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19 September 1966

Mr. L. C. Fuhrmeister
Technical Services Superintendent
Monsanto Chemical Company
Anniston, Alabama 36202

Dear Mr. Fuhrmeister:

In response to your request for information concerning critical dissolved oxygen levels, effects of TCE on bluegills, and tolerances of bluegills to parathion and methyl parathion, I hope the following information will be useful to you:

1) Several thousand papers have been published on DO and it is difficult to derive generalizations from them since a large number of environmental factors influence oxygen requirements and oxygen availability. In general, DO in waters supporting a varied population of warm-water fish should not drop below 5 ppm for more than 8 hours of any 24-hour period, and at no time should it get below 3 ppm. For coarse fish, the DO should not go below 5 ppm for more than 8 hours in any 24-hour period and at no time should go below 2 ppm (Tarzwell, C. 1957. USPHS, Seminar on Biological Problems in Water Pollution, p. 259).

In a recent review, Doudoroff and Warren (1962. Biol. Prob. in Water Pollution, USPHS Pub. 999-WP-25, pp. 145-155) stated that in the absence of other harmful conditions, mortality does not normally occur at or above 3 ppm DO, even during prolonged exposures. Concentrations of 2 ppm may be critical to sensitive forms. They also point out that growth may not be normal at or near minimal concentrations that permit survival.

2) We have tested both green sunfish (Lepomis cyanellus) and bluegills (Lepomis macrochirus) on TCE. In these tests, stock solutions of TCE in acetone were prepared in 2 liters of tapwater (pH 7.8, hardness 28 ppm) in gallon jars. Two or three fish (1.5 to 2.0 inches in length) were tested in each jar at temperatures of 72 ± 2 F. For green sunfish the 36 hr TL_m value is 105 ppm; the equivalent value for bluegills is approximately 60 ppm. There are some inconsistencies in the bluegill data and we will have to run more tests. The 60 figure is really only an estimate based on our present knowledge. Green sunfish lose equilibrium in 500 ppm TCE in 10 minutes; 200 ppm kills nearly all specimens in 20 minutes.

ppm

60 ppm ?

DSW 162353

9/23 - Lu Ch Fuhrmeister - reports all fig in ppb
" except TCE - ... in ppm.

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When TCE is added to water in static tests, it may race on the surface and later form droplets at the bottom of the test container. It is very difficult to duplicate mortality data produced by a particular concentration on different days, presumably because of variation in the amount and effectiveness of dispersion of TCE into the water.

In view of this, I would expect agitation (such as occurs in a natural stream bed) to result in better dispersion of the compound into water, thereby reducing the amount required to produce fish mortality.

3) The following are some published toxicity values for methyl parathion and parathion to bluegills:

1961-1962

Methyl parathion -

24-hour LC_{50}	8500 ppb	(U. S. F. W. S. Bull.# 167)
96-hour TL_m	1900 ppb	(Pickering, Henderson & Lemke)

Parathion

Toxicity threshold for fingerlings	200 ppb	(Rudd)
96-hour TL_m	95 ppb	(Pickering, Henderson, & Lemke)
96-hour TL_m (1-inch size)	65 ppb	(Pickering, Henderson, & Lemke)
96-hour TL_m (3-inch size)	140 ppb	(Pickering, Henderson, & Lemke)

Lethal concentration 50% kill

Same as LD_{50}

In view of the discrepancies in these data and because they fail to conform to our findings with mosquitofish, we performed a series of tests to determine the values for a local population of bluegills and, also, for fingerling large-mouthed bass. Our findings are as follows:

Bluegills:

Methyl parathion	36 hr TL_m	in the vicinity of 25 ppb.
Ethyl parathion	36 hr TL_m	in the vicinity of 75 ppb.

Bass:

Ethyl parathion	36 hr TL_m	in excess of 175 ppb.

THIS IS DATA FROM FERGUSON'S LAB - CONTRADICTS PREV. DATA. - Confirmed 9/23

In general, these data agree with those published except for our methyl parathion value. The 25 ppb figure agrees very closely with our methyl parathion data concerning susceptible strains of mosquitofish (See enclosed reprint) in which 200 ppb produce 50% kills in 8-12 hours.

Sincerely yours,

Fish Trout to Miss St. Univ.

Denzel E. Ferguson
Professor of Zoology

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