

Summary of Contact, Stomach and Residual Toxicity of Insecticides
Against Forest Insect Pests During 1973

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SUMMARY OF LABORATORY EVALUATION OF INSECTICIDES AGAINST
VARIOUS SPECIES OF FOREST INSECT PESTS DURING 1973

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Twenty six insecticides were tested for contact, stomach, and residual toxicity using a modified Potter's tower. Nine 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

Sitka-spruce weevil - *Pissodes sitchensis* Hopk

Four insecticides were tested in 1973 against Sitka-spruce weevil adults which emerged during 1972. The corrected percentage mortality ranged from 93% to 100%.

Phoxim > fenitrothion > Gardona > lindane

Western Hemlock Looper - *Lambdina fiscellaria* lugubrosa (Hulst)

Orthene was tested against III and IV instar larvae of western hemlock looper. The corrected percentage mortality was 100% at 4% concentration and 0.6 gpa (2.69 $\mu\text{g}/\text{cm}^2$)

ONTARIO

European Pine Sawfly - *Neodiprion sertifer* (Geoffroy)

Four new insecticides were tested against fourth instar larvae of European pine sawfly. The corrected percentage mortality ranged from 14% to 92%.

RU 11679 > Dowco 214 > RU 11483 > SP 2539

Larch Sawfly - *Pristiphora erichsonii* (Hartig)

Three insecticides were tested against fourth instar larvae of larch sawfly. The corrected percentage mortality ranged from 50% to 96%.

Cygon > PP484 > Bay 78182

Red-headed Pine Sawfly - *Neodiprion lecontei* (Fitch)

Ten insecticides were tested against fourth instar larvae of red-headed pine sawfly. The corrected percentage mortality ranged from 22% to 100%.

Dowco 214 > Gardona > RU11679 > Dimetilan >
RU11483 > Bay 78182 > Imidan > SP2539 >
Phosvel > Orthene

White-pine Weevil - *Pissodes strobi* (Peck)

Ten insecticides formulations were tested against white-pine weevil adults. The corrected percentage mortality ranged from 97% to 100%.

Fenitrothion + pinolene > Fenitrothion = Gardona >
Phoxim + Pinolene > phoxim > SBP 1382 > Dursban >
Lindane > DDT > Methoxychlor

Spruce Budworm - *Choristoneura fumiferana* (Clemens)

Three insecticides were tested against fifth instar larvae of spruce budworm collected in the Ottawa area. The corrected percentage mortality ranged from 0% to 100%.

SBP1382 > Bay 78182 > Orthene

Eight insecticides were tested against sixth instar spruce budworm larvae collected in the Ottawa area. The corrected percentage mortality ranged from 29% to 100%.

RU11679 > RU11483 > Supracide > Bay 78182 >
SP2539 > PP484 > Phosvel > Orthene

Spruce Budworm Adults *Choristoneura fumiferana* (Clemens)

Two insecticides were tested against spruce budworm adults. The corrected percentage mortality was 100% with fenitrothion at 0.5% concentration at 0.6 gpa (0.336 $\mu\text{g}/\text{cm}^2$) 48 hours after treatment, and 100% with phosphamidon at 0.5% concentration at 0.4 gpa (0.224 $\mu\text{g}/\text{cm}^2$) 72 hours after treatment.

Spruce Budworm *Choristoneura fumiferana* (Clemens)

Laboratory Reared

Six insecticides were tested against fifth instar larvae of the spruce budworm reared in the laboratory on artificial diet. The solvent AR60 was also tested. The corrected percentage mortality for the insecticides ranged from 77% to 100% and for the solvent (AR60) from 6% to 28%.

RU11679 > RU11483 > Bay 78182 > PP484 > Phosvel > Orthene

Eastern Hemlock Looper - *Lambdina fiscellaria fiscellaria* (Guen)

Fenitrothion was tested against adults of eastern hemlock looper. The mortality in two spray trials at 0.5% concentration at 0.6 gpa (0.336 $\mu\text{g}/\text{cm}^2$) was 100% after 48 hours.

QUEBEC

Spruce Budworm *Choristoneura fumiferana* (Clemens)

Late sixth instar larvae of the spruce budworm were collected at Shawville in Quebec for rearing to the adult stage for spray trials. The larvae appeared to be infected with disease organisms and insufficient adults emerged for experimental purposes.

Chain Spotted Geometer - *Cingilla catenaria* (Drury)

Two spray trials were carried out against a combination of fifth and sixth instar larvae of the chain spotted looper, using fenitrothion. The corrected percentage mortality was 82% at 1.121 $\mu\text{g}/\text{cm}^2$ and 100% at 1.344 $\mu\text{g}/\text{cm}^2$.

Swaine's Jack-pine Sawfly - *Neodiprion swainei* (Middleton)

Five insecticides were tested against fourth instar larvae of Swaine's jack-pine sawfly. The corrected percentage mortality ranged from 6% to 100%. The larval mortality during the rearing period indicated the presence of disease organisms in the population.

SBP1382 > Dowco 214 > Cygon > Dylox > Phoxim

Red-headed Pine Sawfly *Neodiprion lecontei* (Fitch)

Six insecticides were tested against fifth instar larvae of red-headed pine sawfly larvae. The corrected percentage mortality ranged from 55% to 100%.

Dimetilan > Dowco 214 > RU11679 > Bay 78182 >
Imidan > Gardona

STOMACH TOXICITY

Five concentrations of Thuricide[®] and Dipel[®] were tested against fifth instar laboratory reared spruce budworm larvae, in order to compare the stomach toxicity of Bt formulations with and without Chitinase. The formulations were sprayed on larch foliage @ .5, 1 and 2 gpa and given to larvae as food. The observations were taken three, five and seven days after treatment. The final observations after seven days are arranged in descending order of toxicity.

Dipel = Dipel + Chitinase > Thuricide + Chitinase > Thuricide

RESIDUAL TOXICITY

The insecticides were tested for residual toxicity by spraying potted host plants in the spraying chamber. The sprayed plants were then exposed to weathering conditions for 10 days. 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.

Spruce Budworm - *Choristoneura fumiferana* (Clemens)

Residual toxicity of eight insecticides was tested against fifth instar larvae of spruce budworm. Two percent fenitrothion, aminocarb, Zectran, and 5% DDT at the rate of 1 GPA were repeated from previous year using white spruce and balsam fir as hosts (series I). Eight percent carbaryl and Imidan, and five percent Orthene and resmethrin, at the rate of 1 GPA were also repeated at a higher concentration from previous year using white spruce (series II).

Series I

White Spruce	0 day-Zectran (98) > DDT (88) > aminocarb (86) > fenitrothion (68)
	10 day-Zectran (83) > aminocarb (54) > DDT (33) > fenitrothion (21)
Balsam Fir	0 day-Zectran (100) = aminocarb (100) > fenitrothion (89) > DDT (87)
	10 day-Zectran (92) = aminocarb (92) > fenitrothion (53) > DDT (16)

Series II

White Spruce	0 day-Orthene (100) = Imidan (100) > resmethrin (79) > carbaryl (68)
	10 day-Orthene (21) > Imidan (20) > resmentrin (0) = carbaryl (0)

Jack-Pine Sawfly-*Neodiprion pratti banksianae* (Rohwer)

Five insecticides were tested against fourth instar larvae of jack-pine sawfly. One percent aminocarb, Gardona, Zectran, and two percent phoxim and propoxur, at the rate of 1 GPA, were repeated from previous year using jack-pine as hosts. The concentration of phoxim and propoxur is double that of last year.

0 day-Gardona = propoxur = Zectran = aminocarb = phoxim-all 100%
10 day-Gardona (41) > propoxur (38) > aminocarb (35) > Zectran (14) > phoxim (9)

Larch Sawfly - *Pristiphora erichsonii* (Hartig)

One percent concentration of three insecticides at the rate of 1 GPA were tested against fourth instar larvae of larch sawfly using tamarack as a host. This was a repeat of previous year's test.

0 day-dimethoate (100) = propoxur (100) > Gardona (98)
10 days-dimethoate (100) > propoxur (97) > Gardona (82)

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List of Insecticides

No.	Insecticide	Formulation	Type	Source
1	Aminocarb	75%	Carbamate Contact	Chemagro
2	Bay 78182	23%	Organo- phosphate contact	Bayer
3	DDT	100% tech	Chlorinated hydrocarbon contact	Math. Col. & Bell
4	Dimethoate	43.5%	Organo- phosphate contact	Chemagro
5	Dimetilan [®]	25% EC	Carbamate contact	Geigy
6	Dipel [®]	3.2% W.P.	Bacterial derivative	Abbott Laboratories
7	Dowco 214	60.6% Solut.	Organo- phosphate contact	Dow
8	Dursban [®]	28.8% EC	Organo- phosphate contact	Dow
9	Dylox [®]	29% EC	Organo- phosphate contact	Chemagro
10	Fenitrothion [®]	98% premium	Organo- phosphate contact	Sumitomo
11	Gardona [®]	99% Tech	Organo- phosphate contact	Shell
12	Imidan	11.92%	Organo- phosphate contact	Stauffer

No.	Insecticide	Formulation	Type	Source
13	Lindane	99%	Chlorinated Aryl hydrocarbon	Hooker
14	Methoxychlor	88% tech	Chlorinated hydrocarbon	DuPont
15	Orthene	97.6% tech	Organo- phosphate contact	Chevron
16	Phosvel	92% tech	Organo- phosphate contact	Velsicol
17	Phoxim	73% tech	Organo- phosphate contact	Chemagro
18	PP484	95% tech	Contact	Chipman Chemicals
19	Propoxur	94% tech	carbamate contact	Chemagro
20	RU11483	100%	Contact	McLaughlin Gormley King Co.
21	RU11679	100%	Contact	McLaughlin Gormley King Co.
22	SBP1382	84.5% tech	Botanical derivative contact	S.B. Penick
23	SP2539	97.7%	Contact	Sumitomo
24	Supracide [®]	40% EC	Organo- phosphate contact	Geigy
25	Thuricide [®]	0.65%	Bacterial derivative	International Minerals and Chemical Corporation
26	Zectran	92%	Carbamate systemic	Dow

LIST OF INSECTS 1973

Insect	Area of origin	Instar Stage	Number Used
<u>CONTACT TOXICITY</u>			
Western Hemlock Looper	Nakusp B.C.	III & IV	420
Sitka spruce weevil	British Columbia	Adult	1540
European pine sawfly	Angus Ontario	IV	880
Larch Sawfly	Ottawa Ontario	IV	660
Red-headed pine sawfly	Smiths Falls Ont	IV	4180
Red-headed pine sawfly	St. Albert & Lost River Quebec	V	1760
White-pine weevil	Sault Ste. Marie Ont	Adult-72	7600
White-pine weevil	Angus & Sault Ste. Marie Ontario	Adult-73	5300
Eastern hemlock looper	Sault Ste. Marie Ont	Adult	440
Spruce Budworm	Ottawa Ontario	V	660
Spruce Budworm	Ottawa Ontario	VI	2420
Spruce Budworm	Ottawa Ontario	Adult	440
Spruce Budworm	Laboratory reared	V	2420
Chain spotted looper	Quebec	V & VI	440
Swaine jack-pine Sawfly	Quebec	IV	1760

Insect	Area of Origin	Instar Stage	Number Used
<u>STOMACH TOXICITY</u>			
Spruce budworm	Ottawa Ontario	V	440
Spruce budworm	Ottawa Ontario	VI	440
Eastern tent caterpillar	Ottawa Ontario	IV	660
Black-headed budworm	Port Alice B.C.	IV	440
Western hemlock looper	Nakusp B.C.	IV	880
<u>RESIDUAL TOXICITY</u>			
Spruce budworm	Ottawa Ontario	V	4780
Black-headed jack-pine sawfly	Ottawa Ontario	IV	2340
Larch sawfly	Ottawa Ontario	IV	2460