

Apparent Potentiation of the Cotton Defoliant DEF[®] by Methyl Parathion in Mosquitofish

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In the southern United States, in the early fall cotton fields are normally sprayed with the cotton defoliant DEF^R (S,S,S-tributyl phosphorotrithioate). Recently it has become fashionable to incorporate the insecticide methyl parathion with DEF^R (Mississippi Cooperative Extension Service, 1974). The purpose of this is to kill as many boll weevils as possible before they enter overwintering diapause. The 24-hr LC₅₀ of DEF^R to mosquitofish (*Gambusia affinis*) is about 0.8 ppm (FABACHER, D. L. Unpublished). The 48-hr LC₅₀ of methyl parathion to mosquitofish is about 13.0 ppm (CHAMBERS and YARBROUGH 1974). The purpose of this study was to determine any differences in the toxicity of DEF^R plus methyl parathion to mosquitofish when compared to the toxicity of methyl parathion or DEF^R alone.

MATERIALS AND METHODS

Mosquitofish were collected from a concrete drainage ditch near the campus of Mississippi University of Women, Columbus, Mississippi. These fish had no history of exposure to pesticides or defoliants. Fish were taken to the laboratory and held 24 hours prior to testing.

Solutions of DEF^R (1 mg/ml) or methyl parathion (10 mg/ml) were prepared in acetone. Appropriate amounts of DEF^R and methyl parathion were added to each aquarium. Additional acetone (1 ml/liter water) was added to each aquarium to facilitate toxicant solubility. One group of fish was treated with 0.5 ppm DEF^R. Another group was treated with 5.0 ppm methyl parathion. A third group was treated with a combination of 0.5 ppm DEF^R and 5.0 ppm methyl parathion. In each test aquarium there were 12 fish in 6 liters of dechlorinated tap

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water. Mortality was recorded 24 hours posttreatment. Tests were replicated 6 times.

RESULTS AND DISCUSSION

There was no mortality in mosquitofish treated with 0.5 ppm DEF^R. In fish treated with 5.0 ppm methyl parathion there was 8% mortality. In fish treated with a combination of 0.5 ppm DEF^R plus 5.0 ppm methyl parathion there was 89% mortality (Table 1).

Table 1

Per cent Mortality of Mosquitofish Treated with
0.5 ppm DEF^R, 5 ppm Methyl Parathion, and
0.5 ppm DEF^R plus 5 ppm Methyl Parathion

Treatment	Mortality (%)
DEF ^R	-
methyl parathion	8
DEF ^R plus methyl parathion	89

Since both compounds are toxic to mosquitofish, and DEF^R is more toxic than methyl parathion (LC₅₀ of DEF^R to mosquitofish is about 16.0x that of methyl parathion); it seems apparent that the toxicity of DEF^R is potentiated by methyl parathion in mosquitofish. Potentiation results when greater than additive effects occur from the combination of two toxicants. This is probably the first instance in which an insecticide has been shown to enhance the toxicity of a cotton defoliant in fish.

These data indicate an apparent pronounced increase in the toxicity of DEF^R by methyl parathion in mosquitofish. These data also suggest a possibility of fish kills as a result of spraying the mixture in the aquatic environment, or from indiscriminate disposal of this mixture in ponds or creeks.

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