Summary of Contact, Stomach and Residual Toxicity of Insecticides Against Forest Insect Pests During 1974

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SUMMARY OF LABORATORY EVALUATION OF INSECTICIDES AGAINST VARIOUS SPECIES OF FOREST INSECT PESTS DURING 1974

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Thirty-seven insecticides were tested for contact, stomach, and residual toxicity using modified Potter towers. Thirteen of these were new insecticides and formulations. The results are summarized under contact, stomach, and residual toxicity studies. Unless otherwise specified mortality counts were made at 72 hours after treatment.

CONTACT TOXICITY

Insecticides were tested for contact toxicity against insects from British Columbia, Ontario, and Quebec. The results are summarized by area of origin and by species. Insect collections were provided by the staff of the Forest Insect and Disease Survey and personnel of the Insect Toxicology Section, Chemical Control Research Institute. Insecticides are arranged in descending order of toxicity.

BRITISH COLUMBIA

Black Cutworm - Agrotis ipsilon (Hufnagel)

Six insecticides were tested in 1974 against fifth instar larvae of black cutworm. The corrected percentage mortality ranged from 79% to 100%.

Methomyl > fenitrothion > carbaryl > Dylox > malathion > Orthene

Douglas Fir Tussock Moth - Hemerocampa pseudotsugata McDunnough

Four insecticides were tested in 1974 against fourth instar larvae of Douglas fir tussock moth. The corrected percentage mortality ranged from 48% to 100%.

Phoxim > MATACIL > fenitrothion > Orthene

Sitka Spruce Weevil - Pissodes sitchensis Hopkins

Seven insecticides were tested against Sitka spruce weevil adults which emerged in 1973. The corrected percentage mortality ranged from 74% to 100%.

Methyltrithion > Gardona > Dursban > Dowco 214 > Lindane > Trithion > DDT

Jack Pine Sawfly - Neodiprion pratti banksianae Rohwer

Eight insecticides were tested against fifth instar larvae of black-headed jack pine sawfly. The corrected percentage mortality ranged from 11% to 100%.

Supracide > methomyl > NRDC-119 > SBP-1382 > RH 218 > Trithion > Orthene > Bay Meb 6046

ONTARIO

Larch Sawfly - Pristiphora erichsonii (Hartig)

Eight insecticides were tested against fourth instar larvae of larch sawfly. The corrected percentage mortality ranged from 78% to 100%.

RU-11679 > SBP-1382 = Supracide > RH-218 > Chlorophoxim > Fyfanon > allethrin > Orthene

Four insecticides were tested against fifth instar larvae of larch sawfly. The corrected percentage mortality in each case was 100%.

RU-11679 > Supracide > RH 218 > Orthene

Spruce Budworm - Choristoneura fumiferana (Clemens)

Field Collected Larvae

Thirteen insecticides were tested against fifth instar larvae of spruce budworm. The corrected percentage mortality ranged from 38% to 100%.

RU-11679 > NRDC-119 > RH-218 = RU 11483 > SBP-1382 > phoxim > F-6957 > Pyrocide = Supracide > PP484 > PH60/40 > Chlorophoxim > Bay 6046.

Thirteen insecticides were tested against sixth instar larvae of spruce budworm. The corrected percentage mortality ranged from 25% to 100%.

RU-11679 > NRDC-119 = RU 11483 > SBP-1382 > RH-218 > Pyrocide > Supracide > F-6957 > PP484 > Fyfanon > Orthene > Isopropyl/parathion > Bay Meb 6046

Laboratory Reared Larvae

Three insecticides were tested in late 1973 and 1974 against fifth instar larvae of laboratory reared spruce budworm. The corrected percentages mortality ranged from 26% to 99%.

Dylox > fenitrothion > Orthene

Sixteen insecticides were tested against pupae of laboratory reared spruce budworm. The corrected percentage mortality ranged from 23% to 100% at 72 hours.

> Imidan = methomyl > Supracide > Dowco 214 > Orthene = Phosphamidon = Zectran > dimethoate > fenitrothion = Matacil > Trithion > phoxim > Dylox > Phosvel > Dimetilan DDT.

Orthene was tested against sixth instar larvae of laboratory reared spruce budworm. The corrected percentage mortality was 97% at 3.0% concentration and .8 gpa (2.69 $\mu g/cm^2$).

White Pine Weevil - Pissodes strobi (Peck)

Fourteen insecticides were tested against white pine weevil adults. The corrected percentage mortality ranged from 3% to 100%.

> Gardona > Methyl Trithion > phoxim > Dursban > Supracide > Dowco 214 > Imidan > Phosvel > lindane > Trithion > MATACIL > DDT > Chlorophoxim > Dimetilan.

QUEBEC

Redheaded Pine Sawfly - Neodiprion lecontei (Fitch)

Eleven insecticides were tested against fifth instar larvae of redheaded pine sawfly. The corrected percentage mortality ranged from 28% to 100%.

> NRDC-119 > Supracide > methomyl > Gardona > Fyfanon > SBP 1382 > Chlorophoxim > RH-218 > Trithion > Orthene > Bay Meb 6046.

Seven insecticides were tested against fourth instar larvae of redheaded pine sawfly. The corrected percentage mortality ranged from 16% to 100%.

> RU-11679 > Supracide > Gardona > SBP-1382 > Chlorophoxim > RH218 > Bay Meb 6046.

Swaine Jack Pine Sawfly - Neodiprion swainei Middleton

Nine insecticides were tested against fourth instar larvae of Swaine jack pine sawfly. The corrected percentage mortality ranged from 82% to 99%.

> Supracide > Gardona > NRDC-119 > Fyfanon > phoxim > SBP-1382 > Chlorophoxim > RH-218 > Orthene

STOMACH TOXICITY

Orthene, fenitrothion and PH 60-40 were tested for stomach toxicity against 5th instar laboratory reared spruce budworm. The foliage was sprayed with various concentrations of these materials at six rates of application. The toxicity of fenitrothion and Orthene was evaluated after 72 hrs. The stomach toxicity of fenitrothion and Orthene was approximately same as both of them gave 97% mortality at 0.22 $\mu g/cm^2$. PH 60-40 gave 100% mortality after 7 days at 1.79 $\mu g/cm^2$ although there was high control mortality.

STOMACH AND CONTACT TOXICITY TOGETHER

Orthene and fenitrothion were tested against laboratory reared and field collected spruce budworm and larch sawfly. Orthene gave 100% mortality against 4th instar larch sawfly at 0.179 $\mu g/cm^2$ and against laboratory reared and field collected 5th instar spruce budworm at 0.224 $\mu g/cm^2$ and 0.448 $\mu g/cm^2$, respectively. Fenitrothion gave 99% mortality against 5th instar laboratory reared spruce budworm at 0.112 $\mu g/cm^2$.

RESIDUAL TOXICITY

The insecticides were tested for residual toxicity by spraying potted trees in the spraying chamber. The sprayed host plants were then exposed to weathering conditions for up to 10 days for jack pine, balsam fir, white spruce, and for up to 40 days for larch. The insects used for bioassay of residues were collected in the field and maintained in the laboratory until their release on the insecticide treated foliage. The residue of the insecticides bioassayed on the same day of spraying (i.e. 4 ± 2 hours after spraying) are referred to as 0 day and these host trees were not exposed to weathering. The insecticides are arranged in descending order of residual toxicity at 0 and 10 days of residual life. The corrected percentage of mortality is given in brackets and is that observed 72 hours after releasing of insects, except in the case of PH 60-40 where it is ten days after insect addition.

Spruce Budworm - Choristoneura fumiferana (Clemens)

Residual toxicity of twelve insecticides was tested against fifth instar larvae of spruce budworm. Two percent phoxim, Zectran, Volaton-A, Volaton-B, Volaton-D (these are various formulations of phoxim), and five percent DDT and Orthene at the rate of 1 GPA were tested using white spruce and balsam fir as hosts (series I). The Volaton formulations were tested for the first time whereas the rest of the insecticides is a repeat test from previous year, although phoxim and Orthene were tested for the first time on balsam fir. Eight percent carbaryl, Imidan, five percent resmethrin, PH 60-40, and two percent fenitrothion, at the rate of 1 GPA, except PH 60-40 which, tested for the first time, was applied by hand for complete coverage of foliage, were also repeated from previous year using white spruce as host (Series II).

Series I

White Spruce 0 day-Volaton-A, Volaton-B (100) > Orthene (98) > phoxim (96) > DDT (95) > Volaton-D (91)
10 day-Orthene (42) > DDT (2)

Balsam Fir 0 day-Orthene (100) > phoxim (92) > DDT (90) > Zectran (86)
10 day-Orthene (69) > Zectran (57) > DDT (27)

Series II

White Spruce 0 day-Imidan (89) > fenitrothion (76) > resmethrin (75) > carbaryl (28) >
10 day-Imidan (39) > carbaryl (33) > fenitrothion and resmethrin (0)
0 and 10 day values for PH 60-40 ten days after insect addition were 90 and 59%, respectively.

Jack Pine Sawfly - Neodiprion pratti banksianae Rohwer

Four insecticides were tested against fourth instar larvae of jack pine sawfly. One percent aminocarb, Zectran, and two percent phoxim and propoxur, at the rate of 1 GPA were repeated from previous year using jack pine as hosts.

0 day-Zectran = aminocarb = propoxur = phoxim = all 100%
10 day-Zectran (65) > aminocarb (61) > propoxur (52) > phoxim (0)

Larch Sawfly - Pristiphora erichsonii (Hartig)

One percent concentration of three insecticides: dimethoate, Gardona and propoxur, at the rate of 1 GPA were tested against fourth instar larvae of larch sawfly using European larch and tamarack as hosts. This was a repeat of previous year's test.

0 day-dimethoate = Gardona = propoxur = all 100%
10 day-propoxur (93) > dimethoate (74) > Gardona (44)

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List of Insecticides Used in 1974

No.	Insecticide	Formulation Stock	Type	Source
1	Allethrin	90%	Botanical derivative	McLaughlin, Gormley, King, Co.
2	Bay Meb 6046	98%		Chemagro
3	Carbaryl	12.5% & 49%	Carbamate	Union Carbide
4	Chlorophoxim	23%	Organophosphate	Chemagro
5	DDT	100%	Chlorinated Hydrocarbon contact	Math. Col. & Bell
6	Dimethoate	43.5%	Organophosphate	Cyanamide
7	Dimetilan ®	25% E.C.	Carbamate contact	Geigy
8	Dowco ® 214	60.6%	Organophosphate contact	Dow
9	Dursban ®	28.8%	Organophosphate contact	Dow
10	Dylox ®	39% E.C.	Organophosphate contact	Chemagro
11	F-6957	2.4%	Pyrethroid	McLaughlin, Gormley, King, Co.
12	Fenitrothion	98% & 98.7%	Organophosphate contact	Sumitomo
13	Fyfanon	95%	Organophosphate	Cheminova
14	Gardona ®	94%	Organophosphate contact	Shell
15	Imidan ®	12.5% & 11.92 %	Organophosphate contact	(Stauffer) Chipman
16	Isopropylparathion	50%	Organophosphate	Pharacaps Can. Ltd.
17	Lannate ®	100%	Carbamate	Dupont

No.	Insecticide	Formulation Stock	Type	Source
18	Lindane	99%	Chlorinated Ayrl hydro-carbon	Hooker
19	Malathion	50%	Aliphatic derivative of phosphorus compounds	
20	Matacil ® (Aminocarb)	34% & 99%	Carbamate	Chemagro
21	Methyl Trithion®	40%	Aryl derivatives of phosphorus compounds	Stauffer
22	NRDC-119	100%	Pyrethroid	Procida
23	Orthene ®	94%	Organophosphate contact	Chevron
24	PH 60/40	25%	Urea	Philips Duphar
25	Phosphamidon	90%	Aliphatic derivatives of phosphorus compounds	CIBA
26	Phosvel	27%	Organophosphate contact	Velsicol
27	Phoxim	47% & 73%	Organophosphate contact	Chemagro
28	PP484	95%		Chipman Chemicals
29	Propoxur (Baygon)	98%	Organophosphate	Chemagro
30	Pyrocide	20%	Pyrethroid	McLaughlin Gormley, King Co.
31	RH218	88%	Organophosphate	Rohm & Haas
32	RU-11483	100%	Pyrethroid contact	McLaughlin, Gormley, King Co.
33	RU-11679	100%	Pyrethroid contact	McLaughlin, Gormley, King Co.
34	SBP-1382 (Resmethrin)	84.5%	Botanical derivative contact	SB Penick

No.	Insecticide	Formulation Stock	Type	Source
35	Supracide®	40%	Organophosphate contact	Geigy
36	Trithion® 8E	95.4%	Organophosphate	Stauffer
37	Zectran®	93.3 & 90%	Carbamate	Dow

LIST OF INSECTS USED IN 1974

Insect	Area of Origin	Instar Stage	Number Used
	CONTACT TOXICITY		
Black Cutworm	B.C.	V	3360
Blackheaded budworm	B.C.	V	210
Douglas Fir Tussock Moth	B.C.	IV	840
Sitka Spruce Weevil	B.C.	Adult	1470
Blackheaded Jack pine Sawfly	Sault Ste Marie Ontario	V	1680
Larch Sawfly	Ottawa Ontario	IV	3360
Larch Sawfly	Ottawa Ontario	V	840
Spruce Budworm	Laboratory reared	V	3780
Spruce Budworm	Laboratory reared	VI	210
Spruce Budworm	Laboratory reared	Pupae	6090
Spruce Budworm	Ottawa Ontario	V	3780
Spruce Budworm	Ottawa Ontario	VI	3780
White Pine Weevil	Sault Ste Marie Ontario	Adult	3150
Redheaded Pine Sawfly	Que.	IV	1890
Redheaded Pine Sawfly	Que.	V	2730
Swaine Jack Pine Sawfly	Que	V	5460
	STOMACH TOXICITY		
Larch Sawfly	Ottawa Ontario	IV	210
Larch Sawfly	Ottawa Ontario	V	210
Spruce Budworm	Laboratory reared	V	1680
Spruce Budworm	Laboratory reared	VI	420
Spruce Budworm	Ottawa Ontario	V	210
Spruce Budworm	Ottawa Ontario	VI	210

Insect	Area of Origin	Instar Stage	Number Used
	COMBINATION CONTACT AND STOMACH TOXICITY		
Larch Sawfly	Ottawa Ontario	IV	210
Larch Sawfly	Ottawa Ontario	V	210
Spruce Budworm	Laboratory reared	V	3360
Spruce Budworm	Laboratory reared	VI	210
Spruce Budworm	Ottawa Ontario	V	630
Spruce Budworm	Ottawa Ontario	VI	420
	RESIDUAL TOXICITY		
Spruce Budworm	Ottawa Ontario	V	5400
Blackheaded Jack Pine Sawfly	Ottawa Ontario	IV	1380
Larch Sawfly	Ottawa Ontario	IV	2640