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Pesticide field trials on shade and shelterbelt trees in Alberta, 1975

by J. A. Drouin and D. S. Kusch

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PESTICIDE FIELD TRIALS ON SHADE AND SHELTERBELT TREES IN ALBERTA, 1975

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ABSTRACT

Thirty-seven insecticides and one fungicide were tested for the control of pests in shade and shelterbelt trees in 95 separate evaluations. The target organisms were 14 insect and 1 fungal species. Purpose of the trials was to obtain information on chemical efficacy, timing of application, equipment performance, and chemical effects on the non-target species to provide data for Canadian registration of successful candidate chemicals. Good to excellent control was obtained in 70 of the treatments. As a result 17 of the pesticides tested now provide efficacy data to support their registration for control of 8 specific insect pests.

RÉSUMÉ

Les auteurs testèrent trente-sept insecticides et un fongicide pour leur efficacité contre les infestations d'insectes nuisibles aux arbres produisant d l'ombre et aux rideaux d'arbres. Ils effectuèrent 95 différentes évaluations. Le groupe cible comprenait 14 espèces d'insectes et 1 espèce de champignon. Les essais consistaient à obtenir des données sur l'efficacité chimique, le temps d'application, l'accomplissement des dispositifs et les effets chimique produits sur les espèces non visées, ceci pour permettre l'enregistrement au Canada de produits chimiques efficaces. L'efficacité variait de bonne à excellente dans 70 des traitements. A la suite de ces essais, on peut maintenant pourvoir la donnée efficace pour soutenir l'enrigistrement de 17 des pesticides testés pour leur utilisation contre 8 insecte nuisibles specifiques.

CONTENTS

INTRODUCTION

Infestations of insects and diseases on trees and shrubs frequently require control by means of pesticides. Because pesticides require registration for specific pest and host species, field efficacy data are necessary to support these registrations. To obtain these data, efficacy trials with experimental or established pesticides to control pests were continued in 1975 as part of an ongoing program at the Northern Forest Research Centre. Results of the 1974 tests (Drouin and Kusch 1975) have provided new efficacy data to support registration recommendations of pesticides for the control of specific pests such as sawflies and aphids.

The objectives of these trials were to 1) establish the most suitable control methods, 2) develop low-hazard application techniques, and 3) furnish the data necessary to support new Canadian registrations for the successful candidate chemicals.

MATERIALS AND METHODS

In the 1975 field trials, 37 insecticides and 1 fungicide were tested for their efficacy (Table 1). Fourteen insect species and one fungal species were the target organisms (Table 2). The treatments were carried out at 12 sites which included nurseries, plantations, reclamation sites, and recreational areas on crown, provincial, municipal and privately owned lands in Alberta. In total 95 separate evaluations were made to test pesticides using five application methods: mist blower, ultra low volume, hydraulic and compressed air sprays, and soil drenches.

Soil drenches (SD) are a suitable method of application where timing is not critical and where direct foliar contamination and drift may be undesirable. All soil drenches were carried out with broad spectrum insecticides having both contact and systemic action against insects feeding on or within stems and foliage. Chemicals were applied into holes dug within the drip line at the base of the tree or shrub and well watered to improve their translocation. Chemical dosages were related to basal stem diameters for treatment of a willow stem sawfly, spruce and larch sawflies, pear slug, pitch nodule maker, and a scale insect on pine.

The ultra low volume (ULV) technique is relatively new to pest control. Unlike thermal fogging, which has several major drawbacks, ultra low volume spray provides distinct advantages of increased speed, lower application costs, less pesticide used, reduced environmental contamination, and greater latitude in treatment period. The unit in use (TOT 2S) has a gravity-fed rotary atomization of specially formulated oil-based chemicals (pbi/Turbair) delivered with sufficient air stream turbulence to produce droplets in the 60-110 micron range.

Efficacy trials were continued with the backpack mist blower (MB) (Solo), a specialized hydraulic sprayer (H), and a compressed air sprayer (HP). Evaluation of air-emulsion spray adjuvants and foam-producing spray emission equipment and spreader-stickers was continued with the application of pesticides. The objectives were to determine physical characteristics (foaming, visibility), insecticidal activity, speed of application, spray drift, plant damage, stability, and coverage. The equipment consisted of a Spraying Systems gunjet (43H)

equipped with a foamjet tip (FJ0020) with hydraulic delivery regulated to 54 kg/cm^2, (750 p.s.i.) using a short-life foaming agent, Atplus 540® (Atlas Chemical Industries) for two trials. The spreader-sticker Atplus 526® (Atlas Chemical Industries) was applied with a mist blower in 43 treatments, and with a compressed air hand sprayer in 1 treatment. Atplus 526® was used as a spray tank additive to improve the spreading, wetting, and sticking properties of chemical sprays. It gave effective coverage on water-repelling foliage, reduced spray run-off, and improved chemical retention. No attempts were made to evaluate Atplus 540® in terms of retention on foliage or spray volume increase or decrease on a per-acre basis. No phytotoxicity was recorded at any spray site using these adjuvants. Trials using short- and long-life adjuvants will be continued in 1976. Some new formulations and mixed insecticides (composed of two or more chemicals) were evaluated. However, all the commercial insecticides were tested on specific pests and host species for possible label expansion. Chemical descriptions (Kenaga and Allison 1971) and details of insecticides are presented in Appendix I. The exclusion of certain manufactured products from the results does not imply rejection, nor does the mention of other products imply exclusive endorsement by the Canadian Forestry Service.

Table 1. Pesticides used in field trials on shade and shelterbelt trees in Alberta, 1975

Trade Name and Formulation	Common Name	Supplier
Basudin 50 EC	diazinon	Ciba-Geigy
Baygon 1.5 EC	propoxur	Chemagro
Benlate 50 WP	benomyl	DuPont
Carzol SP 92%	formetanate	FMC of Can.
CGA 12223 10G	experimental	Ciba-Geigy
Cygon 4E	dimethoate	Cyanamid
Dacamox 10G	thiofanox	Diamond-Shamrock
Dutox EC 23%	trichlorfon and oxydemeton-methyl	Chipman
Fundal SP 97%	chlordimeform	FMC of Can.
Furadan 10G	carbofuran	FMC of Can.
Galecron 50 EC	chlordimeform	Ciba-Geigy
Gardona 75 SP	tetrachlorvinphos	Shell
Hosdon 4G	isothioate	Ciba-Geigy
Imidan 50 W	phosmet	Chipman
Kelthane EC 18%	dicofol	Rohm and Haas
Lannate L 25%	methomyl	DuPont
Lorsban 25W	chlorpyrifos	Dow
Malathion 50 EC	cythion	FMC of Can.
Malathion ULV 1.8%	cythion	Turbair
Meta-Systox-R 25%	oxydemeton-methyl	Chemagro
Nexion 25 WP	bromophos	Ciba-Geigy
Omite 30 W	propargite	Uniroyal
Orthene 75 WP	acephate	Chevron
Pirimor 50 W	pirimicarb	Chipman
PP 505 10G	experimental	Chipman
Resmethrin ULV 0.69%	Synthrin	Turbair
RH 218 50 EC	experimental	Rohm and Haas
R 28627 25 W	experimental	Chipman
Sevin 50 WP	carbaryl	FMC of Can.
Supracide 40 EC	methidathion	Ciba-Geigy
Systemic ULV	dimethoate, dicofol, methoxychlor	Turbair
Temik 10G	aldicarb	Union Carbide
Tetrachlorvinphos ULV 2.5%	Gardona	Turbair
Thiodan 4E	endosulfan	FMC of Can.
Vapona-Methoxychlor ULV 6%	dichlorvos-methoxychlor	Turbair
Volaton 50 EC	phoxim	Chemagro
Volaton 10G	phoxim	Chemagro
Vydate L 25%	oxamyl	DuPont

Table 2. Target pest species in pesticide field trials on shade and shelterbelt trees, 1975

Pests	Scientific Name	Host
Forest tent caterpillar	Malacosoma disstria (Hübner)	T. aspen
Yellow-headed sawfly	Pikonema alaskensis (Rohwer)	Spruce
Willow stem sawfly	Euura atra (Jurine)	Willow
Larch sawfly	Pristiphora erichsonii (Hartig)	Larch
Spruce spider mite	Oligonychus ununguis (Jacobi)	Spruce
Pitch nodule maker	Petrova albicapitana (Busck.)	Pine
Pear slug	Caliroa cerasi (L.)	Cotoneaster
Cherry midge	Contarinia verginianiae (Felt)	Chokecherry
Boxelder aphid	Periphyllus negundinis (Thomas)	M. maple
Aphids	Aphidae	Saskatoon
Ugly nest caterpillar	Archips cerasivoranus (Fitch)	Chokecherry
Ash bug	Neoborus aemoenus Reuter	G. ash
Boxelder twig borer	Proteoteras willingana (Kearfott)	M. maple
Jack pine scale	Toumeyella numismaticum (Petitt and McD.)	Pine
Disease		
Rust	Gymnosporangium clavipes (Cooke and Peck)	Saskatoon

GLOSSARY

a.i. = Active ingredient

EC = Emulsifiable concentrate

G = Granular

HP = Hand pump

H = Hydraulic

L = Liquid

MB = Mistblower

SD = Soil drench

SP = Soluble powder

ULV = Ultra low volume

WP = Wettable powder

	METRIC		ENGLISH
Length	2.54 cm	=	1 in.
	.305 m	=	1 ft
Area	0.404 686 ha	=	1 acre
Weight	28.35 g	=	1 oz
	0.453 592 kg	=	1 lb
Volume	5 ml	=	1 tsp
	28.41 ml	=	1 oz
	4.546 litre	=	1 gal

RESULTS OF FIELD TRIALS

PEST: Forest tent caterpillar, Malacosoma disstria (Hübner)

HOST: Poplar

MATERIALS: Basudin (diazinon) 50 EC, Malathion (cythion) 50 EC, and ULV, Supracide (methidathion) 40 EC, RH 218 50 EC, Resmethrin (ULV), Thiodan (endosulfan) 4E, Sevin (carbaryl) 50 WP, Nexion (bromophos) 25 WP, Lorsban (chlorpyriphos) 25 W, Fundal (chlordimeform) 97 SP, Cygon (dimethoate) 4E, Vapona-Methoxychlor (ULV), Orthene (acephate) 75 SP, Galecron (chlordimeform) 50 EC, Gardona (tetrachlorvinphos) 75 WP, Baygon (propoxur) 1.5 EC, Tetrachlorvinphos (ULV), Systemic (ULV)

PROCEDURE: Twenty plots established in farm woodlands were sprayed. Two chemicals (Basudin EC and Galecron EC) were applied as ovicides in early May before the eggs hatched and 18 were applied as sprays in early June when most larvae were in the 2nd or 3rd instar. Fifteen sprays were applied with a backpack mist blower (Solo) on 0.04-ha plots with 5 ml (1 tsp) Atplus 526 spreader-sticker added per 9 litres solution. Five sprays were applied using an ultra low volume roto sprayer and oil base formulations on plots consisting of 10 tree units each. Percentage control was assessed by egg hatch and larval counts before and within 72 h after spraying.

RESULTS: Most chemicals provided good to excellent (70-100%) control (Table 3), verifying previously reported data (Drouin and Kusch 1975). Previous results with Galecron were also consistent at near 50% control.

Table 3. Description and results of 1975 field trials, forest tent caterpillar, Malacosoma disstria (Hübner)

Material	Type	Litres	Dosage a.i. (ml or g)	Plot (ha)	Av. dbh (cm)	Av Ht (m)	% Control
Basudin EC	MB	9.1	28.4	0.04	6.3	6.0	100
Basudin EC	MB*	9.1	28.4	0.04	5.0	5.0	77
Malathion EC	MB	9.1	28.4	0.04	7.6	6.7	100
Malathion	ULV	28.4 ml	0.5	10 T	3.0	4.0	90
Supracide EC	MB	9.1	28.4	0.04	5.0	5.5	100
RH 218 EC	MB	9.1	28.4	0.04	5.0	5.5	100
Resmethrin	ULV	42.0 ml	0.3	10 T	3.0	4.0	100
Thiodan EC	MB	9.1	28.4	0.04	6.3	6.0	95
Sevin WP	MB	9.1	28.4	0.04	5.0	5.5	95
Nexion WP	MB	9.1	28.4	0.04	7.6	6.7	95
Lorsban WP	MB	9.1	28.4	0.04	9.0	9.0	95
Fundal SP	MB	9.1	28.4	0.04	5.0	5.5	95
Cygon EC	MB	9.1	28.4	0.04	6.3	6.7	80
Vapona-Methoxychlor	ULV	28.4 ml	1.7	10 T	3.0	5.5	80
Orthene SP	MB	9.1	28.4	0.04	7.6	6.7	70
Galecron EC	MB*	9.1	28.4	0.04	5.0	5.0	48
Gardona SP	MB	9.1	28.4	0.04	5.0	5.5	40
Baygon EC	MB	9.1	28.4	0.04	6.3	6.0	20
Tetrachlorvinphos	ULV	28.4 ml	0.7	10 T	3.0	4.0	20
Systemic	ULV	28.4 ml	--	10 T	3.0	5.5	20

T = tree unit
* = ovicide application

COMMENTS: Defoliation was less noticeable in the treated plots than in the untreated areas. Some phytotoxicity occurred to aspen treated with RH 218. An egg band survey in the plot areas showed an average of 12.0 egg bands per tree, a 50% drop from 1974.

PEST: Yellow-headed spruce sawfly, Pikonema alaskensis (Rohwer)

HOST: Spruce

MATERIALS: Basudin (diazinon) 50 EC, Malathion (cythion) 50 EC and ULV, Lannate (methomyl) L, Sevin (carbaryl) 50 WP, Imidan (phosmet) 50 WP, Cygon (dimethoate) 4E, Orthene (acephate) 75 SP, Furadan (carbofuran) 10G, Baygon (propoxur) 1.5 EC, Systemic (ULV), Resmethrin (ULV), PP 505 10G, Galecron (chlordimeform) 50 EC, Vapona-Methoxychlor (ULV), CGA 12223 10G, Hosdon (isothioate) 4G, Supracide (methidathion) 40 EC, Volaton (phoxim) 10G

PROCEDURE: Twenty-one plots were established in an 8-yr-old plantation and a recreation area in 1975. Eleven insecticides were applied as soil drenches, six were sprayed with a backpack mist blower, and four sprayed with an ultra low volume roto sprayer. Soil drenches were at the rate of approximately 5 g or ml/cm of basal diameter of the trees. Atplus 526 spreader-sticker was added to all of the mist blower solutions at the rate of 2.5 ml (1/2 tsp)4.5 litres. Oil base formulations were used in the ultra low volume applications. Percentage control was determined with the use of control plots for the soil drenches and by branch counts before and within 48 h after spraying.

RESULTS: See Table 4.

COMMENTS: Most chemicals gave good to excellent (51-100%) control, verifying previously reported data. No attempt was made to evaluate the insecticidal effects on a high population of spruce gall aphids and spruce spider mite in the general area.

PEST: Willow stem sawfly, Euura atra (Jurine)

HOST: Willow

MATERIALS: Cygon (dimethoate) 4E, Baygon (propoxur) 1.5 EC, Meta-Systox-R (oxydemeton-methyl) 25 EC, Basudin (diazinon) 50 EC, Furadan (carbofuran) 10G, Vydate (oxamyl) L 25, Volaton (phoxim) 10G, Supracide (methidathion) 40 EC, Temik (aldicarb) 10G, Orthene (acephate) 75 WP, Galecron (chlordimeform) 50 EC, Dacamox (thiofanox) 10G, CGA 12223 10G

PROCEDURE: Thirteen soil drenches were conducted on plots established in willow stool beds in a tree nursery in 1975. Basal diameters were based on the cumulative total of the stems in each stool bed. Percentage insect control was determined by the random sampling and dissection of 10 46-cm whips taken from treated and untreated plots 8 weeks after application and applying Abbott's formula.

RESULTS: Control varied from excellent to insignificant (Table 5).

COMMENTS: The primary target of this willow sawfly appears to be acute willow, but peach leaf, golden, laurel leaf, and native willows are also attacked. Adults emerge over a long period, starting in late May, and by July egg laying is complete. Shoots are killed directly from the

Table 4. Description and results of 1975 field trials on yellow-headed spruce sawfly, Pikonema alaskensis (Rohwer)

Material	Type	Litres	Dosage a.i. (ml or g)	Plot (trees)	Av dbh (cm)	Av ht (m)	% Control
Basudin EC	MB	4.5	3.1	20	4.0	1.4	100
Malathion EC	MB	4.5	3.1	20	4.0	1.4	100
Malathion	ULV	56.8 ml	1.0	10	9.0	4.6	95
Lannate L	MB	4.5	3.1	20	4.0	1.4	100
Sevin WP	MB	4.5	3.1	20	4.0	1.4	100
Imidan WP	MB	4.5	3.1	20	4.0	1.4	100
Cygon EC	MB	4.5	3.1	20	4.0	1.4	100
Cygon EC	SD	0.22	110.0	5	4.0	1.5	98
Orthene SP	SD	0.16 kg	120.0	5	4.0	1.5	98
Furadan G	SD	1.0 kg	100.0	5	4.5	1.4	98
Baygon EC	SD	0.8	120.0	5	4.8	1.4	98
Systemic	ULV	56.8 ml	--	10	10.0	4.6	98
Resmethrin	ULV	56.8 ml	0.4	10	9.0	4.6	91
PP 505 G	SD	0.79 kg	79.4	5	3.5	1.2	67
Galecron EC	SD	0.22	110.0	5	4.0	1.0	64
Vapona-Methoxychlor	ULV	56.8 ml	3.4	10	10.0	5.5	51
CGA 12223 G	SD	0.90 kg	90.0	5	4.0	1.5	47
Hosdon G	SD	1.78 kg	71.0	5	4.0	1.3	0
Supracide EC	SD	0.28	112.0	5	4.0	1.0	0
Volaton G	SD	0.79 kg	79.0	5	3.5	1.5	0
Basudin EC	SD	0.25	125.0	5	4.3	1.5	0

Table 5. Description and results of 1975 field trials, willow stem sawfly, Euura atra (Jurine)

Material	Litre	Dosage a.i. (ml or g)	Plot (trees)	Av dbh (cm)	Av ht (m)	% Control
Cygon EC	0.69	344	5	12.5	0.9	93
Baygon EC	2.1	320	5	12.5	0.9	81
Meta-Systox-R EC	2.3	578	7	15.0	1.8	81
Basudin EC	0.7	350	5	12.7	0.9	64
Furadan G	2.88 kg	288	5	12.8	1.0	48
Vydate L	1.36	341	5	12.4	0.9	25
Volaton G	2.86 kg	286	5	12.7	1.0	20
Supracide EC	0.81	325	5	12.5	0.9	19
Temik G	10.12 kg	1000	15	15.0	1.8	9
Orthene SP	0.47 kg	352	5	12.5	0.9	4
Galecron EC	0.69	346	5	12.6	0.9	1
Dacamox G	4.72 kg	472	7	15.0	1.8	0
CGA 12223 G	2.81 kg	281	5	12.5	0.9	0

extensive attacks, when as many as 13 larvae are found in a 30.5-cm stem. These attacks also act as entry points for disease and promote desiccation. Heaviest attacks occurred in acute willow stool beds cut for propagation in late fall. The insecticides were applied in early July when 75% of the population was in the first instar.

Control of the stem sawfly is most desirable in nurseries because of the high commercial value of the willows. Soil drench trials will be continued in the 1976 field program.

PEST: Larch sawfly, Pristiphora erichsonii (Hartig)

HOST: Larch

MATERIALS: Cygon (dimethoate) 4E, Sevin (carbaryl) 50 WP, Galecron (chlordimeform) 50 EC, Basudin (diazinon) 50 EC, Dutox (trichlorfon and oxydemeton-methyl) 23 EC, Vydate (oxamyl) L 25, Supracide (methidathion) 40 EC, Resmethrin (ULV)

PROCEDURE: Eight foliar sprays were conducted in plots established in a farm shelterbelt. Seven were applied with a backback mist blower at the rate of 3 g or ml (a.i.) per litre of solution with 5 ml (1 tsp) Atplus 526 spreader-sticker added per 9 litres. Plots consisted of seven trees averaging 8.5 m in height and 15 cm dbh. One spray was applied with an ultra low volume roto sprayer and an oil base formulation at the rate of 28 ml (0.2 ml a.i.) for three trees averaging 5.5 m in height and 12.7 cm dbh. Percentage control was assessed by insect counts before and within 72 h after treatment.

RESULTS: All chemicals gave excellent results of 100%, verifying previously reported data (Drouin and Kusch 1973, 1974). Dutox and Vydate, however, were tested for the first time.

COMMENTS: The shelterbelt consisted of 16-yr-old Siberian and European larch.

PEST: Spruce spider mite, Oligonychus ununguis (Jacobi)

HOST: Spruce

MATERIALS: Kelthane (dicofol) 18 EC, R 28627 25 W, Carzol (formetanate) 92 SP, Basudin (diazinon) 50 EC, Omite (propargite) 30 W, Pirimor (pirimicarb) 50 W

PROCEDURE: Six plots were established in an 8-yr-old plantation and chemicals were applied with a backpack mist blower to trees averaging 1.5 m in height. Atplus 526 spreader-sticker was added to the solution at the rate of 5 ml (1 tsp)/9 litres. One trial was conducted in a farm shelterbelt approximately 17 yr old using a hydraulic sprayer unit. Atplus 540 short-life adjuvant-foamer was added at the rate of 0.71 litres per 227 litres solution. Percentage insect control was determined by samples taken from treated and untreated plots 7 days after spraying and applying Abbott's formula.

RESULTS: All chemicals gave excellent control (Table 6).

COMMENTS: Spray emission hardware and foaming agents produced good spray visibility and coverage. Medium to severe spider mite and spruce gall aphid populations were recorded in the plantation area.

Table 6. Description and results of 1975 field trials, spruce spider mite, Oligonychus ununguis (Jacobi)

Material	Type	Litres	Dosage a.i. (ml or g)	Plot (trees)	Av dbh (cm)	Av ht (m)	% Control
Kelthane EC	MB	9.1	26.0	12	4.0	1.4	100
R 28627 W	MB	9.1	28.3 g	9	4.4	1.5	100
Carzol SP	MB	9.1	27.6 g	17	4.0	1.5	100
Basudin EC	MB	9.1	28.4	12	4.0	1.5	100
Basudin EC	H	227.0	114.0	100	15.0	6.7	90
Omite W	MB	9.1	28.0 g	15	3.8	1.4	98
Pirimor W	MB	9.1	28.3 g	11	3.8	1.5	90

PEST: Pitch nodule maker, Petrova albicapitana (Busck)

HOST: Pine

MATERIALS: Cygon (dimethoate) 4E, Furadan (carbofuran) 10G, Orthene (acephate) 75 SP, Volaton (phoxim) 50 EC

PROCEDURE: Four soil drenches were conducted in a tree nursery. Chemicals were applied at the rate of 4.5-5.5 g or ml (a.i.) per cm of basal diameter. There were 10 trees per plot averaging 5 cm in diameter and 1.8 m in height. Percentage insect control was determined 10 weeks after application by examination and analysis of all nodules in the treated and control plots and applying Abbott's formula.

RESULTS: Cygon gave 67% control, Furadan 65%, Orthene 42%, and Volaton no control.

COMMENTS: In plantations in the prairie provinces jack pine and particularly lodgepole pine are susceptible to severe attack and damage. In this high-value nursery block there were from 2 to 29 attacks per tree. Emergence occurred in all plots, indicating treatments should be conducted for 2 successive years.

PEST: Pear slug, Caliroa cerasi (L.)

HOST: Cotoneaster

MATERIALS: Cygon (dimethoate) 4E, Furadan (carbofuran) 10G, Orthene (acephate) 75 SP, Volaton (phoxim) 50 EC

PROCEDURE: Four soil drenches were conducted on ornamentals on private property. Chemicals were applied at the rate of 4.5-5.5 g or ml (a.i.) per cm of basal diameter (cumulation of stems). Each plot consisted of five shrubs averaging 5 cm in diameter and 1.2 m in height. Percentage insect control was determined by insect counts on randomly selected leaves from treated and untreated plots 3 weeks after application and applying Abbott's formula.

RESULTS: Cygon gave 99% control, Furadan 94%, Orthene 82%, and Volaton 60%. These results verified previously reported test data.

COMMENTS: Leaf samples indicated many dead embryonic larvae and unhatched eggs in all treated areas.

PEST: Chokecherry midge, Contarinia virginianiae (Felt)

HOST: Chokecherry

MATERIALS: Basudin (diazinon) 50 EC, Malathion (cythion) 50 EC, Resmethrin (ULV)

PROCEDURE: Two sprays were applied in a tree nursery with a backpack mist blower at the rate of 9 litres (28 ml a.i.) per 0.04 ha on bushes averaging 3 m in height. Five ml (1 tsp) Atplus 526 spreader-sticker was added to the solution. A third spray was applied with an ultra low volume roto sprayer and an oil base formulation at the rate of 28 ml (0.2 ml a.i.) per 6 bushes 3 m in height. Percentage insect control was determined by examination of randomly selected whips from treated and untreated plots 4 weeks later.

RESULTS: All chemicals gave excellent results at 100%.

COMMENTS: The flowers were at peak petal drop at the time the chemicals were applied. Light phytotoxicity on the foliage occurred at both ends of the Malathion and Basudin plots, indicating a spray overlap.

PEST: Boxelder aphid, Periphyllus negundinis (Thomas)

HOST: Manitoba maple

MATERIALS: Cygon (dimethoate) 4E

PROCEDURE: One spray test was conducted in a farm shelterbelt using a backpack mist blower. The plot consisted of eight trees averaging 3.6 m in height which were sprayed with 9 litres (28 ml a.i.) of solution with 5 ml (1 tsp) Atplus 526 spreader-sticker added. Percentage insect control was assessed by using a branch sampling technique before and within 72 h after treatment.

RESULTS: No living insects were found, indicating excellent control and verifying previously reported data.

COMMENTS: Aphid populations increased as fall temperatures decreased.

PEST: Aphids

HOST: Saskatoon

MATERIALS: Basudin (diazinon) 50 EC, Lannate (methomyl) L 25, Malathion (ULV), Systemic (ULV), Vapona-Methoxychlor (ULV), Resmethrin (ULV), Tetrachlorvinphos (ULV)

PROCEDURE: Seven spray tests were conducted in a recreation area. Two were applied with a backpack mist blower on 0.04 ha of regeneration ornamental shrubs with 2.5 ml (1/2 tsp) Atplus 526 spreader-sticker added to the solution. Five sprays were applied using an ultra low volume roto sprayer and oil base formulations on plots 0.04 ha in size. Percentage insect control was determined by random sampling of leaves in treated and untreated plots 72 h after treatment and applying Abbott's formula.

RESULTS: Most chemicals gave excellent control (Table 7). Results with Resmethrin and Tetrachlorvinphos were considered fair. All tests, however, more or less verified previously reported data on open-feeding aphids.

COMMENTS: Aphid populations in the area increased as fall temperatures decreased.

PEST: Ugly nest caterpillar, Archips cerasivoranus (Fitch)

HOST: Chokecherry

MATERIALS: Dutox (trichlorfon and oxydemeton-methyl) 23 EC, Cygon (dimethoate) 4E

PROCEDURE: Two spray tests were conducted in a recreation area with a compressed air hand pump. Chemicals were applied to the insect egg masses in early spring at the rate of 4.5 litres (14 ml a.i.) solution per 0.02 ha of regeneration shrubs. The Dutox had 2.5 ml (1/2 tsp) Atplus 526 spreader-sticker added. Percentage insect control was assessed by microscopic examination of randomly selected egg masses from treated and untreated plots after eclosion had been completed and by applying

Table 7. Description and results of 1975 field trials for plant lice, Aphidae

Material	Type	Dosage Litres	Dosage a.i. (ml)	Av dbh (cm)	Av ht (m)	% Control
Basudin EC	MB	4.5	3.1	1.3	1.5	100
Lannate L	MB	4.5	3.1	1.3	1.6	100
Malathion	ULV	28.4 ml	0.5	1.4	1.5	98
Systemic	ULV	28.4 ml	--	1.8	1.6	98
Vapona-Methoxychlor	ULV	28.4 ml	1.7	1.3	1.5	94
Resmethrin	ULV	28.4 ml	0.2	1.5	1.6	45
Tetrachlorvinphos	ULV	28.4 ml	0.7	1.5	1.7	36

Abbott's formula.

RESULTS: Dutox gave excellent control at 82% and Cygon good control at 68%.

COMMENTS: Better ovicide coverage could be achieved by using a hydraulic sprayer and an adjuvant and applying to the drip stage.

PEST: Green ash bug, Neoborus aemoenus Reuter

HOST: Green ash

MATERIALS: Basudin (diazinon) 50 EC, Cygon (dimethoate) 4E

PROCEDURE: Two spray tests were conducted in a tree nursery with a backpack mist blower. Chemicals were applied at the rate of 9 litres (28 ml a.i.) per 30 trees averaging about 2.5 m in height, with 5 ml (1 tsp) Atplus 526 spreader-sticker added to the solution. Percentage insect control was determined by random leaf sampling in treated and untreated plots 72 h after application.

RESULTS: Both chemicals gave 100% control.

COMMENTS: Very light phytotoxicity occurred in both plots. Light frost (0°C) had caused yellowing of foliage.

PEST: Boxelder twig borer, Proteoteras willingana (Kearfott)

HOST: Manitoba Maple

MATERIALS: Basudin (diazinon) 50 EC

PROCEDURE: One spray test with a hydraulic sprayer unit was conducted in a farm shelterbelt. The chemical was applied at the rate of 113 litres (56 ml a.i.) per 25 trees averaging about 3 m in height, with 0.57 litres of Atplus 540 adjuvant-foamer added to the solution. Percentage insect control was determined by random leaf sampling in treated and untreated plots within 48 h after treatment and applying Abbott's formula.

RESULTS: Analysis indicated 34% insect control.

COMMENTS: Better results could have been achieved had the area been sprayed 6 days earlier, because most of the current year's larvae had left the leaves, migrated to the twigs, and bored into the newly formed buds. Larvae examined inside the twigs were unaffected by the spray. The foam-producing spray emission equipment and agent gave good visibility and coverage. No phytotoxicity occurred in the plot.

PEST: Pine tortoise scale, Toumeyella numismaticum (Petitt and McD.)

HOST: Pine

MATERIALS: Furadan (carbofuran) 10G

PROCEDURE: One soil drench test was conducted on potted pine root stocks used for grafting purposes growing in a research greenhouse. Chemical granules were applied to the soil around 14 plants at the rate of 28 g (2.8 g a.i.) per 0.6 cm basal diameter. Percentage insect control was determined by examination of treated and untreated stock 14 days after application.

RESULTS: No living insects were found after examination of the treated plants, indicating 100% control.

COMMENTS: A light aphid infestation of the pine root stocks was also eliminated.

PEST: Rust disease, Gymnosporangium clavipes (Cooke and Peck)

HOST: Saskatoon

MATERIALS: Benlate (benomyl) 50 WP

PROCEDURE: One spray test was conducted on regeneration shrubs in a tree nursery. The chemical was applied with a backpack mist blower at the rate of 9 litres (28 g a.i.) solution per 0.04 ha and repeated in the same plot 10 days later with 5 ml (1 tsp) Atplus 526 spreader-sticker added to the solution.

RESULTS: Due to insufficient rust disease throughout the general area, the results were inconclusive. Very light occurrence of another rust, Gymnosporangium nelsonii Arth. was recorded in the spray and control plots when they were examined August 14. The fungicide was still in evidence on the foliage indicating the effectiveness of the A 526 spreader-sticker.

SUMMARY OF 1975 FIELD TRIALS

1	HP	Dutox	Archips	82% con-	49	SD	Vydate	Euura	25% con-
2	HP	Cygon 4E	"	68 trol	50	SD	Baygon	"	81 trol
3	MB	Galecron	F.T.C.	48	51	SD	Dacomox	"	00
4	MB	Basudin	"	77	52	SD	Meta-S-R	"	81
5	SD	Cygon 4E	Petrova	67	53	SD	Basudin	"	64
6	SD	Volaton	"	00	54	SD	Temik	"	9
7	SD	Orthene	"	42	55	SD	CGA 12223	"	00
8	SD	Fur. 10G	"	65	56	SD	Cygon 4E	P. slug	99
9	SD	Cygon 4E	Y.H.S.	98	57	SD	Orthene	"	82
10	SD	Orthene	"	98	58	SD	Volaton	"	60
11	SD	Volaton	"	00	59	SD	Fur. 10G	"	94
12	SD	Galecron	"	64	60	ULV	Resmethrin	Y.H.S.	91
13	SD	PP 505 10G	"	67	61	ULV	Malathion	"	95
14	SD	Supracide	"	00	62	ULV	Systemic	"	98
15	SD	Hosdon 10G	"	00	63	ULV	Vapona	"	51
16	SD	Fur. 10G.	"	98	64	MB	Malathion	"	100
17	SD	Baygon	"	98	65	MB	Basudin	"	100
18	SD	Basudin	"	00	66	MB	Lannate L	"	100
19	SD	CGA 12223	"	47	67	MB	Sevin	"	100
20	SD	Fur. 10G	Scale	100	68	MB	Imidan	"	100
21	MB	Cygon 4E	F.T.C.	80	69	MB	Cygon 4E	"	100
22	MB	Thiodan	"	95	70	MB	Cygon 4E	L. Sfy	100
23	MB	Sevin	"	95	71	MB	Sevin	"	100
24	MB	Basudin	"	100	72	MB	Galecron	"	100
25	MB	Nexion	"	95	73	MB	Basudin	"	100
26	MB	Lorsban	"	95	74	MB	Dutox	"	100
27	MB	Supracide	"	100	75	MB	Vydate L	"	100
28	MB	Malathion	"	100	76	MB	Supracide	"	100
29	MB	Orthene	"	70	77	ULV	Resmethrin	"	100
30	MB	Baygon	"	20	78	MB	Kelthane	S. mite	100
31	MB	RH 218	"	100	79	MB	Omite	"	98
32	MB	Fundal	"	95	80	MB	R 28627	"	100
33	MB	Gardona	"	40	81	MB	Carzol	"	100
34	ULV	Resmethrin	"	100	82	MB	Pirimor	"	90
35	ULV	Malathion	"	90	83	MB	Basudin	"	100
36	ULV	Vapona	"	80	84	HYD	Basudin	Twig b.	34
37	ULV	Tetrachlor	"	20	85	HYD	Basudin	S. mite	90
38	ULV	Systemic	"	20	86	MB	Basudin	bug	100
39	MB	Basudin	Midge	100	87	MB	Cygon 4E	"	100
40	MB	Malathion	"	100	88	MB	Basudin	Aphid	100
41	ULV	Resmethrin	"	100	89	MB	Lannate L	"	100
42	MB	Benlate	Rust	-	90	ULV	Resmethrin	"	45
43	SD	Cygon 4E	Euura	93	91	ULV	Malation	"	98
44	SD	Orthene	"	4	92	ULV	Systemic	"	98
45	SD	Volaton	"	20	93	ULV	Vapona	"	94
46	SD	Galecron	"	11	94	ULV	Tetrachlor	"	36
47	SD	Supracide	"	19	95	MB	Cygon 4E	"	100
48	SD	Fur. 10G	"	48					

42 MB 33 SD 4H,HP 16 ULV

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APPENDIX 1

LIST OF INSECTICIDES AND CHEMICAL NAMES

acephate	O,S-dimethyl N-acetyl phosphoramidothioate
aldicarb	2-methyl-2-(methylthio) propionaldehyde O-(methyl-carbamoyl) oxime
Basudin	see diazinon
Baygon	see propoxur
Benlate	see benomyl
benomyl	methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate
bromophos	O (4-bromo-2,5-dichlorophenyl) O,O-dimethyl phosphorothioate
carbaryl	1-naphthyl methylcarbamate
carbofuran	2,3-dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate
Carzol	see formetanate
CGA 12223	O,O-diethyl O-(1-isopropyl-5-chloro-1,2,4-triazolyl(3)) phosphorothioate
chlordimeform	N-(2-methyl-4-chlorophenyl)-N,N'-dimethylformamidine hydrochloride
chlorpyrifos	O,O-diethyl O-(3,5,6-trichloro-2-pyridyl) phosphorothioate
cygon	see dimethoate
cythion	diethyl meraptosuccinate S-ester with O,O-dimethyl phosphorodithioate
Dacamox	see thiofanox
diazinon	O,O-diethyl O-(isopropyl-6-methyl-4-pyrimidinyl) phosphorothionate
dicofol	1,1-Bis(chlorophenyl)-2,2,2-thrichloroethanol
dichlorvos	2,2-dichlorovinyl dimethyl phosphate
dimethoate	O,O-dimethyl phosphorodithioate S-ester with 2-mercapto-N-methyl-acetamide

Dutox	trichlorfon and oxydemeton-methyl
endosulfan	1,4,5,6,7,7-hexachloro-5-norbornene-2,3-dimethyl cyclic sulfite
formetanate	m-((dimethylamino)methylene)amino) methylcarbamate hydrochloride
Fundal	see chlordimeform
Furadan	see carbofuran
Galecron	see chlordimeform
Gardona	see tetrachlorvinphos
Hosdon	see isothioate
Imidan	see phosmet
Isothioate	O,O-dimethyl S-isopropylthio ethyl phosphorodithioate
Kelthane	see dicofol
Lannate	see methomyl
Lorsban	see chlorpyrifos
Malathion	see cythion
Meta-Systox-R	see oxydemeton-methyl
methidathion	O,O-dimethyl phosporodithioate S-ester with thiodiazolin-5-one
methomyl	S-methyl N-((methylcarbamoyl)oxy)thiacetrimidate
Methoxychlor	1,1,1-trichloro-2,2-bis(p-methoxyphenyl) ethane
Nexion	see bromophos
Omite	see propargite
Orthene	see acephate
oxamyl	S-methyl-1-1-(dimethylcarbamoyl)-N-((methylcarbamoyl) oxy) thioformimidate
oxydemeton-methyl	S(2-(ethylsulfinyl-1,4 oxathiin-3-carboxanilide-4, 4-dioxide

phosmet	O-O-dimethyl phosphorodithioate S-ester with N-(mercaptomethyl) phthalimide
phoxim	phenylglyoxylonitrile oxime O,O-diethyl phosphorothioate
Pirimor	see pirimicarb
pirimicarb	2-(dimethylamino)-5,6-dimethyl-4-pyrimidinyl dimethylcarbamate
PP 505	unknown
propargite	2-(p-tert-butylphenoxy)cyclohexyl-2-propynyl sulfate
Propoxur	O-isopropoxyphenyl methylcarbamate
Resmethrin	(5-benzyl-3-furyl)methyl (+) cis, trans-2,2-dimethyl -3-(2-methylpropeny) cyclopropanecarboxylate
RH 218	unknown
R 28627	S-tricyclohexyltin-O,O-diisopropyl phosphorodithioate
Sevin	see carbaryl
Supracide	see methidathion
Systemic (Turbair)	see dicofol, dimethoate, methoxychlor
Temik	see aldicarb
tetrachlorvinphos	2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate
Thiodan	see endosulfan
thiofanox	3,3 Dimethyl-1-(methylthio)-2-butanone O-((methylamino)-carbonyl) oxime
trichlorfon	dimethyl (2,2,2-trichloro-1-hydroxyethyl) phosphonate
Vapona	see dichlorvos
Volaton	see phoxim
Vydate	see oxamyl