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Pesticide field trials on shade and shelterbelt trees in Alberta, 1979



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PESTICIDE FIELD TRIALS ON SHADE AND SHELTERBELT TREES IN ALBERTA, 1979

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COVER: A weevil, *Pseudanthrenus crataegi* Walsh, which attacks the fruit of saskatoon.

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ABSTRACT

Nineteen insecticides were tested in 1979 for the control of 15 insect pests in shade and shelterbelt trees in 56 separate evaluations. The purpose of the trials was to obtain information on the efficacy of the insecticides, optimum timing of application, equipment performance, and any adverse effects on host plants. The data obtained have been sent to the Control Products Section of Agriculture Canada to provide additional support for the registration of candidate chemicals. The names of 14 candidate chemicals tested during 1972-79 have been submitted with supporting data for registration under the Pest Control Products Act for new and modified uses in the control of 9 insect species.

RESUME

Dix-neuf insecticides ont été testés en 1979 relativement à la répression de 15 insectes nuisibles s'attaquant aux arbres d'ombre et d'abri, selon 56 évaluations distinctes. Le but de ces essais était de s'informer sur l'efficacité des insecticides, le meilleur temps d'application, la performance de l'équipement utilisé et, enfin, tous effets adverses sur les plantes-hôtes. Les données recueillies ont été envoyées à la section du contrôle des produits d'Agriculture Canada pour servir de base supplémentaire à l'enregistrement des produits chimiques à choisir. Les noms de 14 produits testés entre 1972-79 ont été soumis avec les données d'appui, pour enregistrement en vertu de la Loi sur les produits antiparasitaires. Ces produits seront utilisés dans des opérations nouvelles ou modifiées de répression de 9 espèces entomologiques.

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NOTE

The exclusion of certain manufactured products does not imply rejection nor does the mention of other products imply endorsement by the Canadian Forestry Service.

INTRODUCTION

The evaluation of pesticides and cultural methods for the control of insect pests on shelterbelts and ornamental trees and shrubs was continued in 1979. Emphasis was placed on completing data requirements for established insecticides that previously were tested and showed promise, including the synthetic pyrethroids. The most promising test results have been forwarded, with recommendations, to the various chemical firms and to the Plant Products Division, Control Products Section, Department of Agriculture, Ottawa. Results of similar tests published in previous reports (Drouin and Kusch 1973-1979) provide additional data for the registration review of 14 chemical products tested for the control of nine insect pests attacking eight species of trees and shrubs.

MATERIALS AND METHODS

Nineteen insecticide formulations and a spreader/sticker adjuvant (Table 1) were tested against 15 insect species (Table 2) during the 1979 field trials. The test sites were established in woodlots and recreational areas and on crown and privately owned land in Alberta. A total of 56 separate evaluations (Table 5) was made using four application techniques: mist blower, soil drench, ovicide dip, and hydraulic knapsack sprayer.

Forty-six foliar spray treatments were applied with a backpack mist blower (Solo) against three birch leaf-mining sawflies, the forest tent caterpillar, insects attacking the fruits of saskatoon and chokecherry, large aspen tortrix, yellow-headed spruce sawfly, larch sawfly, open-feeding aphids, spruce spider mite, and a willow sawfly. Three soil insecticides with systemic qualities were applied as drenches to control the birch leaf-mining sawflies. These insecticides were placed into holes dug within the dripline of the tree at a dosage based on the basal diameter of the tree. Two ovicides were tested in the laboratory on forest tent caterpillar egg bands. Two insecticides applied as a hydraulic spray with a knapsack sprayer (Solo 425) were used to control the yellow-headed spruce sawfly and open-feeding aphids. Three insecticides applied as an ultralow volume spray with a roto sprayer (TOT 2S) were used against the forest tent caterpillar, yellow-headed spruce sawfly, and the larch sawfly.

The insecticide formulations tested included an emulsifiable concentrate, wettable powders, a new ultralow volume oil-base liquid, and a granular product. A spreader/sticker adjuvant (Atplus 526) also was utilized.

A summary of the chemicals tested and recommendations for insect control were submitted to the Plant Products Division in Ottawa to support their registration (Table 6). Chemical descriptions (Kenaga and Allison 1971) of all insecticides tested in 1979 are listed in Appendix I. The pests appear in the results section in order of importance and occurrence.

ABBREVIATIONS

a.i.	= Active ingredient
EC	= Emulsifiable concentrate
G	= Granular
HKS	= Hydraulic knapsack sprayer
MB	= Mist blower
OD	= Ovicide dip
SD	= Soil drench
SP	= Soluble powder
ULV	= Ultralow volume
WP	= Wettable powder

Table 1. Pesticides and an additive used in field tests on shade, shelterbelt, and ornamental trees and shrubs in Alberta, 1979

Trade name and formulation	Common name	Supplier
Ambush 50% EC	permethrin	Chipman
Atplus 526	spreader/sticker	Atlas Chem.
Basudin 50% EC	diazinon	Ciba-Geigy
Baygon 18% EC	propoxur	Chemagro
Belmark 30% EC	fenvalerate	Shell
Cygon 4E (34% EC)	dimethoate	Cyanamid
Dacamox 10G (10%)	thiofanox	Diamond-Shamrock
Dimecron 94% EC	phosphamidon	Ciba-Geigy
Dutox 24% EC	trichlorfon and oxydemeton-methyl	Chipman
Dylox 4E (40% EC)	trichlorfon	Chemagro
Nem-A-Tak 25% EC	experimental (AC 64475)	Cyanamid
Orthene 75% SP	acephate	Chevron
Orthene 16% EC	acephate	Chevron
Ripcord 40% EC	cypermethrin	Shell
Sevin 50% WP	carbaryl	FMC
Supracide 25% EC	methidathion	Ciba-Geigy
Talcord 40% EC [†]	permethrin	Shell
Ultracide (ULV) 25%	methidathion	Ciba-Geigy
Vendex 50% WP	fenbutatin oxide	Shell
Vydate 25% EC	oxamyl	DuPont

[†] Known as WL 43479 until 1979.

Table 2. Target pest species and host plants in the 1979 field trials

Pest	Scientific name	Host
Forest tent caterpillar	<i>Malacosoma disstria</i> Hübner	Trembling aspen
Birch leaf miners	<i>Fenusa pusilla</i> (Lepeletier) <i>Heterarthrus nemoratus</i> (Fallen) <i>Profenusa thomsoni</i> (Konow)	Birch
Large aspen tortrix	<i>Choristoneura conflictana</i> (Walker)	Trembling aspen
Yellow-headed spruce sawfly	<i>Pikonema alaskensis</i> (Rohwer)	Spruce
Open-feeding aphids	<i>Myzus cerasi</i> (Fabricius) <i>Rhopalosiphum padi</i> (Linnaeus) Aphidae	Chokecherry
Chokecherry midge	<i>Contarinia virginianiae</i> (Felt)	Fire bush
A seed-boring sawfly	<i>Hoplocampa lacteipennis</i> (Rohwer)	Chokecherry
Fruit-feeding sawflies	<i>Hoplocampa</i> spp.	Saskatoon
Larch sawfly	<i>Pristiphora erichsonii</i> (Hartig)	Larch
Spruce spider mite	<i>Oligonychus ununguis</i> (Jacobi)	Spruce
Willow sawfly	<i>Nematus ventralis</i> Say	Willow

RESULTS OF FIELD TREATMENTS

FOREST TENT CATERPILLAR

Pest: Forest tent caterpillar, *Malacosoma disstria*

Host: Poplar, trembling aspen

Materials: Ambush (permethrin) 50 EC, Belmark (fenvalerate) 30 EC, Ripcord (cypermethrin) 40 EC, Ultracide (methidathion) ULV 25%

Procedure: Nine tests consisting of six sprays applied with a backpack mist blower (Solo), one ultralow volume spray using a roto sprayer (TOT 2S), and two laboratory ovicide dip treatments were conducted in 1979. Spray plots were established in heavily infested farm woodlots and were approximately 0.04 ha in size, with trees averaging 5.5 m in height. There were four foliar sprays applied at the rate of 9.1 L solution per plot and two ovicide sprays applied at the rate of 4.5 L per plot in early spring before egg hatch. A spreader/sticker (Atplus 526) was added to the solutions at the rate of 0.5 mL/L. The ultralow volume spray plot, which was also 0.04 ha in size and was located in a recreation area, was sprayed with an oil-base formulation at the rate of 114 mL per plot. The amounts of active ingredient in the spray applications are given in Table 3. Before spraying, a mean of 3-5 egg bands per tree was found, indicating a potential of over 400 larvae per 5-cm tree. Up to 25 egg bands were found on one tree. Percentage insect control was determined by visual observation, because very few living larvae were found in the treatment plots 48 h after application.

The two ovicide dip tests in the laboratory consisted of 10 egg bands each dipped in the insecticide solutions and removed immediately. Control in the ovicide dip and ovicide spray plots was based on counts of hatched and unhatched eggs about 3 weeks after treatment. Dissection of 10 egg bands from the control plot showed a total of 1557 eggs, with 1272 living, 270 parasitized, and 15 dead larvae. Similar postspray counts for fenvalerate showed a total of 1768 eggs, of which 1633 were dead and the remaining 135 had been parasitized or contained dead yolks. The cypermethrin-treated plot showed a total of 1415 eggs, of which 1372 were dead and the remaining 43 were parasitized or contained dead yolks.

Table 3. Results of 1979 field tests on *Malacosoma disstria*

Material	Type of application	L/plot	A.i. (mL/L)	% control
Ambush	MB	9.1	1.6	100
Belmark	OD	—	0.2	100
Belmark	MB [†]	4.5	1.0	100
Belmark	MB	9.1	0.6	100
Ripcord	OD	—	0.2	100
Ripcord	MB [†]	4.5	1.2	100
Ripcord	MB	9.1	0.8	100
Ripcord	MB	9.1	0.5	100
Ultracide	ULV	0.11	250.0	95

[†] Ovicide sprays tested under field conditions.

Comments: Larval populations were not as high in 1979 as they were in 1978; however, trembling aspen in the general test area was completely defoliated. Ambush, Belmark, and Ripcord again showed extremely fast knockdown characteristics for the forest tent caterpillar and other leaf roller species.

Results: See Table 3. Insect control was excellent in all tests and verified data previously reported. Ultracide, a relatively new low-volume preparation, was tested for the first time. It performed well and was not phytotoxic.

BIRCH LEAF-MINING SAWFLIES

Pests: Birch leaf miners, *Fenusa pusilla*, *Profenusa thomsoni*, and *Heterarthrus nemoratus*

Host: Birch, white

Materials: Ambush (permethrin) 50 EC, Basudin (diazinon) 50 EC, Belmark (fenvalerate) 30 EC, Dacamox (thiofanox) 10G, Dutox (trichlorfon and oxydemeton-methyl) 24 EC, Orthene (acephate) 75 SP, Vydate (oxamyl) 25 EC

Procedure: Eight tests evaluating the efficacy of seven insecticides were conducted in moderately infested natural stands of white birch near Winterburn, Alberta. There were five foliar sprays applied with a backpack mist blower (Solo) and three soil drench applications. Spray plots were approximately 0.02 ha, with trees averaging 3.5 m in height. In the soil drench tests, plots consisted of five trees averaging about 9.3 cm basal diameter. Spray solutions were applied on 16 July at the rate of 4.5 L per plot at a concentration of 1.6 mL a.i./L for Ambush, Basudin, and Dutox, 0.8 mL a.i./L for Belmark, and 3.1 mL a.i./L for Vydate. A spreader/sticker (Atplus 526) was added to the solutions at the rate of 0.5 mL/L. Soil drenches were applied on 10 May at the rate of 4.5 g a.i./cm basal diameter for Dacamox, 6.0 mL a.i./cm for Dutox, and 5.3 g a.i./cm for Orthene. Percentage insect control was determined by applying Abbott's (1925) formula to data obtained from examination of two 45-cm branches selected randomly from the upper and lower crowns of trees in the treatment and control plots from 13 to 29 August.

Comments: Populations of *F. pusilla* and *P. thomsoni* dropped markedly in 1979, but there was some increase in *H. nemoratus*. In 1978, 2792 living larvae of *F. pusilla*, 921 larvae of *P. thomsoni*, and 641 larvae of *H. nemoratus* were found in 5679 leaves. In 1979, 1294 *F. pusilla*, 174 *P. thomsoni*, and 836 *H. nemoratus* living larvae were found in 5944 leaves.

	No. of larvae/leaf	
	1978	1979
<i>F. pusilla</i>	0.49	0.21
<i>P. thomsoni</i>	0.16	0.03
<i>H. nemoratus</i>	0.11	0.14

Occurrence of these three species and phenology were similar to 1978. Some chemicals tested in 1978 were tested again in 1979, which results in 2 years of field data.

Results: See Table 4. At the Belvedere control plot, 1743 leaves were examined and were found to contain 827 live and 124 dead larvae. In the soil drench trials, no living larvae were found during

Table 4. Results of 1979 field tests on birch leaf-mining sawflies

Material	Type of application	No. leaves examined	No. leaves mined	No. larvae		% control [†]
				Live	Dead	
Ambush	MB	1337	298	0	107	100
Basudin	MB	1733	401	42	180	80
Belmark	MB	1455	352	35	174	82
Dacamox	SD	1466	74 ^{††}	0	0	100
Dutox	SD	1535	453 [†]	0	31	100
Dutox	MB	1453	487	0	258	100
Orthene	SD	1647	413 ^{††}	0	0	100 ^T
Vydate	MB	1634	419	77	176	68
Control	MB	1523	658	477	35	
Control	SD	1794	664	264	60	

[†] Control based on total larval counts of all species of leaf miners.

^{††} Many unhatched eggs or only a trace of feeding.

^T Trace phytotoxicity.

postspray examination of 1160 leaves in the Dacamox plot, 1535 leaves in the Dutox plot, and 1646 leaves in the Orthene plot. At the Winterburn control plot, of 1489 leaves examined, 477 living and 35 dead larvae were recorded. For the foliar spray trial, postspray examination results for living and dead larvae were as follows: on 1733 leaves in the Basudin plot there were 180 dead and 42 live; on 1455 leaves in the Ambush plot there were 174 dead and 35 live; on 1593 leaves in the Vydate plot there were 176 dead and 77 live; and no living larvae were found in the Dutox and Ambush plots. Percentages of control with Ambush, Basudin, Dutox, and Vydate applied as foliar sprays were higher in 1979 (Table 4) than in 1978 (78%, 30%, 54%, and 16%, respectively). Results of the soil drench treatments with Belmark, Dacamox, Dutox (SD), and Orthene were very similar to those reported previously (Drouin and Kusch 1978).

LARGE ASPEN TORTRIX

Pest: Large aspen tortrix, *Choristoneura conflictana*

Host: Aspen, trembling

Materials: Cygon (dimethoate) 4E, Dimecron (phosphamidon) 94 EC, Dutox (trichlorfon and oxydemeton-methyl) 24 EC, Nem-A-Tak (AC 64475) 25 EC, Orthene (acephate) 16 EC, Sevin (carbaryl) 50 WP, Talcord (permethrin) 40 EC

Procedure: Seven spray treatments using the same seven insecticides tested in 1978 (Orthene was 75 SP) were applied again in 1979 with a backpack mist blower (Solo). Plots were established in a moderately infested farm woodlot and were approximately 0.04 ha in area, with trees averaging 6 m in height. Solutions were applied at the same rate as in 1978: 9.1 L per plot at a concentration of 3.1 mL or g a.i./L and with a spreader/sticker (Atplus 526) added at the rate of 0.5 mL/L. Percentage insect control was determined by counts of living and dead larvae on five 45-cm branches selected randomly from each plot. Because many dead larvae could not be found after spraying,

control was based on the assumption that the original number of larvae in the treated plots was the same as in the control plots, and Abbott's formula was applied.

Comments: Larval populations in the general test area were somewhat lower in 1979 than in 1978. A total of 137 living, dead, or parasitized larvae was recorded in 1979 from counts of five 45-cm branches; 247 were counted in 1978. At the time of treatment, foliation was not as advanced as in 1978.

Results: Cygon gave 67%, Dimecron 100%, Dutox 89%, Nem-A-Tak 2%, Orthene 100%, Sevin 100%, and Talcord 100% control. All chemicals except Nem-A-Tak gave good to excellent control, verifying 1978 results (Drouin and Kusch 1979). Control with Nem-A-Tak was considerably lower than in 1978 (54%). Dimecron control was better than in 1978 (68%).

YELLOW-HEADED SPRUCE SAWFLY

Pest: Yellow-headed spruce sawfly, *Pikonema alaskensis*

Host: Spruce, white

Materials: Ambush (permethrin) 50 EC, Belmark (fenvalerate) 30 EC, Ripcord (cypermethrin) 40 EC, Supracide (methidathion) 25 EC, Talcord (permethrin) 40 EC, Ultracide (methidathion) ULV 25%, Vydate (oxamyl) 25 EC

Procedure: Seven spray treatments using six insecticides (two formulations of methidathion) were applied to ornamentals on 5 July and to a heavily infested farm shelterbelt on 16 July. Five were applied with a backpack mist blower (Solo), one was applied with an ultralow volume roto sprayer (TOT 2S), and one was applied with a knapsack sprayer unit (Solo). All plots were 0.04 ha in size, with trees averaging 4.5 m in height. Mist-blower solutions were applied at the rate of 9.1 L per plot at a concentration of 1.6 mL a.i./L except for Ripcord and Belmark, which were at 1.0 mL a.i./L. A spreader/sticker (Atplus 526) was added at the rate of 0.5 mL/L. The ultralow volume spray was applied at the rate of 114 mL of formulation or 28.4 mL a.i. for the plot. Talcord, applied with a knapsack sprayer, was at a concentration of 0.2 mL a.i./L, with Atplus 526 added at the rate of 0.5 mL/L. Percentage insect control was determined by examination of the foliage of all treated trees 72 h after spraying.

Comments: Although the Talcord dosage was very low, mortality in the plot was higher than expected. Talcord also exhibited fast knockdown characteristics.

Results: Insect control was 95% for Talcord. Control in the rest of the tests was considered to be 100%, since no living larvae were found in the treated plots. All tests indicated excellent second-year results and verified previously reported data on the control of open-feeding sawflies (Drouin and Kusch 1979).

OPEN-FEEDING APHIDS

Pests: Open-feeding aphids, *Myzus cerasi*, *Rhopalosiphum padi*, and an unidentified species on fire bush

Hosts: Chokecherry and fire bush

Materials: Ambush (permethrin) 50 EC, Belmark (fenvalerate) 30 EC, Dimecron (phosphamidon) 94 EC, Ripcord (cypermethrin) 40 EC, Talcord (permethrin) 40 EC, Vydate (oxamyl) 25 EC

Procedure: Six tests evaluating the efficacy of six insecticides were conducted in a moderately infested recreation area and on heavily infested ornamental plantings (fire bush) at the Northern Forest Research Centre in Edmonton. All were foliar sprays, five applied with a backpack mist blower (Solo) and one with a hand pump sprayer (Solo). Mist-blower plots were approximately 0.02 ha, with shrubs averaging about 2.5 m in height. Spray solutions were applied on 17 September at the rate of 4.5 L per plot at a concentration of 1.6 mL a.i./L except for Ripcord, for which the rate was 1.0 mL a.i./L. Talcord was applied with a knapsack sprayer on 18 June to a fire bush hedge 2.4 m in length and 0.9 m in height. The spray solution (2 L) was applied at a concentration of 0.25 mL a.i./L. A spreader-sticker (Atplus 526) was added to all spray solutions at the rate of 0.5 mL/L. Percentage insect control was determined from counts of living and dead insects taken from 25 leaves selected randomly from each mist-blower plot 48 h after treatment and from five tips selected randomly from the hedge 24 h after application.

Comments: Four of these tests were second-year applications and verified data previously reported for open-feeding aphids. Ripcord and Talcord were used for the first time against aphids in this area.

Results: Insect control was 95% in the Ambush, Talcord, and Vydate plots and was assumed to be 100% in the Belmark, Dimecron, and Ripcord plots because no living insects were found on the samples taken.

CHOCKECHERRY AND SASKATOON FRUIT INSECTS

Pests: Chokecherry midge, *Contarinia virginianiae*, seed-boring sawfly, *Hoplocampa lacteipennis*, and saskatoon fruit-feeding sawflies, *Hoplocampa* spp.

Hosts: Chokecherry and saskatoon

Materials: Ambush (permethrin) 50 EC, Baygon (propoxur) 18 EC, Dimecron (phosphamidon) 94 EC, Dutox (trichlorfon and oxydemeton-methyl) 24 EC, Dylox (trichlorfon) 40 EC

Procedure: Five spray treatments using five insecticides were applied with a backpack mist blower in a recreation area on 12 June. Plots were approximately 0.04 ha in size, with saskatoon shrubs averaging about 2 m in height. Chokecherry shrubs in the Dimecron plot averaged about 3.5 m in height. Plots were sprayed shortly after petal drop, when the fruit was starting to form. Spray solutions were applied at the rate of 9.1 L per plot at a concentration of 1.6 mL a.i./L with a spreader/sticker (Atplus 526) added at the rate of 0.5 mL/L. Percentage insect control was determined by examination of the fruit on 10 45-cm branches selected randomly from each treated and control plot approximately 6 weeks after treatment in the saskatoon plots and about 8 weeks after treatment in the chokecherry plot. Abbott's formula was applied to the data.

Comments: Fruit production in the treated plots was higher than in the control plot. Chokecherry showed the greatest difference: 442 fruit per 10 45-cm branch tips in the control plot versus 845 fruit in the spray plots. On saskatoon, production was increased from 334 per 10 45-cm branch tips in the control plot to 453 in the spray plots. No phytotoxicity was observed on the treated trees. Four species of sawflies were obtained during several years of periodic saskatoon flower examinations: *Hoplocampa lacteipennis* (Roh.), *H. montanicola* Roh., *H. pallipes* MacGillivray, and *H. halcyon* (Nort.). In some areas, *H. lacteipennis* and *H. halcyon* occurred in up to 29% of the saskatoon fruit. Two weevil species attacking 1-2% of the fruit were also recorded: *Tachypterellus quadrigibbus* Say. and the smaller *Pseudanthonomus crataegi* Walsh, of which little is known.

Results: Insect control was 96% in the Dimecron-treated chokecherry plot and was assumed to be 100% in all of the saskatoon plots because no attacked fruit was found. Attack in the control plot was 7%. All tests on saskatoon indicated excellent control. Dutox and Dylox results at 100% were better than in 1978 (21% and 85%, respectively). Dimecron results verified previously reported data (Drouin and Kusch 1976).

LARCH SAWFLY

Pest: Larch sawfly, *Pristiphora erichsonii*

Host: Larch, Siberian

Materials: Ambush (permethrin) 50 EC, Belmark (fenvalerate) 30 EC, Orthene (acephate) 16 EC, Ripcord (cypermethrin) 40 EC, Ultracide (methidathion) ULV 25%

Procedure: Five foliar spray tests evaluating the efficacy of five insecticides were conducted in a moderately infested farm shelterbelt. Counts of five 45-cm branch tips showed that 13 out of 22 current shoots had been used for oviposition. There were 18 unhatched eggs and varying numbers of instar larvae: 22 I, 110 II, 109 III, 7 IV, and 17 V. Four sprays were applied with a backpack mist blower (Solo) on 5 July, and one was applied with an ultralow volume roto sprayer (TOT 2S) on 9 July. There were three plots consisting of 16 trees each, one plot of 8 trees adjacent to the shelterbelt, and one plot of 1 tree. Trees in all plots averaged about 4.8 m in height. Mist-blower applications were at the rate of 9.1 L solution per plot except for Orthene, which was 4.5 L. A spreader/sticker (Atplus 526) was added to the solutions at the rate of 0.5 mL/L. The ultralow volume oil-base formulation was applied at the rate of 28 mL on one tree. Percentage insect control was determined by visual examination of the foliage in all plots 72 h after treatment.

Comments: All spray applications gave excellent control results and verified previously reported data. Orthene, however, previously had given excellent results against open-feeding sawflies when applied as a soil drench rather than as a foliar spray (Drouin and Kusch 1975).

Results:

Material	Type	A.i.	Trees	% control
Ambush	MB	1.6 mL/L	16	100
Belmark	MB	0.5 mL/L	16	95
Orthene	MB	3.0 mL/L	8	100
Ripcord	MB	0.5 mL/L	16	100
Ultracide	ULV	7.0 mL/28 mL	1	100

SPRUCE SPIDER MITE

Pest: Spruce spider mite, *Oligonychus ununguis*

Host: Spruce, white

Materials: Ambush (permethrin) 50 EC, Belmark (fenvalerate) 30 EC, Dutox (trichlorfon and oxydemeton-methyl) 24 EC, Ripcord (cypermethrin) 40 EC, Vendex (fenbutatin oxide) 50 WP

Procedure: Five spray treatments using five insecticides were applied with a backpack mist blower (Solo) in a heavily infested farm shelterbelt. Four sprays were applied on 4 July in plots that were approximately 0.04 ha in size. The fifth spray (Dutox) was applied 4 September in a plot 0.2 ha in size. Trees in all plots averaged about 5 m in height. Spray solutions were applied at the rate of 9.1 L in the small plots and 45 L in the larger plot at a concentration of 1.6 mL a.i./L except in the Belmark and Ripcord plots, where the concentration was 1.0 mL a.i./L. A spreader/sticker (Atplus 526) was added to the spray solutions at the rate of 0.5 mL/L. Percentage insect control was determined from examination of two 15-cm branches selected randomly from five trees in each plot 72 h and 7 days after treatment.

Comments: Two 12.7-cm branches were examined from each of five trees at the five spray plots and one control plot. At the control plot, counts of 10 767 live and 1191 dead mites were recorded. Nine days after spraying, no live mites were found in the Ambush, Belmark, Ripcord, Dutox, and Vendex plots. All tests gave excellent results, with the Ambush and Belmark treatments verifying data previously reported (Drouin and Kusch 1978). Dutox, Ripcord, and Vendex were used for the first time as a miticide in this area.

Results: Control was considered to be 100% in all tests because no living mites were found in the posttreatment samples.

A WILLOW SAWFLY

Pest: A willow sawfly, *Nematus ventralis*

Host: Spruce, white

Materials: Ambush (permethrin) 50 EC, Belmark (fenvalerate) 30 EC, Orthene (acephate) 16 EC, Ripcord (cypermethrin) 40 EC

Procedure: Four spray treatments using four insecticides were applied on 16 August with a backpack mist blower (Solo) in a heavily infested grove of native willow with up to 90% defoliation. Each plot was approximately 0.02 ha in size, with bushes averaging 3.5 m in height. Spray solutions were applied at the rate of 4.5 L per plot at a concentration of 1.6 mL a.i./L for Ambush and Orthene and at 1.0 mL a.i./L for Belmark and Ripcord. A spreader/sticker (Atplus 526) was added to the solutions at the rate of 0.5 mL/L. Percentage insect control was assessed from examination of all foliage in each plot before and 48 h after treatment. Five 45-cm branches taken at random showed larval counts of 61 to 126 mixed early and late instars. A number of the willow clumps were 100% defoliated, indicating larval mortality from starvation.

Comments: All chemicals gave excellent results, verifying data previously reported in the control of open-feeding sawflies. The larvae were in various stages of development when the spray solutions were applied.

Results: Insect control was 95% in the Orthene plot and was assumed to be 100% in all other plots because no living larvae could be found.

Table 5. Summary of 1979 field tests

Species [†]	Chemical	Type	% control	Species [†]	Chemical	Type	% control
FTC	Belmark 30 EC	OD	100	Fruit Pests	Ambush 50 EC	MB	100
FTC	Ripcord 40 EC	OD	100	Fruit Pests	Baygon 18 EC	MB	100
FTC	Belmark 30 EC	MB	100	Fruit Pests	Dutox 25 EC	MB	100
FTC	Ripcord 40 EC	MB	100	Fruit Pests	Dylox 42 EC	MB	100
FTC	Ambush 50 EC	MB	100	Fruit Pests	Dimecron 94 EC	MB	96
FTC	Ripcord 40 EC	MB	100	LS	Ambush 50 EC	MB	100
FTC	Belmark 30 EC	MB	100	LS	Ripcord 40 EC	MB	100
FTC	Ripcord 40 EC	MB	100	LS	Belmark 30 EC	MB	95
FTC	Ultracide 25%	ULV	95	LS	Orthene 16 EC	MB	100
BLM	Dacamox 10G	SD	100	LS	Ultracide 25%	ULV	100
BLM	Dutox 24 EC	SD	100	SSM	Ambush 50 EC	MB	100
BLM	Orthene 75 SP	SD	100	SSM	Belmark 30 EC	MB	100
BLM	Basudin 40 EC	MB	80	SSM	Ripcord 40 EC	MB	100
BLM	Ambush 50 EC	MB	100	SSM	Vendex 50 WP	MB	100
BLM	Belmark 30 EC	MB	82	SSM	Dutox 24 EC	MB	100
BLM	Dutox 24 EC	MB	100	WS	Ambush 50 EC	MB	100
BLM	Vydate 25 EC	MB	68	WS	Ripcord 40 EC	MB	100
LAT	Cygon 4E	MB	67	WS	Belmark 40 EC	MB	100
LAT	Dimecron 94 EC	MB	100	WS	Orthene 16 EC	MB	95
LAT	Dutox 24 EC	MB	89				
LAT	Nem-A-Tak 25 EC	MB	02				
LAT	Orthene 16 EC	MB	100				
LAT	Sevin 50 WP	MB	100				
LAT	Talcord 40 EC	MB	100				
YHS	Talcord 40 EC	HKS	95				
YHS	Ambush 50 EC	MB	100				
YHS	Ripcord 40 EC	MB	100				
YHS	Belmark 30 EC	MB	100				
YHS	Supracide 25 EC	MB	100				
YHS	Vydate 25 EC	MB	100				
YHS	Ultracide 25%	ULV	100				
Aphids	Talcord 40 EC	HKS	95				
Aphids	Ambush 50 EC	MB	95				
Aphids	Belmark 30 EC	MB	100				
Aphids	Ripcord 40 EC	MB	100				
Aphids	Dimecron 94 EC	MB	100				
Aphids	Vydate 25 EC	MB	95				

[†] FTC = Forest tent caterpillar
BLM = Birch leaf miner
LAT = Large aspen tortrix
YHS = Yellow-headed sawfly
LS = Larch sawfly
SSM = Spruce spider mite
WS = Willow sawfly

Table 6. Products submitted for registration to the Pest Control Products Division for new and modified uses as a result of field tests in 1972-1979

Marketing type, pest	Host	Method
Ambush (permethrin) 50 EC		
Forest tent caterpillar	Aspen, poplar	MB, OD
Sawflies (open-feeding) ¹	Spruce, larch, willow, pine	MB
Aphids (open-feeding) ²	Maple, caragana, saskatoon	MB
Spruce spider mite	Spruce	MB
Chokecherry fruit insects ⁴	Chokecherry	MB
Saskatoon fruit insects ⁵	Saskatoon	MB
European fruit scale	Cherry, hazel, saskatoon	MB
Belmark (fenvalerate) 30 EC		
Forest tent caterpillar	Aspen, poplar	MB, OD
Sawflies (open-feeding) ¹	Spruce, larch, willow, pine	MB, H
Aphids (open-feeding) ²	Caragana, saskatoon, maple	MB
Cygon 4E (dimethoate) 34 EC		
Large aspen tortrix	Aspen	MB
Dacamox (thiofanox) 10G		
Birch leaf miners ³	Birch	SD
Dimecron (phosphamidon) 94 EC		
Forest tent caterpillar	Aspen, poplar	MB, OD
Aphids (open-feeding) ²	Maple, caragana, saskatoon	MB
Large aspen tortrix	Aspen	MB
Chokecherry fruit insects ⁴	Chokecherry	MB
Saskatoon fruit insects ⁵	Saskatoon	MB
Birch leaf miners ³	Birch	MB
Dutox (metasystox + trichlorfon) 24 EC		
Birch leaf miners ³	Birch	MB
Sawflies (open-feeding) ¹	Spruce, larch, willow, pine	MB, H
Large aspen tortrix	Aspen	MB
Chokecherry fruit insects	Chokecherry	MB
Saskatoon fruit insects ⁵	Saskatoon	MB
Dylox (trichlorfon) 42 EC		
Chokecherry fruit insects ⁴	Chokecherry	MB
Saskatoon fruit insects ⁵	Saskatoon	MB
Orthene (acephate) 75 SP		
Large aspen tortrix	Aspen	MB
Ripcord (cypermethrin) 40 EC		
Forest tent caterpillar	Aspen, poplar	MB
Sawflies (open-feeding) ¹	Pine, spruce, willow, larch	MB
Aphids (open-feeding) ²	Maple, caragana, saskatoon	MB
Spruce spider mite	Spruce	MB

Table 6. Continued.

Marketing type, pest	Host	Method
Sevin (carbaryl) 50 WP Large aspen tortrix	Aspen	MB
Supracide (methidathion) 25 EC Forest tent caterpillar	Aspen, poplar	MB
Sawflies (open-feeding) ¹	Spruce, pine, willow, larch	MB
Aphids (open-feeding) ²	Maple, caragana	MB
Birch leaf miners ³	Birch	MB
Talcord (permethrin) 40 EC Forest tent caterpillar	Aspen, poplar	MB, OD
Sawflies (open-feeding) ¹	Pine, spruce, willow, larch	MB
Large aspen tortrix	Aspen	MB
Vydate (oxamyl) 25 EC Forest tent caterpillar	Aspen, poplar	MB
Sawflies (open-feeding) ¹	Larch, spruce, willow	MB
Aphids (open-feeding) ²	Maple, caragana, saskatoon	MB

¹ Sawflies (open-feeding): *Pikonema alaskensis* Roh., *Pristiphora erichsonii* Htg., *Nematus fulvicrus* Prov., *Neodiprion pratti banksianae* Roh., *Nematus ribesii* (Scop.), *Caliroa cerasi* (L.).

² Aphids (open-feeding): *Periphyllus negundinis* (Thos.), *Acyrtosiphon caraganae* (Cholodk.), *Nearctaphis soriata* (Gillette and Bragg), *Aphid* spp.

³ Birch leaf miners: *Fenusa pusilla* (Lep.), *Heterarthrus nemoratus* (Fall.), *Profenusa thomsoni* (Konow).

⁴ Chokecherry fruit insects: *Hoplocampa lacteipennis* (Roh.), *Contarinia virginianiae* (Felt).

⁵ Saskatoon fruit insects: *Hoplocampa lacteipennis* (Roh.), *H. montanica* Roh., *H. halcyon* (Nort.), *H. pallipes* MacG.

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APPENDIX I

LIST OF INSECTICIDES AND CHEMICAL NAMES

acephate	0,S-Dimethyl acetylphosphoramidothiote
Ambush	see permethrin
Basudin	see diazinon
Baygon	see propoxur
Belmark	see fenvalerate
carbaryl	1-Naphthyl methylcarbamate
cygon	see dimethoate
cypermethrin	synthetic pyrethroid
Cythion	0,0-Dimethyl phosphorodithioate ester of diethyl mercaptosuccinate
Dacamox	see thiofanox
diazinon	<u>0,0</u> -Diethyl 0-(2-isopropyl-6-methyl-5-pyrimidinyl) phosphorothionate
Dimecron	see phosphamidon
dimethoate	<u>0,0</u> -Dimethyl S-(N-methylcarbamoylmethyl) phosphorodithioate
Dutox	trichlorfon and oxydemeton-methyl
Dylox	see trichlorfon
fenbutatin oxide	Hexakis (2-methyl-2 phenylpropyl)-distannoxane
fenvalerate	synthetic pyrethroid
methidathion	<u>0,0</u> -Dimethyl phosphorodithioate, S-ester with 4-(mercaptomethyl)-2-methoxy-1,3,4-thiadiazolin-5 one
Nam-A-Tak	experimental
Orthene	see acephate
oxamyl	Methyl N',N'-dimethyl-N-([methylcarbamoyl] oxy)-1-thiooxamimdate
oxydemeton-methyl	(S-(2-ethylsulfinyl)ethyl) 0,0-dimethyl phosphorothioate
permethrin	m-phenoxybenzyl(+ or -)-cis, trans-3(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate
phosphamidon	(2-Chloro-2-(diethylcarbamoyl)-1-methylvinyl)-dimethyl phosphate
propoxur	2-(1-methylethoxy)phenyl methylcarbamate

List of insecticides and chemical names, continued

Ripcord	see cypermethrin
Sevin	see carbaryl
Supracide	see methidathion
Talcord	see permethrin
Temik	see aldicarb
thiofanox	3,3-Dimethyl-1-(methylthio)-2-butanone-0-([methylamino]-carbonyl)oxime
trichlorfon	Dimethyl(2,2,2-trichloro-1-hydroxyethyl)phosphonate
Ultracide	see methidathion
Vendex	see fenbutatin oxide
Volaton	see phoxim
Vydate	see oxamyl