Toxicity of Endrin and an Endrin-Methyl Parathion Formulation to Largemouth Bass Fingerlings

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Fish kills from toxic organochlorine insecticides are an increasing problem throughout the southern United States. These fish kills are associated with insecticides used in cotton producing areas. Methyl parathion is often used in combination with endrin to control cotton insects. In most cases endrin residues have been detected in dead fish.

Endrin is the most toxic insecticide to fish in use to date (HENDERSON et al. 1959). The toxicity of endrin to largemouth bass (Salmoides micropterus) for a 96 hr. LC_{50} is between 0.1 and 0.5 ppb (micrograms/liter), while the toxicity of methyl parathion is between 1,000 and 10,000 ppb (SCHOETTER 1974).

The purpose of this study was to determine the exact toxicity of endrin and a 1.6-1.6 lbs/gal. endrin-methyl parathion formulation to largemouth bass fingerlings and to determine if the toxicity of the formulation was different from that of endrin alone.

MATERIALS AND METHODS

Bass fingerlings were obtained from the National Fish Hatchery in Tupelo, Mississippi. Maximum care was used in handling the fish to avert any parameters of stress. The fingerlings were transported to Mississippi State University and held in a large tank of continuously flowing tap water. The fish were kept in the tank 5 days prior to testing. They were fed zooplankton twice daily. The zooplankton were collected from a pond with no history of pesticide contamination on Mississippi State's Campus.

LC_{50} values (24 and 48 hrs.) of technical endrin and a 1.6-1.6 lbs./gal. endrin-methyl parathion formulation were determined for bass fingerlings. Bioassays consisted of 10 fish in 6 liters of aerated, dechlorinated tap water. Test procedures were under static conditions. A minimum of 4 concentrations were

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used to establish each LC_{50} value. Toxicant concentrations ranged from 0.1 to 0.5 ppb. Acetone (1 ml./liter water) was added to facilitate toxicant solubility. Controls were treated in the same manner, minus the toxicants. The fingerlings had an average weight of 0.475 grams, a total length of 3.4 cm (range 3.0-4.3) and an average standard length of 2.9 cm (range 2.7-3.2). The water temperature ranged from 62-64°F.

Ten fish were also treated with 0.1 ppb endrin or 0.1 ppb endrin-methyl parathion and mortality recorded on the 20th day. On the 5th, 10th, and 15th days the fish were exposed to a new solution of 0.1 ppb toxicant. When a fish died during the test period it was rinsed with acetone and pooled for residue analysis.

RESULTS AND DISCUSSION

The 24 and 48 hr. LC_{50} values for endrin to bass fingerlings were 0.49 and 0.27 ppb respectively. The 24 and 48 hr. LC_{50} values of the endrin-methyl parathion formulation were 0.48 and 0.37 ppb respectively (Table 1).

Fish treated with 0.1 ppb endrin or 0.1 ppb endrin-methyl parathion showed 40% mortality in both assays on the 20th day after initial exposure. Average endrin residues in 4 dead fish from each assay were 0.0115 ppm in the endrin assay and 0.0165 ppm in the endrin-methyl parathion assay (Table 2).

The data show that methyl parathion has no significant effect on the toxicity of endrin alone. Observed differences in toxicity could be a result of some other component(s) in the endrin-methyl parathion mixture, since this was a diluted formulation.

Even though endrin residues in dead bass exposed for 20 days were less than 0.02 ppm (Table 2), residue analysis is not a valid criterion to establish cause of death in fish from the environment. FERGUSON et al. (1966) showed that when dead mosquitofish with no endrin residues were placed in 250 ppb endrin for 11.25 hours, they subsequently contained 1.70 ppm endrin. These authors concluded that the presence of a certain amount of endrin in the whole body of a dead fish is not definitive proof that the fish died of endrin poisoning, since fish can accumulate endrin from the surrounding water.

However, the data (Table 2) show that continuous concentrations of 1 ppb or greater of endrin in the

Table 1

LC_{50} Values (ppb) of Endrin and an Endrin-Methyl Parathion Formulation to Largemouth Bass Fingerlings for 24 and 48 Hours.

Treatment	Time (hours)	LC_{50} (ppb)
endrin	24	0.49
	48	0.27
endrin-methyl parathion	24	0.48
	48	0.37

Table 2

Percent Mortality of Bass Fingerlings Treated with 0.1 ppb Endrin or Endrin-Methyl Paration Every 5th Day for 20 Days. Endrin Residues (ppm) are Mean Data for 4 Dead Fish from Each Assay.

Treatment	Mortality (%)	Endrin (ppm)
control	-	-
endrin	40	0.0115
endrin-methyl parathion	40	0.0165

aquatic environment should be lethal to largemouth bass fingerlings, if they don't die beforehand as a result of other factor(s).

It seems apparent that unless endrin is kept out of the aquatic environment, fish kills of largemouth bass and other species by endrin are unavoidable.

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