

Effects of Aerial Sumithion® Spraying on Juvenile Atlantic Salmon (*Salmo salar* L.) and Brook Trout (*Salvelinus fontinalis* Mitchell) in Newfoundland

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To control the hemlock looper (*Lambdina fiscellaria fiscellaria* Guen.) an aerial spray of Sumithion® was applied over 430,380 acres (174,175 hectares) of Newfoundland forest in July 1968 and 2.1 million acres (850,500 hectares) during July 1969. This report covers part of a study by the Department of Fisheries and Forestry of Canada on the effects of Sumithion spraying on fish.

Methods

In western Newfoundland the dosage was 2 sprays of 2 oz/acre in 1968 and 2 of 2 oz/acre and 1 of 3 oz/acre in 1969. In central Newfoundland the dosage was 1 spray of 4 oz/acre in 1968 and 2 sprays of 2 oz/acre and 1 of 3 oz/acre in 1969. The sprays in any one area were at least 7 days apart.

Caged salmon and brook trout were held in water systems inside and outside the spray plots of western Newfoundland in 1968, and both western and central Newfoundland in 1969. Fish picked up dead, caught live from the brooks, or taken live from the holding cages over 4-day post-spray periods were analysed for Sumithion content by gas chromatography.

Results and Discussion

In 1968 and 1969, mortalities among caged fish were insignificant. Since insecticide content of the trout and salmon analysed were similar, data for both species were pooled (Table 1). Only 3 of all the fish analysed contained Sumioxon, an oxidation product of Sumithion. Levels of 1.88, 2.07, and 2.70 ppm were found in fish caught live from a brook sprayed twice at 2 oz/acre in 1968. Some live fish in a brook sprayed with 4 oz/acre in 1968 showed typical insecticide poisoning symptoms (5). None of 27 fish collected from outside any of the sprayed areas contained Sumithion.

Table 1. Sumithion residues in small salmon and brook trout collected over a four-day post-spray period.

Year	Area	Dosage	Fish condition	Part of fish analysed	No. analysed	Mean residue (ppm)	Residue range (ppm)	S.E.
1968	W	2 sprays, 2 oz/acre	live, caged	whole	18	0.09	0.0 -0.77	0.20
1968	W	2 sprays, 2 oz/acre	live, wild	whole	10	0.06	0.0 -0.24	0.20
1968	C	1 spray, 4 oz/acre	dead, wild	whole	5	0.42	0.31-0.72	0.35
1969	W	1 3-oz/acre & 2 2-oz/acre sprays	live, caged	whole	11	0.01	0.0 -0.13	0.09
1969	W	1 3-oz/acre & 2 2-oz/acre sprays	live, wild	stomach contents	21	0.53	0.0 -2.23	0.17
1969	W	1 3-oz/acre & 2 2-oz/acre sprays	live, wild	muscle tissue	21	0.04	0.0 -0.34	0.10

Note: W = Western; C = Central Newfoundland.

Residues found in the fish could cause reduction in acetylcholinesterase activity with subsequent deleterious effects on wild populations (4). Results from this study are in agreement with previous findings that forest sprays of another organophosphate pesticide, Phosphamidon[®], caused little acute mortality to fish (2,6). They are in contrast to other results that showed severe deleterious effects of DDT on fish populations after insect control operations (1,3).

Conclusions

Forest sprays of the organophosphate pesticide, Sumithion, at 2 or 3 oz/acre were less acutely harmful to fish than sprays of the chlorinated hydrocarbon pesticide DDT have been in the past. Possible indirect or chronic effects cannot be discounted.

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References

1. ELSON, P. F. and KERSWILL, C. J., Advances Water Poll. Res. 1, 55 (1966)
2. GRANT, C. D., J. Fish. Res. Bd. Canada, 24, 801 (1967)
3. HATFIELD, C. T., Can. Fish Cult. 40, 61 (1969)
4. HATFIELD, C. T., M.Sc. Thesis, Queen's Univ., Kingston, Ont., Canada, 101 p (1970)
5. SAUNDERS, J. W., J. Fish. Res. Bd. Canada, 26, 695 (1969)
6. SCHOUWENBURG, W. J. and JACKSON, K. J., Can. Fish Cult. 37, 35 (1966)