Table 2.—Effect of topical applications and foliar sprays of 4 *O,O*-dialkyl homologues of *O-p*-nitrophenyl phosphorothioate after 48 hr against the bollworm and the tobacco budworm.

Homologue	Topical applications LD_{50} (mg/g)		Foliar sprays LC_{50} (lb/acre)	
	Bollworm	Tobacco budworm	Bollworm	Tobacco budworm
V *O,O*-dimethly (methyl parathion)	0.014	0.043[a]	>0.5[c]	>0.5[c]
VI *O,O*-diethyl (parathion)	.050[a]	.24	> .5[c]	> .5[c]
VII *O,O*-dipropyl			<4.0[d]	<4.0[d]
VIII *O,O*-diisopropyl	10.36	[b]	<4.0[d]	<4.0[d]

[a] Taken from Wolfenbarger and McGarr (1970).
[b] Not able to compute LD_{50} with high dose of 25 μg/larva.
[c] 100% mortality.
[d] 30–70% mortality.

Compound IV was more active against the bollworm than against the tobacco budworm.

Compound V, methyl parathion, the *O,O*-dimethyl homologue of *O*-(*p*-nitrophenyl) phosphorothioate, was the most toxic of all 8 compounds to both species when it was applied topically (Table 2). Compounds V, VI, and VIII were more toxic to the bollworm than to the tobacco budworm when applied topically; the reverse was true for Compounds I, II, and III (Table 1). Foliar sprays of Compounds V and VI were equally toxic to the bollworm and the tobacco budworm and were more toxic than Compounds VII and VIII.

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Effect of the Antifeeding Compound AC-24055 on the Philippine Lady Beetle[1,2]

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The Philippine lady beetle, *Epilachna philippinensis* Dicke, is a serious pest of tomato, *Lycopersicum esculentum* Mill. and eggplant, *Solanum melongina* L. in Guam, and feeds on a weed, *Solanum nigrum* L. in the off season. An antifeeding compound of the American Cyanamid Company, AC-24055 (4′-(3,3-dimethyl-1-triazeno) acetanilide) has been tested as a protectant against larvae and adults of the Philippine lady beetle on tomato leaves.

Wright (1967) reported that AC-24055 at practical rates is nontoxic to most insects, and inhibits feeding of most surface-feeding chewing insects. According to the manfacturers (Anonymous 1964) AC-24055 is limited in its effectiveness against defoliators of cabbage, cotton, and tobacco, because of noncoverage of new growth and degradation of this compound on exposure. In the laboratory it has given effective protection of leaf area with concentrations as low as 0.01% against the Mexican bean beetle, *Epilachna varivestis* Mulsant, and at 0.003% against southern armyworm, *Spodoptera eridania* (Cramer). AC-24055 has been reported to be effective in protecting grape vines against a heavy population of Japanese beetle, *Popillia japonica* Newman, up to 7 days after application (Anonymous 1966). According to Meisner and Ascher (1965), this compound is not active against certain lepidopterous larvae. Wright (1963) noted that corn-filled paper bags treated with AC-24055 are not penetrated by the lesser grain borer, *Rhyzopertha dominica* (F.). Loschiavo (1965) observed confused flour beetles, *Tribolium confusum* Jacquelin duVal, feeding on pith discs treated with an aqueous extract of wheat germ and not on discs also treated with AC-24055. Loschiavo (1969) tested this compound against 6 species of stored-product insects, and reported it to have a contact insecticidal action and to reduce the number of eggs laid. In 1970 Loschiavo reported that sacks made from unbleached cotton containing 60–62 threads/in. and treated with AC-24055 at 300 mg/ft² protected from penetration by *T. confusum*, *Oryzaephilus surinamensis* (L.), *R. dominica*, and *Trogoderma parabile* Beal.

The present study was undertaken to note the effective concentration of AC-24055 at which it protects tomato leaves against larvae and adults of the Philippine lady beetle. In this study, tomato leaves were used because in a preliminary study this beetle was observed to prefer leaves of tomato rather than eggplant.

MATERIALS AND METHODS.—The Philippine lady beetle culture was maintained in the laboratory on tomato leaves at 68–76°F and 34–38%RH. For the tests, the grubs and adults used were reared from a single egg mass to ensure more uniform response.

The concentrations of AC-24055 for the tests were prepared by mixing 50% WP in water. For each treatment 3 to 6 tender tomato leaflets totalling about 15 cm² were used. The leaflets were soaked for a minute in each concentration, then kept at room temperature for the excess solvent to evaporate before being placed in glass petri dishes. Each petri dish served as a treatment and was replicated 3 times with 2 insects per dish. Observations were made 24 and 48 hr after the test insects were placed in the dishes. Feeding was measured in mm² by placing the leaves on transparent graph paper on a glass plate with a fluorescent light beneath.

RESULTS AND DISCUSSION.—The antifeeding compound AC-24055 at concentrations as low as 0.03125% was very effective in protecting the leaf area from feeding by the larvae and adult beetles. At the lowest concentration used, 0.0078%, it did not protect the leaf area to a significant extent, even though at the concentration of 0.0156% the areas eaten by 3rd-stage larvae in 24 hr and 4th-stage larvae in 24 and 48 hr were significantly less in size than at the concentration of 0.0078%. The re-

[1] Coleoptera: Coccinellidae.
[2] Received for publication Sept. 22, 1971.
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Table 1.—Effect of antifeeding compound AC-24055 on feeding of larvae and adults of the Philippine lady beetle.

Concentration	Area of tomato leaves eaten (in cm²) [a]					
	3rd-stage larvae		4th-stage larvae		adult	
	24 hr after feeding	48 hr after feeding	24 hr after feeding	48 hr after feeding	24 hr after feeding	48 hr after feeding
0.0625%	0.08 a	0.12 a	0.21 a	0.26 a	0.01 a	0.03 a
.03125%	.09 a	.17 a	.36 a	.39 a	.03 a	.03 a
.0156%	1.79 b	2.93 b	1.38 b	2.11 b	2.00 b	4.77 b
.0078%	2.08 bc	3.06 b	2.72 c	4.54 c	2.34 b	4.99 b
Control	2.57 c	3.19 b	2.86 c	4.92 c	2.32 b	4.89 b

[a] Values followed by the same letter are not significantly different at the 1% level of confidence by Duncan's Multiple range test. Each column has been analyzed separately.

sults in Table 1 show that under laboratory conditions AC-24055 was effective in protecting the leaf area of tomatoes treated with a concentration as low as 0.03125%. Since this study was conducted in confined areas of petri dishes, the grubs and adults were forced to remain on the treated surfaces. But in the field the beetles might avoid the treated leaves at still lower concentrations.

ACKNOWLEDGMENT.—I thank Mr. Jose T. Barcinas, Director, for help and encouragement during the study period, and Mr. R. L. Linkfield, Cyanamid International, Princeton, N. J., for the supply of AC-24055.

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Predation by *Blattisocius keegani*[1] on Egg Masses of *Diaprepes abbreviatus*[2] in the Laboratory[3]

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An egg parasite, *Tetrastichus haitiensis* Gahan, recently has been considered a possible biological-control agent for the so-called sugarcane rootstalk borer weevil, *Diaprepes abbreviatus* (L.), a recently introduced pest of citrus in Florida (Woodruff 1968). Therefore, a colony of the parasites has been maintained on eggs of *D. abbreviatus* at the Citrus Root Weevil Laboratory, Apopka, Fla.

D. abbreviatus egg masses are obtained from field-collected adult weevils which are held in 2×2×2-ft screen cages and provided green bean foliage for food. Eggs are deposited in masses between wax-paper strips attached to the top of the cage (Wolcott 1933). The wax-paper strips are removed from the cages and separated, exposing one side of the egg mass. The masses are then exposed to the parasites for oviposition.

Dark circles on the chorion of both hatched and unhatched eggs were first thought to result from host feeding by *T. haitiensis*. However, several mites were observed later on eggs which had been exposed to the parasites for oviposition. These mites were identified by H. A. Denmark and confirmed by Dr. E. E. Lindquist, Taxonomy Section, Canadian Department of Agriculture, as *Blattisocius keegani* Fox, a known predator of the eggs and young larvae of moths in laboratory colonies (Nesbitt 1951, Stein 1960). Muma (1961) collected this mite from citrus. Also, Barker (1967) found that nymphs and adults of *B. keegani* fed readily on eggs of beetles of the genera *Cryptolestes, Tribolium, Trogoderma,* and *Oryzaephilus.*

We studied the effect of *B. keegani* upon eggs of *D. abbreviatus.* Two egg masses (0–24 hr old) of *D. abbreviatus* were collected at random from the laboratory colony; 1 mass of 43 eggs was exposed to 9 adult *B. keegani* of unknown age, and the other of 98 eggs was held as control; both were observed 1 or 2 times daily for 2 weeks.

One day after the eggs were exposed to *B. keegani,* several small black spots were visible on 4 eggs; the control showed no similar spots. After 2 days, the spots on the eggs had become large dark circles (Fig. 1), and a small hole in the chorion was seen in some of the circles. No mites were observed feeding, but after 2 days, 18 exposed eggs had one or more dark circles. No mite eggs were observed, possibly because the mites preferred to remain in the small spaces between the weevil eggs or between the egg mass and the wax paper and

[1] Acarina: Blattisocidae.
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