LETHAL TOXICITY OF EXPERIMENTAL AQUEOUS FORMULATIONS OF SPRUCE BUDWORM CONTROL AGENTS CONTAINING TRITON® X-100 TO RAINBOW TROUT.

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INTRODUCTION

Lethality tests with rainbow trout *(Salmo gairdneri)* were conducted in the laboratories of the Forest Pest Management Institute in Sault Ste. Marie as part of the 1982 New Brunswick Action Plan to generate the data required to register new water-based formulations of fenitrothion and aminocarb for spruce budworm control in time for the 1983 field season. The results of these tests are reported here.

MATERIALS AND METHODS

MATACIL® 180F (19.6% active ingredient) and Sumithion® Technical (99.8% AI) were supplied by Chemagro Ltd. and Sumitomo Canada Ltd. respectively. TRITON® X-100 was obtained from Rohm and Haas Canada Inc. and Cyclosol 63 from Shell Canada Chemical Co. Stock solution of the test materials similar to the tank mixes used in the 1982 New Brunswick Action Plan field applications were prepared as follows:

Solution I - by weight 24.9% MATACIL® 180F + 3.1% TRITON® X-100 + 72.2% water

Solution II - by weight 13.9% Sumithion® Technical + 13.9% TRITON® X-100 + 72.2% water

Solution III - by weight 14.3% Sumithion® Technical + 23.7% Cyclosol 63 + 3.0% TRITON® X-100 + 59.0% water

Tests were static and of 96 hours duration. Nine rainbow trout (average fork length, 5.8 $\pm$ 0.6 cm; average weight, 2.0 $\pm$ 0.5 g) were exposed in 20 L aliquots of dechlorinated tap water fortified with the stock solutions to give a range of not less than 7 concentrations for each formulation. Untreated water was used for the control. The test solutions were aerated gently to prevent oxygen depletion and temperature was maintained at 15 $\pm$ 0.5°C.

LC_{50}'s and LT_{50}'s were estimated by probit analysis. Lethal thresholds were calculated from lethality lines by the method of Zitko (1979).

RESULTS AND DISCUSSION

Results of the lethality tests are summarized in Table 1. Nominal concentrations were converted to mg AI (active ingredient)/L to facilitate comparisons with other published data.

The 96-h LC_{50} for the MATACIL® 180F + TRITON® X-100 + water formulation (14.5 mg AI/L) is significantly lower (P 0.05) than the 96-h LC_{50} reported by Szeto and Holmes (1982) for the MATACIL® 180F + Atlox 3409F + water formulation (23.1 mg AI/L). Although this would seem to suggest a slightly higher toxicity for the TRITON® X-100 formulation, this difference

Table 1. LC_{50} values and lethal thresholds of aminocarb and fenitrothion field formulations containing TRITON® X-100 to rainbow trout.

	24-h LC_{50} (mg/L) and 95% Confidence Limits		96-h LC_{50} (mg/L) and 95% Confidence Limits		Lethal Threshold (mg/L)	
	nominal concentration*	active ingredient**	nominal concentration	active ingredient	nominal concentration	active ingredient
MATACIL® 180F + TRITON® X-100 + water	353.4 (282.7 - 455.2)	17.2 (13.8 - 22.2)	296.2 (238.0 - 368.3)	14.5 (11.6 - 18.0)	193.6	9.4
Fenitrothion Technical + TRITON® X-100 + water	26.0 (22.5 - 30.1)	3.6 (3.1 - 4.2)	17.6 (15.5 - 19.9)	2.4 (2.1 - 2.8)	16.8	2.3
Fenitrothion Technical + Cyclosol 63 + TRITON® X-100 + water	26.1 (21.5 - 32.0)	3.7 (3.1 - 4.6)	17.4 (14.9 - 20.2)	2.5 (2.1 - 2.9)	15.8	2.3

*nominal concentration = mg of field formulation/L of test water
**active ingredient = mg of aminocarb or fenitrothion active ingredient/L of test water

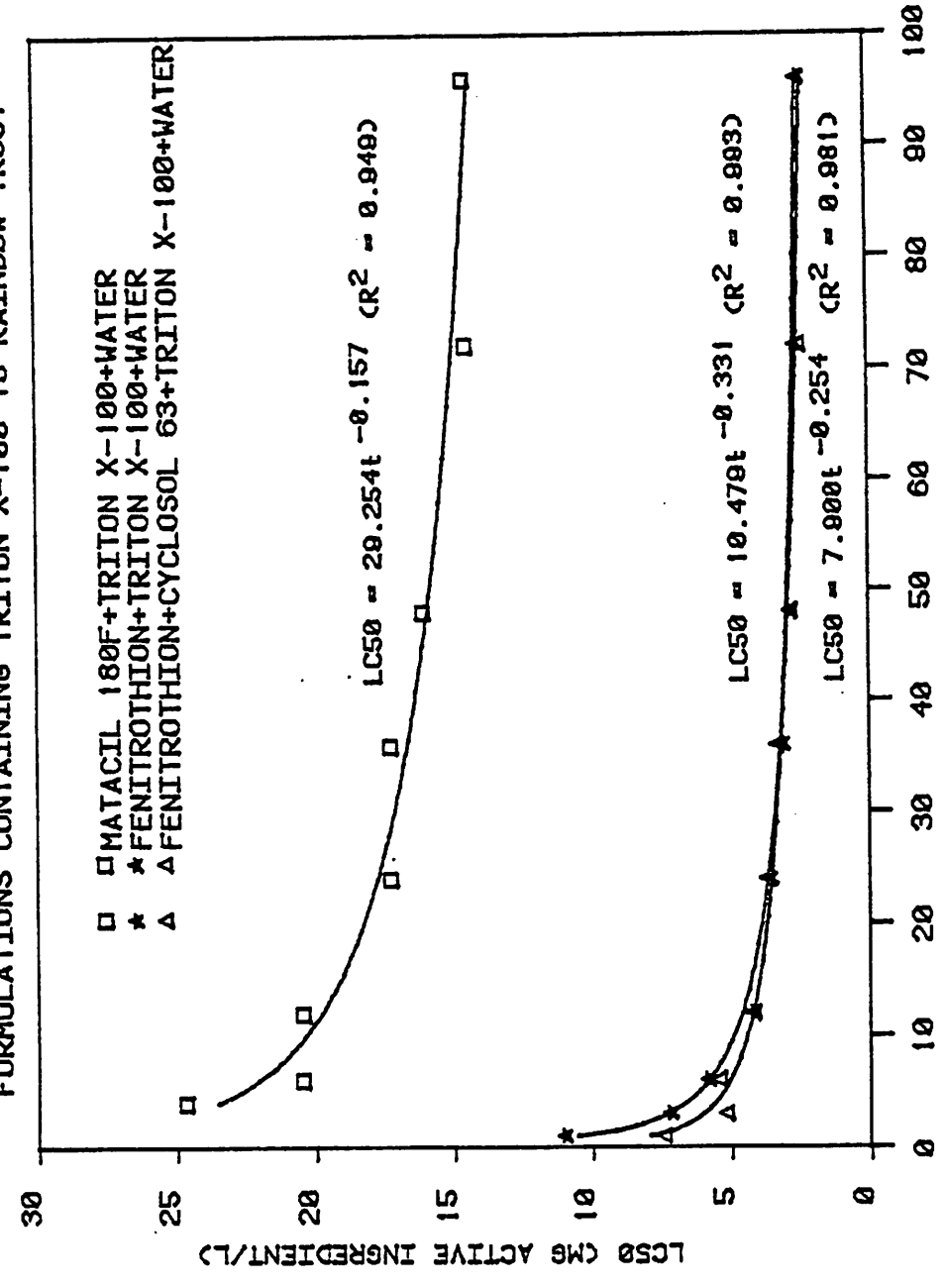

Fig. 1. TOXICITY CURVES OF AMINOCARB AND FENITROTHION FIELD FORMULATIONS CONTAINING TRITON X-100 TO RAINBOW TROUT

might also be explained by differences in the size of the test organisms used (rainbow trout in our study averaged 2.0 g in weight as compared to 5.4 g in the other study), temperature (15°C as compared to 9°C) or loading density (0.9 g of fish/L of test water as compared to 1.6 g/L). The lethal threshold of the MATACIL® 180F + TRITON® X-100 + water formulation to rainbow trout (9.4 mg AI/L) is similar to that of pure aminocarb to Atlantic salmon *(Salmo salar)* (8.7 mg AI/L) as reported by McLeese et al (1980).

There was virtually no difference in toxicity between the 2 fenitrothion formulations. LC_{50} values in our study (24-h LC_{50}, 3.6-3.7 mg AI/L; 96-h LC_{50}, 2.4-2.5 mg AI/L) were similar to those reported by Klaverkamp et al. (1976) for technical fenitrothion to rainbow trout (24-h LC_{50}, 3.4 mg AI/L; 96-h LC_{50}, 2.0 mg AI/L). Ernst et al. (1981) reported a higher 96-h LC_{50} for technical fenitrothion (3.3 mg AI/L), but a slightly lower 96-h LC_{50} for an operational fenitrothion spray mixture formulated in fuel oil (11 mg/L (nom. conc)) as compared to 17.4-17.6 mg/L (nom. conc) in our study).

An examination of the toxicity curves presented in Figure 1 reveals that for all 3 formulations tested the intensity of response was greatest in the first 24-hours of exposure. By 96-hours, LC_{50} values for both fenitrothion formulations had approached the lethal threshold level. The MATACIL® 180F formulation was still exerting some toxic effect at this time (i.e., 96-h LC_{50}> lethal threshold).

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