethyl phosphorothioate), Dyfonate® (*O*-ethyl *S*-phenyl ethylphosphonodithioate), Imidan® (*O,O*-dimethyl phosphorodithioate *S*-ester with *N*-(mercaptomethyl)-phthalimide), Dowco® 213 (tricyclohexylhydroxytin), Shell SD-14114 (hexakis (*β*,-*β*dimethy.-phenethyl)distannoxane), Stauffer R-10044 (*N*-[(1,1,2,2-tetrachloro-2-fluoroethyl)thio]methanesulfonanilide), Upjohn U-27415 (benzoyl chloride (2,4,6-trichlorophenyl) hydrazone), PP-211 (*O*-[2-diethylamino)-6-methyl-4-pyrimidinyl] *O,O*-diethyl phosphorothioate), and MBR 6866 (1-[(dichlorofluoromethyl)thio]-3,4-dihydro-3-methyl-1H-2,1,3-benzothiadiazine 2,2-dioxide).

Results and Discussion.—In the filter paper tests, *material formulations and rates/100 gal/acre that gave* 100% mortality included bromopropylate 2 lb/gal EC 0.25 lb, Shell SD-9098 2 lb/gal EC 2.0 lb, aldrin 4 lb/gal EC 5.0 lb, carbaryl 50 WP 0.75 lb, carbofuran 10G 0.20 lb, chlordane 8 lb/gal EC 2.0 lb, diazinon 4 lb/gal EC 0.5 lb, Dyfonate 10G 4.0 lb, heptachlor 10G 3.0 lb, PP-211 10G 4.0 lb, and methidathion 2 lb/gal EC 0.5 lb. Material formulations and rates/100 gal/acre that were ineffective included Dyfonate 10G 0.4 lb, Imidan 50% WP 5 lb, dicofol 4 MF 0.5 lb, demeton 2 EC 0.25 lb, formetanate hydrochloride 95 T 0.12 lb, dicrotophos 82% EC 0.41 lb, carbophenothion 4 EC 1.0 lb, chlorobenzilate 4 EC 0.1 lb, Stauffer R-10044 65 WP 0.65 lb, dimethoate 2 EC 1.0 lb, Shell SD-14114 50 WP 1.0 lb, oxydemetonmethyl 2 EC 0.25 lb, Dowco 213 50 WP 0.5 lb, MBR-6866 50 WP 0.5 lb, and Upjohn U-27415 75 WP 0.38 lb. Control survival ranged from 64.6–100%.

In the soils test, material formulations and rates/100 gal/acre that gave 100% mortality included Shell SD-9098 2 lb/gal EC 2.0 lb, aldrin 4 lb/gal EC 5.0 lb, carbaryl 50 WP 2.5 lb, carbofuran 10G 1.0 lb, chlordane 8 lb/gal EC 10.0 lb, dieldrin 1.5 lb/gal EC 4.5 lb, and heptachlor 10G 3.0 lb. Methidathion 2 lb/gal EC 0.5 lb gave 95.7% mortality. Material formulations and rates/100 gal/acre that were ineffective included diazinon 50 WP 0.75 lb, ethion 4 EC 2.5 lb, dicrotophos 82% EC 0.82 lb, and DDT 25% EC 2.5 lb. Control survival was 94.0–100%.

Although the filter paper and the soil tests gave similar results, we discontinued the filter paper test because the untreated control insects survived better in the soil tests.

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Combination of Two Insecticides and a Sticker Tested Against the Pecan Weevil[1] on Pecan[2,3,4]

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The pecan weevil, *Curculio caryae* (Horn), causes serious damage to pecans in most southern states. Feeding by adults before the oviposition period causes a nut loss, and the larvae that develop within the nut completely destroy the kernel (Osborn et al. 1966). Control of the pecan weevil is achieved almost entirely by the application of insecticides against the adult weevil. Of the insecticides that have been screened for use with the pecan weevil, carbaryl has been found to give effective control (Osborn and Tedders 1966, Van Cleave and Anderson 1972, Hoelscher and Van Cleave 1972, and Polles and Payne 1973). However, phosalone has been effective against other insect pests of pecan, e.g., black pecan aphid, *Tinocallis caryaefoliae* (Davis), yellow aphids, *Monellia* spp., and the hickory shuckworm, *Laspeyresia caryana* (Fitch) (Estes 1969. Osburn and Tedders 1969, Van Cleave and Anderson 1972, Cole and Van Cleave 1972); some growers have used carbaryl and phosalone in combination for weevil control. A test was therefore made to determine the effectiveness of carbaryl and phosalone used alone and in combination for weevil control. Also, since some growers and researchers (Hoelscher and Van Cleave 1972) have used an extender sticker with the insecticides, this material was included. The experiment was conducted near Shreveport, La., in 1973.

Methods and Materials.—Nine treatments (AI/100 gal water) were made as follows: carbaryl 80 WP 0.5 lb + phosalone 3 EC 0.25 lb; carbaryl 1.0 lb; carbaryl 1.0 lb + an extender sticker (bi-*p*-menth-1-ene polymer as Nu-Film-17® (Pinolene®)) 1 pt; carbaryl 1.0 lb + sticker 2 pt; carbaryl 0.5 lb + phosalone 0.25 lb + sticker 1 pt; phosalone 0.5 lb; phosalone 0.5 lb + sticker 1 pt; phosalone 0.5 lb + sticker 2 pt; untreated check. Each treatment (replicated 5 times in a randomized complete block design) was applied to 6 individual clusters and surrounding leaves of the 'Stuart' pecan variety by using a 2-gal hand sprayer. After the test materials were applied, weevils of known age were confined to a treated nut cluster in a nylon cage (25 cm diam × 61 cm high). Weevils used in the test emerged between July 20 and Sept 3 from outdoor bottomless soil boxes (they had been collected originally as larvae from infested nuts and put in the soil (Miller clay soil type) in 1971). Eight weevils were put in each cage at 0, 2, 4, and 7 days posttreatment; 4 and 10 weevils were placed in the cages at 9 and 13 days posttreatment, respectively (an equal number of each sex was used throughout the test). A different group of weevils was exposed to a new or unused cluster on each occasion. The weevils introduced at 9 days posttreatment were caged on the same day they emerged (Aug. 30) to determine if newly emerged weevils would oviposit before being killed by the insecticides. Collectively, totals of 45 cages, 270 clusters, and 2070 weevils were used in the 16-day test.

The treatments were evaluated by 4 criteria: mortality at 1 day; mortality at 2–4 days; number of feeding punc-

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[1] Coleoptera: Curculionidae.
[2] In cooperation with the Louisiana Agric. Exp. Stn.
[3] Received for publication Apr. 12, 1974.
[4] Mention of a pesticide or a proprietary product does not constitute a recommendation or an endorsement by the USDA.