1991
PEST MANAGEMENT
RESEARCH REPORT

Compiled for:

THE EXPERT COMMITTEE
ON PEST MANAGEMENT

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Secretary - C. Hunter

by:

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1991
RAPPORT DE RECHERCHE
DE LA LUTTE DIRIGÉE

Préparé pour:

LE COMITÉ D'EXPERTS
DE LA LUTTE DIRIGÉE

Président - M.G. Dolinski
Secrétaire - C. Hunter

par:

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This annual report is designed to encourage and facilitate the rapid dissemination of pest management research results amongst researchers, the pest management industry, university and government agencies, and others concerned with the development, registration and use of effective pest management strategies. The use of alternative and integrated pest management products is seen by the ECPM as an integral part in the formulation of sound pest management strategies. If in doubt about the registration status of a particular product, consult the Pesticides Directorate, Food Production and Inspection Branch, Agriculture Canada, Ottawa, Ontario, K1A 0C5.

L'objectif poursuivi par la compilation du rapport annuel est de faciliter la diffusion des résultats de la recherche de la lutte dirigée auprès des chercheurs, des industries, des universités, des organismes gouvernementaux et toutes les personnes ou groupes concernés par le développement, la fabrication, l'homologation et l'emploi des produits pour la lutte dirigée. Utilization de produits pour la lutte intégrée ou de produits alternatifs est perçu par Le Comité d'experts de la lutte dirigée comme faisant parti intégrante de l'élaboration d'une stratégie pour la lutte dirigée. En cas de doute relatif à l'enregistrement d'un produit donné, consulter la Direction des pesticides, Direction générale de la production et de l'inspection des aliments, Agriculture Canada, Ottawa (Ontario) K1A 0C6.

FOREWORD

The Expert Committee on Pest Management (ECPM), formerly the National Committee on Pesticide Use in Agriculture (NCPUA) and more recently the Expert Committee on Pesticide Use in Agriculture, formed in 1961 by its parent body, the National Coordinating Committee on Agricultural Services, is one of ten Expert Committees reporting to the Canada Committee on Crop Production Services (CCCPS) which in turn is one of 6 Canada Committees reporting to the Canadian Agricultural Services Coordinating Committee (CASCC).

The Expert Committee on Pest Management has been tasked with summarizing and making available current information on pest management on an annual basis. This year there were 153 reports. We are indebted to the research workers for their cooperation in this field, from provincial and federal departments, as well as universities and industry, together with the section editors and members of the Scientific Information Retrieval Section for making this report possible.

Michael Dolinski
Chairman, ECPM
January, 1992

THIS ANNUAL REPORT IS DESIGNED TO ENCOURAGE AND FACILITATE THE RAPID DISSEMINATION OF PEST MANAGEMENT RESEARCH RESULTS AMONGST RESEARCHERS, THE PESTICIDE INDUSTRY, GOVERNMENT AGENCIES, AND OTHERS CONCERNED WITH THE DEVELOPMENT, REGISTRATION AND USE OF EFFECTIVE PEST MANAGEMENT STRATEGIES.

IF IN DOUBT ABOUT THE REGISTRATION STATUS OF A PARTICULAR PEST CONTROL PRODUCT, CONSULT THE PESTICIDES DIRECTORATE, FOOD PRODUCTION AND INSPECTION BRANCH, AGRICULTURE CANADA, OTTAWA, ONTARIO K1A 0C6.

AVANT-PROPOS

Le Comite d'experts sur la lutte dirigee (CELD), autrefois appele Comite national pour l'emploi des pesticides en agriculture (CNEPA) et plus recemment, Comite d'experts pour l'emploi des pesticides en agriculture, forme en 1961 par son organisme parent, le comite de coordination des services agricoles canadiens (CCSAC), est l'un des dix groupes d'experts qui relevent directement du Comite canadien des productions vegetales (CCPV), lequel a son tour fait partie des six comites places sous l'autorite du Comite de coordination des services agricoles canadiens.

Le Comite d'experts sur la lutte dirigee a la responsabilite de compiler des resumes de rapports de recherche et de diffuser, chaque annee, les donnees les plus recentes, sur la lutte dirigee contre les ravageurs. Ainsi, cette annee, il y a 153 rapports. Les membres du Comite tiennent a remercier chaleureusement les chercheurs des ministeres provinciaux et federaux, des universites et du secteur prive sans oublier les redacteurs et le personnel de la Section d'information sur la recherche scientifique dont la collaboration a permis de rediger le present rapport.

Michael Dolinski
President, CELD, Janvier 1992

L'OBJECTIF POURSUIVI DU RAPPORT ANNUEL EST DE FACILITER LA DIFFUSION DES RESULTATS DE LA RECHERCHE SUR LA LUTTE DIRIGEE AUPRES DES CHERCHEURS, DE L'INDUSTRIE, DES ORGANISMES GOUVERNEMENTAUX ET TOUTES LES PERSONNES OU GROUPES CONCERNES PAR L'HOMOLOGATION ET L'EMPLOI DES PESTICIDES.

EN CAS DE DOUTE RELATIF SUR L'ENREGISTREMENT D'UN PRODUIT DONNE, CONSULTER LA DIRECTION DES PESTICIDES, DIRECTION GENERALE DE LA PRODUCTION ET DE L'INSPECTION DES ALIMENTS, AGRICULTURE CANADA, OTTAWA (ONTARIO) K1A 0C6.

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TABLE DES MATIERES **ENREGISTREMENT**

#001

STUDY DATA BASE: 352-1461-8501

CROP: Apple cv. McIntosh

PEST: Apple aphid, *Aphis pomi* DeGeer

NAME AND AGENCY:
MARSHALL, D.B. and PREE, D.J.
Agriculture Canada, Research Station, Vineland Station, Ontario, L0R 2E0
Tel. (416) 562-4113, Fax (416) 562-4335

TITLE: COMPARISON OF INSECTICIDES FOR CONTROL OF APPLE APHID

MATERIALS: PIRIMOR 50 WP (pirimicarb)
PIRIMOR 50 WG (pirimicarb)
NTN-33893 240 FS (imidacloprid)
SAFERS INSECTICIDAL SOAP
MALATHION 25 WP (malathion)

METHODS: This trial was conducted in a seven-year-old orchard in the Jordan area. Trees cv. McIntosh were on M26 rootstock and spaced 3.1 by 4.9 m. Treatments were arranged according to a randomized complete block design, assigned to two-tree plots and replicated four times. Prespray (July 3), plots were sampled by rating 25 terminals / plot for apple aphids. Terminals were rated from 0 to 5; 0 for no aphids, and 5 for heavily infested. On July 4 treatments were applied (ca. 16 L / plot) until runoff (with the exception of SAFERS INSECTICIDAL SOAP where foliage was sprayed to wet) using a Rittenhouse truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Insecticides were diluted to a rate comparable to 3000 L of water / ha and pressure was set at 2000 kPa. Postspray, plots were sampled July 10 using the same rating system as prespray. Data were analysed using an analysis of variance and Duncan's multiple range test at the 0.05 significance level.

RESULTS: As presented in the table below.

CONCLUSIONS: Postspray, all treatments significantly reduced ratings below control plots. Lowest ratings were in PIRIMOR 50 WP and WG, and NTN-33893 240 FS treated plots. Both formulations of PIRIMOR produced similar ratings.

Treatment July 4	Rate g ai/ha	Prespray Rating July 3	Postspray Rating July 10
PIRIMOR 50 WP	850	2.3 B*	0.5 C
PIRIMOR 50 WG	850	2.3 B	0.6 C
NTN-33893 240FS	90	2.6 B	0.6 C
SAFERS INSECTICIDAL SOAP	1:100 dilution rate	2.4 B	1.1 B
MALATHION 25 WP	1000	3.5 A	1.2 B
Control	------	2.5 B	2.3 A

* Means followed by the same letter not significant $P<0.05$, Duncan's multiple range test).

#002

STUDY DATA BASE: 353-1461-9007

CROP: Apple cv. McIntosh

PEST: Apple aphid, *Aphis pomi* Degeer

NAME AND AGENCY:
SMITH, R. F. and LOMBARD, J.
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Kentville, Nova Scotia, B0P 1C0
Tel. (902) 679-5730 Fax (902) 679-2311

TITLE: EVALUATION OF ZOLONE 50 EC AND PIRIMOR 50 WP FOR APPLE APHID CONTROL

MATERIALS: PIRIMOR 50 WP (pirimicarb)
ZOLONE 50 EC (phosalone)

METHODS: The test site was a two year old orchard of apple cv. McIntosh spaced 3 m by 4 m and planted on MM 106 semidwarf rootstock. Treatments were replicated in a completely randomized design using 16 single tree plots/ insecticide; untreated trees were included as a control comparison. On July 16th, prior to spraying, each tree was examined for aphid colonies.

Insecticides were applied with a truck-mounted sprayer equipped with a handgun. Treatments were sprayed until run-off and diluted to a rate of 3300 L/ha; a pressure of 2800 Kpa was maintained. Five days post-treatment plots were sampled and percent mortality determined. Data was first transformed to arsine of the square root n + 1 prior to analysis using SAS general linear model and means separated by Tukey's pairwise comparison at the 0.05 significance level.

RESULTS: As given in the following table.

CONCLUSIONS: The three rates of ZOLONE and two rates of PIRIMOR proved effective in suppressing apple aphid populations. All treatments significantly controlled the aphids compared to the untreated check.

Treatment	Rate of product / ha	Percent aphid mortality
PIRIMOR 50 WP	850 g	68.8ab
PIRIMOR 50 WP	1700 g	78.5ab
ZOLONE 50 EC	1000 mL	38.9a
ZOLONE 50 EC	2000 mL	100.0b
ZOLONE 50 EC	3000 mL	100.0b
CHECK	-	0.0c

Means within a column sharing a common letter are not significantly different ($P<0.05$, Tukey's pairwise comparison test).

#003

STUDY DATA BASE: 353-1461-9007

CROP: Apple cv. McIntosh

PEST: Apple brown bug, *Atractotomus mali* (Meyer)
White apple leafhopper, *Typhlocyba pomaria* McAtree,
Rosy apple aphid, *Dysaphis plantaginea* (Passerini)

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TITLE: EVALUATION OF BAY-NTN-33893 FOR SUPPRESSION OF APPLE BROWN BUG, WHITE APPLE LEAFHOPPER AND ROSY APPLE APHID

MATERIALS: BAY-NTN-33893

METHODS: Test site 1 was a 25 year old orchard of apple cv. McIntosh, Red Delicious and Cortland spaced 3 m by 4 m. Treatment were replicated in a completely randomized design using twelve single tree plots sprayed with insecticide; untreated trees were included as a control comparison. Prior to pesticide application, 20 limb-tap samples were taken to assess apple brown bug density, 70 fruit clusters were examined for presence of rosy apple aphid colonies and one hundred randomly selected leaves were observed for white apple leafhopper. On June 4th, the insecticide were applied using an orchard mist blower sprayer, The treatment was sprayed at 4x concentration at an equivalent rate to 3300 L/ha; a pressure of 2800 Kpa was maintained. Ten days post-treatment, plots were again sampled; both numbers of eggs and live leafminer larvae were determined. Data was first transformed to square root of (n + .5) then analysed using ANOVA and means separated by Tukey's pairwise comparison at the 0.05 significance level.

RESULTS: As given in the following table.

CONCLUSIONS: There was no difference in pre-treatment numbers within species; similarly post treatment live larvae counts did not differ between BAY-NTN-33893 and the untreated check. Number of post treatment white apple leafhoppers was reduced by this test product.

Treatment June 4th	Rate product per ha	apple brown bug per limb tap		rosy apple aphid per 70 spur clusters		white apple leafhopper /100 leaves	
		pre-spray	post-spray	pre-spray	post-spray	pre-spray	post-spray
BAY-NTN-33893	100.0 g	2.9a	3.4a	0.1a	0.3a	0.0a	0.0b
CHECK	-	1.7a	2.7a	0.1a	0.4a	0.0a	0.1a

Means within a column sharing a common letter are not significantly different (P<0.05, Tukey's pairwise comparison test).

#004

STUDY DATA BASE: 353-1461-9007

CROP: Apple, cv. Red Delicious

PEST: Apple leaf midge, *Dasinura mali* Kieffer

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TITLE: EVALUATION OF VARIOUS INSECTICIDES FOR CONTROL OF APPLE LEAF MIDGE LARVAE

MATERIALS: ORTHENE 75 WP (acephate)
SUPRACIDE 25 EC (methidathion)
CARZOL 92 SP (formetanate hydrochloride)
LANNATE L (methomyl)
IMIDAN 50 WP (phosmet)
BASUDIN 50 WP (diazinon)
RIPCORD 400 EC (cypermethrin)
ZOLONE 50 EC (phosalone)
CYGON 480 EC (dimethoate)
JAVELIN WG (*Bacillus thuringiensis* var. *kurstaki*)

METHODS: Water sprouts were collected from heavily infested Red Delicious apple trees; each shoot contained 8-12 larval colonies. Each treatment replicate consisted of 10 water sprouts which were sprayed to run off at a dilute rate of 3300 L water /ha. 48 h post treatment, mortality was determined for each of two larval age classes, early instar representing 1-2nd stage and late instar for those beyond 2nd instar.

RESULTS: As given in the following table.

CONCLUSIONS: With the exception of CARZOL and JAVELIN all other insecticides gave satisfactory control of early instar larvae. Latter instar larvae were more difficult to kill and ORTHENE gave the best results among the products tested.

Pesticide	Rate product per ha	Percent larvae killed early instar	n	late instar	n
ORTHENE 75WP	1.7 kg	100a	4	96.7a	3
SUPRACIDE 25EC	3.9 L	8.3b	2	2.1bc	6
CARZOL 92 SP	1.1 kg	0c	4	0bc	5
LANNATE L	2.5 L	52.3b	5	0bc	3
IMIDAN 50WP	3.3 kg	30.2b	3	0bc	3
BASUDIN 50WP	6.7 kg	100a	3	0bc	3
BASUDIN 50WP	3.4 kg	100a	7	33.3bc	6
RIPCORD 400EC	285 ml	100a	2	33.3bc	6
ZOLONE 50EC	2.0 L	100a	6	30.3bc	6
CYGON 480EC	3.5 L	-	-	0bc	8
CYGON 480EC	7.0 L	94.4a	6	14.6bc	8
CYGON 480EC	1.5 L	-		0bc	8
JAVELIN WG	2.0 kg	0c	2	0c	2
Check	-	0c	5	6.2c	13

Means within a column sharing a common letter are not significantly different (P<0.05, Tukey's pairwise comparison test), n represents number of replicates each having 80-120 larval colonies.

#005

STUDY DATA BASE: 353-1461-9007

CROP: Apple cv. McIntosh

PEST: Apple maggot, *Rhagoletis pomonella* Walsh.

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TITLE: EVALUATION OF BAY-NTN-33893 FOR SUPPRESSION OF APPLE MAGGOT INJURY TO FRUIT

MATERIALS: BAY-NTN-33893 (unknown) CYGON 480 EC (dimethoate).

METHODS: The test site was a 30 year old orchard of apple cv. McIntosh spaced 4 m by 5 m. Treatment were replicated in a completely randomized design using four single tree plots sprayed with insecticide; untreated trees were included as a control comparison. Prior to pesticide application, protein-baited apple maggot traps were used to determine that adult emergence was in progress. On July 4th, the insecticide were applied using a truck-mounted sprayer. The treatment was sprayed at an equivalent rate of 3300 L/ha; two rates of BAY-NTN were compared with a standard CYGON treatment. Sixty days post treatment twenty-five randomly selected fruit were harvested from each replicate and examined for apple maggot oviposition punctures. Percent fruit injured was first transformed then analysed using ANOVA and means separated by Tukey's pairwise comparison at the 0.1 significance level.

RESULTS: As given in the following table.

CONCLUSIONS: There was no difference in percent fruit injured for fruit treated with BAY-NTN-33893 50 g, CYGON 480 EC active ingredient and the untreated check. Only BAY-NTN at 100 g/ha differed from the check plot.

Treatment July 4th	Rate active ingredient per ha	Percent injured fruit
BAY-NTN-33893	100.0 g	6.0a
BAY-NTN-33893	50.0 g	11.0ab
CYGON 480 EC	48.0 ml	8.0ab
CHECK	-	23.4b

Means within a column sharing a common letter are not significantly different ($P<0.1$, Tukey's pairwise comparison test).

#006

STUDY DATA BASE: 352-1461-8501

CROP: Apple cv. McIntosh

PEST: Codling moth, *Cydia pomonella* (L.)

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TITLE: COMPARISON OF INSECTICIDES FOR CONTROL OF CODLING MOTH

MATERIALS: RH-5992 240 F
LATRON 1956 (adjuvant)
GUTHION 50 WP (azinphosmethyl)
AC 303,630 120 EC

METHODS: A seven-year-old orchard in the Jordan area was used for this trial. Trees cv. McIntosh were spaced 3.1 m by 4.9 m and were on M26 rootstock. Treatments were replicated four times and assigned to four-tree plots separated by guard trees and arranged according to a randomized complete block design. Timing of applications was determined from pheromone trap catches of male moths. Insecticides were sprayed with a Rittenhouse truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Materials were diluted to a rate comparable to 3000 L of water/ha and sprayed until runoff at 2000 Kpa pressure. Plots were first treated (25 L/plot) for first generation codling moth (CM) May 31 (RH-5992 240 F timed for egg deposition) and June 3 (AC 303,630 120 EC and GUTHION 50 WP timed for egg hatch). All treatments were applied again on July 24 (24 L/plot) and Aug. 16 (22 L/plot) according to pheromone trap catches. Plots were first sampled July 9 when 200 fruit from each plot (50/tree) were examined for deep CM damage (deep damage caused by larvae eating through the flesh of the apple to the core and feeding on the seeds). A final sample was taken Aug. 26. One bushel of fruit was picked from the canopy (132 - 159 apples), and a second bushel picked from the ground (92 - 174 apples), from each plot. Percentages of CM damage (deep and shallow injury, - shallow caused by first instar larvae excavating chambers below the skin of the fruit) from tree and ground pick samples were calculated. Data were angularly transformed to degrees, and analysed with an analysis of variance and Duncan's multiple range test at the 0.05 significance level.

RESULTS: As presented in the table below.

CONCLUSIONS: There was significantly less deep CM damage in RH-5992 240 F and GUTHION 50 WP treated plots than in AC 303,630 120 EC or control plots.

Treatment	Rate g AI/ha	% CM Damage July 9 tree deep	August 26 tree deep	August 26 tree shallow	August 26 ground deep	August 26 ground shallow
RH-5992 240 F with	240	0.0 B*	0.4 B	0.5 A	3.2 B	3.2 A
LATRON 1956	0.06%					
GUTHION 50 WP	1050	0.6 B	0.7 B	0.7 A	5.6 B	2.5 A
AC 303,630 120 EC	200	3.1 A	3.3 A	0.4 A	24.8 A	1.8 A
Control	------	3.4 A	6.6 A	0.3 A	26.8 A	2.8 A

* Means followed by the same letter not significantly different (P<0.05, Duncan's multiple range test).

#007

STUDY DATA BASE: 348-1461-4802

CROP: Apple cv. McIntosh

PEST: European red mite, *Panonychus ulmi* (Koch)
Twospotted spider mite, *Tetranychus urticae* Koch

NAME AND AGENCY:
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Tel. (613) 392-3527 Fax (613) 392-0359

TITLE: EVALUATION OF ACARICIDES FOR THE CONTROL OF MITES

MATERIALS: APOLLO 50 SC (clofentezine)
RU-38702 EC (150 g AI/L)

METHODS: Mite control was evaluated in an orchard of twenty-year-old McIntosh apple trees on MM.106 rootstock. The three-tree plots were replicated three times using a randomized complete block design. The trees were sprayed to runoff (14-17 L/plot) using a hydraulic handgun attached to a Rittenhouse plot sprayer operating at 2700 Kpa. RU-38702 was sprayed at calyx on May 22; APOLLO was sprayed on May 27.

The prespray mite population was assessed on May 21 by examining all the leaves on 25 blossom clusters per plot. On May 27, a prespray sample for the APOLLO plots consisted of 25 cluster or older shoot leaves per plot. The mite population was assessed on June 3, 17 and July 2 by examining 25 older shoot leaves per plot. On July 16, 30 and August 13, 25 midshoot leaves per plot were checked for mites. All samples were examined under a binocular microscope with the number of eggs, nymphs and adults being recorded. The data were analyzed using an analysis of variance. Duncan's multiple range test was used to indicate mean spread only where a significant "F" value (P<0.05) occurred in the ANOVA table.

RESULTS: Prespray counts on May 21 indicated an average of 2.9 eggs and 4.5 nymphs + adults per cluster. Prespray counts on May 27 indicated an average of 12.3 eggs and 0.2 nymphs + adults per leaf on the APOLLO plots. Other results are summarized in the table below.

CONCLUSIONS: The sprayed treatments provided equivalent control of mites, which was significantly better than the check, up to July 2. On July 16, there was no difference in mite control among the treatments at the 5% significance level. The low rate of RU-38702 (13.3 Ml product/100 L) had a significantly higher number of mites than the other treatments on July 30. By August 13, there was no significant difference (P=0.05) in the number of mites among the treatments.

	MEAN NUMBER OF MITES* PER LEAF TREATMENT			
	Check	APOLLO	RU-38702	RU-38702
Rate of product/100 L	-	10.0 Ml	13.3 Ml	20.0 Ml
Date of Applic.	-	May 27	May 22	May 22
JUNE 3				
eggs	1.0	4.2	0.2	0.1
nymphs	1.7 a**	0.1 b	0.1 b	0.0 b
adults	0.0	0.1	0.0	0.0
JUNE 17				
eggs	4.5	3.4	1.1	0.1
nymphs	0.1	0.1	0.0	0.0
adults	0.3 a	0.0 b	0.0 b	0.0 b
JULY 2				
eggs	12.2 a	1.6 b	5.7 b	0.8 b
nymphs	2.8 a	0.3 b	0.7 b	0.2 b
adults	1.5	0.3	0.8	0.1
JULY 16				
eggs	6.1	3.1	18.8	4.7
nymphs	2.6	0.5	5.2	3.1
adults	0.9	0.2	1.3	0.7
JULY 30				
eggs	10.8 b	3.8 b	25.6 a	14.4 ab
nymphs	3.7 b	0.8 b	10.7 a	4.1 b
adults	1.2 b	0.5 b	3.5 a	1.6 b
AUGUST 13				
eggs	5.9	2.5	12.5	8.5
nymphs	1.5	0.7	4.3	3.0
adults	0.9	0.3	1.8	2.2

* MITES refers to both ERM and TSSM

** Means in a row followed by different letters are significantly different using Duncan's multiple range test (P=0.05). Absence of letters indicates no significant difference.

#008

STUDY DATA BASE: 348-1461-4802

CROP: Apple cv. Paulared

PEST: European red mite, *Panonychus ulmi* (Koch)
Twospotted spider mite, *Tetranychus urticae* Koch; *Phytoseiid, Ambvlyseius fallacis* (Garman); *Stigmaeid Zetzellia mali*

NAME AND AGENCY:
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TITLE: IMPACT OF PYRETHROID APPLICATIONS ON THE MITE COMPLEX

MATERIALS: KARATE (lambda-cyhalothrin) 50 g AI/L EC

METHODS: A 15-year-old orchard at the Smithfield Experimental Farm was used. Trees were spaced 3 m by 10 m. The orchard was divided into 24 blocks of 5-7 trees each. The three treatments were replicated eight times using a randomized complete block design. Sample trees consisted of 2-3 central trees in each block, a total of 20 trees for each treatment. The rest of the trees in the block served as guard trees. The first generation spray for control of the spotted tentiform leafminer, Phyllonorycter blancardella (F.) was made on 11 May at the full recommended rate of KARATE (12.5 g AI/ha), and the second generation spray on 4 July was 30% of the recommended rate (4.75 g AI/ha). Trees were sprayed to run-off (approximately 3000 L/ha) using hydraulic handgun attached to a truck-mounted Rittenhouse sprayer operating at a pressure of 2700 Kpa. The trees were sampled every other week from the beginning of June to the end of August, a total of seven times. Each sample consisted of 10 leaves taken randomly from each of 60 trees. The leaves were examined on both sides for all stages of mites using a dissecting microscope at the magnification of 10 x. Data were subjected to an analysis of variance and Duncan's multiple range test at the 5% significance level.

RESULTS: The results are presented in the table below.

CONCLUSIONS: The pyrethroid sprayed on 4 July for control of the second generation leafminer significantly increased populations of the phytophagous mites compared with the control and the 11 May spray treatments respectively. However, population densities of predators were not significantly different among the three treatments.

Treatment*	Rate	Mean no. of mites per 10-leaf sample**						
	g AI/ha	5June	19June	3July	17July	31July	14Aug.	23Aug.
				Panonychus ulmi				
F (11 May)	12.5	192.4 a	874.9 a	734.6 a	313.3 ab	99.9 a	63.3 a	33.7 a
S (4 July)	4.75	139.2 a	918.9 a	734.3 a	408.0 b	166.5 b	73.8 a	38.1 a
Control		189.8 a	676.0 a	749.7 a	271.3 a	102.1 a	56.9 a	28.4 a
				Tetranychus urticae				
F (11 May)	12.5	5.3 a	6.9 a	60.6 a	88.4 a	43.9 a	56.6 a	21.8 a
S (4 July)	4.75	3.9 a	13.9 a	66.6 a	54.5 a	121.1 b	109.1 b	117.9 b
Control		2.6 a	14.2 a	126.3 a	86.4 a	38.7 a	20.1 c	10.4 a
				Predators (*Amblyseius fallacis* and *Zetzellia mali*)				
F (11 May)	12.5	0.1 a	0 a	0.1 a	0.9 a	1.0 a	15.6 a	22.5 a
S (4 July)	4.75	0 a	0.1 a	0.5 a	1.4 a	1.8 ab	15.0 a	18.4 a
Control		0.1 a	0.5 a	0.9 a	0.9 a	3.3 b	20.1 a	26.3 a

* F = Fist generation spray for control of the leafminer; S = Second generation spray for control of the leafminer.

** Means in the same column within the same species followed by the same letter are not significantly different (P>0.05, Duncan's multiple range test).

#009

STUDY DATA BASE: 352-1461-8501

CROP: Apple cv. McIntosh

PESTS: European Red Mite, *Panonychus ulmi* (Koch);
Twospotted Spider Mite, *Tetranychus urticae* Koch

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TITLE: CONTROL OF EUROPEAN RED MITE WITH SUNSPRAY ULTRA-FINE SPRAY OIL, SAFERS INSECTICIDAL SOAP, AND OMITE

MATERIALS: OMITE 30 W (propargite)
SUNSPRAY ULTRA-FINE SPRAY OIL
SAFERS INSECTICIDAL SOAP

METHODS: A ten-year-old orchard cv. McIntosh in the Simcoe area was chosen for this trial. Treatments were arranged according to a randomized complete block design, replicated four times, and assigned to single-tree plots. Trees were spaced 8.5 m by 5.5 m and were on M7 rootstock. A prespray sample was taken Aug. 6. Fifty leaves were randomly picked per plot and five of these leaves were examined under a binocular microscope and the remaining 45 brushed with a Henderson-McBurnie mite brushing machine. Numbers of European red mite (ERM) and twospotted spider mite (TSSM) eggs and actives (nymphs and adults) as well as numbers of predatory mites (*Phytoseiidae*) and *Zetzellia mali* were recorded. A Rittenhouse truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate was used to apply materials. Plots were sprayed (ca. 10 L/plot) Aug. 6 until runoff (with the exception of SAFERS INSECTICIDAL SOAP where foliage was sprayed to wet) using a pressure of 2000 Kpa and materials were diluted to a rate comparable to 3000 L/ha. The air temperature was 21.5 degrees Celsius and relative humidity was 48%. Plots were subsequently sampled Aug. 13 and 20 as described for prespray. Data were analysed using analysis of variance and means separated with a Duncan's multiple range test at the 0.05 significance level.

RESULTS: Results are presented in the table below.

CONCLUSIONS: Prespray, no statistical differences in phytophagous and predatory mite numbers were apparent among treatments. OMITE 30 W significantly reduced numbers of ERM actives at 7 days postspray compared to the control. TSSM counts were similar in all treatments. By 14 days postspray ERM egg and active numbers were significantly less in all treated plots compared to the untreated controls, and TSSM actives were reduced by OMITE treatment. Throughout the trial, numbers of *Phytoseiidae* remained similar in all plots. Zetzellia numbers appeared to drop by 14 days in OMITE treated plots. In samples after 7 days and later, leaves showed dead areas, usually at the margins (leaf burn), and premature leaf drop occurred in plots treated with OIL or SOAP. This premature drop ceased after ca. 3 weeks but fruit finish was affected at harvest. OIL and SOAP sprayed fruit had a filmy wax layer compared to fruit in other plots.

Treatment Aug.6	Rate/ha	ERM eggs	ERM actives	TSSM eggs	TSSM actives	phytos	zetzellia
		Numbers/leaf Aug. 6 (prespray)					
OMITE 30 W	1650 g AI	2.0A*	4.7A	8.0A	8.9A	0.1A	0.5A
SUNSPRAY OIL	600 mL (2%)	2.8A	3.9A	15.0A	11.1A	0.2A	0.2A
SAFERS SOAP	600 mL (2%)	3.6A	5.3A	4.9A	6.5A	0.2A	0.2A
Control	----------	3.1A	4.3A	6.3A	6.3A	0.2A	0.6A

Numbers/leaf
Aug. 13 - 7 days

Treatment	ERM eggs	ERM actives	TSSM eggs	TSSM actives	phytos	zetzellia
OMITE	1.3 A	0.4 B	0.7 A	1.6 A	0.1 A	0.2 AB
OIL	0.7 A	0.6 AB	4.3 A	5.5 A	0.0 A	0.2 AB
SOAP	1.4 A	0.6 AB	2.0 A	3.4 A	0.1 A	0.1 B
Control	2.0 A	1.4 A	6.1 A	6.1 A	0.4 A	0.6 A

Numbers/leaf
Aug. 20 - 14 days

Treatment	ERM eggs	ERM actives	TSSM eggs	TSSM actives	phytos	zetzellia
OMITE	0.4 B	0.1 B	0.2 A	0.2 B	0.1 A	0.04 B
OIL	0.5 B	0.2 B	2.7 A	3.3 AB	0.5 A	0.2 AB
SOAP	0.6 B	0.3 B	3.1 A	2.8 AB	0.1 A	0.2 AB
Control	1.4 A	1.2 A	6.5 A	6.0 A	0.4 A	0.6 A

* Means followed by the same letter not significantly different (P<0.05, Duncan's multiple range test).

#010

STUDY DATA BASE: 352-1461-8501

CROP: Apple cv. McIntosh

PEST: European red mite, *Panonychus ulmi* (Koch)

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TITLE: PERSISTENCE OF TOXIC RESIDUES OF APOLLO, 1991

MATERIAL: APOLLO 50 SC (clofentezine) 500 g AI/L

METHODS: A four-year-old orchard cv. McIntosh in the Jordan Station area was used for this trial. Trees were planted on M26 rootstock and spaced 3.1 m by 4.9 m. APOLLO 50 SC was applied at three different times. The first application of APOLLO 50 SC was prebloom (fruit buds were at the pink stage), May 3, when five-tree plots replicated four times were sprayed until runoff. Plots were subsequently sampled 0,3, 7, 10, 14, and 18 days posttreatment. A second set of plots (three-tree plots replicated four times) was sprayed May 24 at petal fall and sampled 0, 3, 7, 10, 14 and 21 days postspray. The last treatment was applied June 7 to three-tree plots replicated four times (approximately first cover). Postspray samples were taken on days 0, 3, 7, 10, 17, 25, 35, and 52. APOLLO 50

SC was diluted to a rate comparable to 3000 L of water/ha and applied (ca. 13 L/plot) using a Rittenhouse truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 2000 kPa. Treatments were sampled by randomly picking 5 leaves from each plot and then cutting 5 1.5 cm-diameter leaf disks for each replicate. These disks were placed lower surface up on moist rayon (IDA brand) pads in 11 cm-square by 4 cm high acrylic dishes. Five adult female and two adult male European red mites (ERM) from a lab colony reared on Elberta and Loring peach seedlings were placed on each leaf disk and allowed to oviposit for 48 h. A similar unsprayed control treatment was also set up. After 48 h adult ERM were removed and eggs were counted. Eight days after the adults were removed egg mortality was observed and percent calculated. Percent egg mortality was angularly transformed to degrees prior to mean comparison with a paired t-test.

RESULTS: As presented in the table below.

CONCLUSIONS: Both prebloom and petal fall applications showed significant reductions in egg hatch up to and including 14 days postspray. Significant effects from the June 7 application were seen 35 days post application. This pattern of decline in the bioactivity of residues (i.e. rapid early season and slower midseason) was seen in a similar trial in 1990 and can be related to the rapid rate of leaf growth in the spring. As the leaves grow the original residues may be diluted. Applications timed midseason when residues persist for long periods could pressure several generations of ERM and could select resistance rapidly.

Treatment May 3	Prebloom Application (pink) - % Egg Mortality					
	Day 0 May 3	Day 3 May 6	Day 7 May 10	Day 10 May 13	Day 14 May 17	Day 18 May 21
APOLLO 50 SC	87.5	89.6	98.4	25.0	16.5	10.4
Control	19.7	12.8	13.1	10.8	5.1	6.4
calculated t	9.85	10.21	7.19	3.77	4.70	1.31

Treatment May 24	Postbloom Application (petal fall) - % Egg Mortality					
	Day 0 May 24	Day 3 May 27	Day 7 May 31	Day 10 June 3	Day 14 June 7	Day 21 June 14
APOLLO 50 SC	91.2	82.6	51.4	59.1	53.5	16.6
Control	8.4	2.2	1.8	7.9	3.4	2.2
calculated t	11.65	19.90	4.84	7.97	9.06	2.62

	June 7 Application - % Egg Mortality							
Treatment June 7	Day 0 June 7	Day 3 June 10	Day 7 June 14	Day 10 June 17	Day 17 June 24	Day 25 July 2	Day 35 July 12	Day 52 July 29
APOLLO 50 SC	91.9	82.9	75.8	65.3	80.4	70.4	56.3	33.1
Control	8.5	5.6	5.4	2.7	5.9	3.5	4.3	3.4
calculated t	8.25	17.83	12.17	8.43	6.03	10.42	9.60	2.53

Critical t0.05 =3.182, 3 d.f., comparisons are between treatments for each day.

#011

STUDY DATA BASE: 352-1461-8501

CROP: Apple cv. Empire

PEST: European red mite, *Panonychus ulmi* (Koch)

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TITLE: CONTROL OF EUROPEAN RED MITE WITH RU-38702, TWO FORMULATIONS OF APOLLO AND SUPERIOR OIL

MATERIALS: RU-38702 150 EC (acrinathrin)
APOLLO 50 SC (500 g AI/L clofentezine)
APOLLO SE (60 g AI/L clofentezine plus 650 mL oil/L)
SUPERIOR OIL 70

METHODS: A five-year-old orchard cv. Empire in the Victoria area was used. Trees were spaced 5.5 m by 4.3 m and were on M7 rootstock. Treatments were arranged according to a randomized complete block design, replicated four times, and assigned to single-tree plots. Plots were sampled May 28, June 4, 11,18,25, and July 10 when 50 leaves were randomly picked per plot. Five of these leaves were examined under a binocular microscope and the remaining 45 brushed with a Henderson-McBurnie mite brushing machine. Numbers of European red mite (ERM) eggs and actives (nymphs and adults) were recorded. APOLLO SC and SE formulations and SUPERIOR OIL 70 were applied (ca. 8 L/plot) May 28 when most ERM were in the egg stage. SUPERIOR OIL 70 was applied at a rate of 1625 mL/ ha. This rate was similar to the volume of oil applied with the APOLLO SE treatment. RU-38702 150 EC was applied (ca. 10 L/plot) June 4 when a higher proportion of ERM had hatched. Acaricides were diluted to a rate comparable to 3000 L/ha and sprayed until runoff with a Rittenhouse truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 2000 kPa. By June 25 plots treated with SUPERIOR OIL 70 and control plots had high numbers of ERM and were sprayed with OMITE 30 W to avoid excessive bronzing of leaves, precluding any subsequent sampling. Data were analysed using an analysis of variance and means separated with a Duncan's multiple range test at the 0.05 significance level.

RESULTS: Results are presented in the table below.

CONCLUSIONS: Plots had similar numbers of eggs and actives prespray May 28. On June 4 numbers of actives in plots treated with APOLLO SC and SE were significantly less than the controls. By June 11 all treated plots had fewer eggs and actives than the controls. In samples June 18 and 25, numbers of eggs and actives in SUPERIOR OIL 70 plots were significantly higher than in other treated plots, but the highest numbers tended to be in control plots. By July 10, ERM numbers in the APOLLO (both formulations) and RU-38702 treated plots remained below action thresholds (7 - 10). Throughout the trial, control by the SE formulation of APOLLO was equal to the SC formulation. SUPERIOR OIL 70, which was at a low rate compared to the rate of dormant oil, had a suppressive effect. RU-38702 150 EC controlled ERM throughout the trial and no resurgence was noted. Predatory mites were too few to include in the results.

Treatment	Rate AI/ha	May 28 eggs	May 28 actives	June 4 eggs	June 4 actives	June 11 eggs	June 11 actives
		Number of ERM Eggs and Actives/leaf					
APOLLO 50 SC	150	12.6A*	1.0 A	6.8 A	1.3 C	6.2 B	0.4 B
APOLLO SE	150	11.1A	0.9 A	4.8 A	0.8 C	4.5 B	0.5 B
SUPERIOR OIL 70	1625 mL/ha	8.3A	0.8 A	2.5 A	2.2 BC	12.7 B	3.1 B
RU-38702 150 EC	90	10.9A	1.2 A	4.0 A	5.7 A	2.0 B	0.4 B
Control	------	14.1A	1.1 A	3.3 A	4.9 AB	25.3A	6.1A

Treatment	June 18 eggs	June 18 actives	June 25 eggs	June 25 actives	July 10 eggs	July 10 actives
	Number of ERM Eggs and Actives/leaf					
APPOLO 50 SC	5.9 C	0.3 B	4.3 C	0.2 C	2.8A	0.9 A
APOLLO SE	4.1 C	0.6 B	4.1 C	0.4 C	3.7A	1.0 A
SUPERIOR OIL 70	24.5 B	5.3 A	14.2 B	22.7 B	-----	-----
RU-38702 150 EC	1.3 C	0.0 B	0.4 C	0.2 C	1.1 B	1.3 A
Control	40.6A	9.7 A	26.9A	46.0A	-----	-----

* Means followed by the same letter not significantly different ($P<0.05$, Duncan's multiple range test).

#012

STUDY DATA BASE: 348-1461-4802

CROP: Apple cv. McIntosh

PEST: Gypsy moth, *Lymantria dispar* (L.)
Obliquebanded leafroller, *Choristoneura rosaceana* (Harris)
Redbanded leafroller, *Argyrotaenia velutinana* (Walker)
Green fruitworm, *Lithophane antennata* (Walker);
Eastern tent caterpillar, *Malacosoma americanum* (F.)

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TITLE: EVALUATION OF INSECTICIDES FOR SPRING FEEDING CATERPILLAR (SFC) CONTROL

MATERIALS: GUTHION 50 WP (azinphosmethyl)
IMIDAN 50 WP (phosmet)
ORGANIC INSECT KILLER LIQUID (*B. thuringiensis Berliner* var. *Kurstaki* (Bt) 4.2 billion I.U./L)

METHODS: A five-year-old orchard of McIntosh apple trees on M.26 rootstock and spaced at 2 x 10 m was used in this randomized complete block design trial. Seven-tree plots were replicated four times with two guard trees between each plot. The materials were sprayed to runoff (10-14 L/plot) using a hydraulic handgun attached to a Rittenhouse plot sprayer operating at 2700 kPa. Bt was applied on May 10 (pink); May 10 and 23 (calyx); May 10, 23 and 30; and May 23. GUTHION was sprayed on May 10; and May 23. IMIDAN was sprayed on May 23. The 5 middle trees/plot were checked for SFC and SFC damage. All the leaves on five terminal shoots and 20 clusters/tree were checked for SFC and SFC damage on May

6, 16, 22, 29, and June 19. All the fruit on a tree up to a maximum of 50 fruit/tree were checked for SFC damage on May 29 and June 19. The data were analyzed using an analysis of variance and Duncan's multiple range test (P=0.05).

RESULTS: The number of damaged terminals + clusters and SFC in the prespray samples (May 6, 16 and 22) were very small with no significant (P=0.05) differences among treatments. Other results are summarized in the table below.
CONCLUSIONS: The two- and three-spray programs of Bt and the calyx organophosphate sprays provided the best control of GM and TOTAL caterpillars. The prebloom application of Bt was no better than the unsprayed check in terms of controlling the number of caterpillars. On May 29, IMIDAN, the two-spray program of Bt, and both GUTHION treatments provided significant SFC control on the cluster leaves and terminal shoots relative to the unsprayed check treatment. All the sprayed treatments, except the prebloom application of Bt,provided significant protection to the terminals and clusters as compared to the check on June 19. The two- and three-spray programs of Bt and the organophosphate treatments provided equivalent protection to the terminals and clusters. On June 19 all sprayed treatments had a significantly lower percentage of fruit with SFC damage as compared to the check treatment.

Treatment	Date of appl.	Mean no. caterpillars May 29 LR*	GM	TOTAL**	Mean no. damaged term. + clusters May 29	June 19	% Fruit with SFC damage June 19
Check	-	0.2b****	1.3a	1.6a	5.7ab	6.8a	2.2a
Bt***	May 10	0.8a	1.2a	1.9a	7.1a	5.1ab	0.7b
Bt***	May 10, 23	0.0b	0.3b	0.4b	1.7c	3.0cd	0.7b
Bt***	May 10, 23, 30	0.3b	0.2b	0.5b	3.1bc	2.3cd	0.3b
Bt***	May 23	0.2b	0.8ab	1.0ab	3.8bc	3.8bc	0.7b
GUTHION*** 50 WP	May 10	0.1b	0.5ab	0.6b	1.6c	1.0d	0.6b
GUTHION*** 50 WP	May 23	0.0b	0.1b	0.1b	2.0c	1.1d	0.1b
IMIDAN*** 50 WP	May 23	0.2b	0.0b	0.4b	1.8c	1.5d	0.1b

* LR = OBLR + RBLR
** TOTAL = LR + GM + Green fruitworm + Eastern tent caterpillar
*** Rate of product/100 L: Bt 283.0 mL; GUTHION 46.7 g, IMIDAN 83.3g
**** Means followed by the same letter within each column are not significantly different using Duncan's multiple range test (P=0.05)

#013

STUDY DATA BASE: 352-1461-8501

CROP: Apple cv. Red Delicious

PEST: Mullein plant bug, *Campylomma verbasci* (Meyer)

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TITLE: CONTROL OF MULLEIN PLANT BUG WITH VARIOUS INSECTICIDES

MATERIALS: GUTHION 50 WP (azinphosmethyl)
IMIDAN 50 WP (phosmet)
MALATHION 25 WP (malathion)
NTN-33893 240 FS (imidacloprid)
PIRIMOR 50 WP (pirimicarb)
SAFERS INSECTICIDAL SOAP

METHODS: This trial was conducted in a seven-year-old block of Red Delicious at the Horticultural Experimental Station near Simcoe. Trees were on M106 rootstock and spaced 3.7 by 5.5 m. Single-tree plots were arranged according to a randomized complete block design and replicated four times. Plots were sampled prespray May 22 by tapping. A white cotton tray 46 by 46 cm square was held beneath a limb and the limb was struck twice with a stick for each tap. Thirty trees were randomly selected in the plot area for sampling and each tree was tapped once. Numbers of mullein plant bugs caught on the tray were recorded and a mean for the area calculated. Treatments were applied (ca. 9 L /plot) May 22 until runoff (with the exception of SAFERS INSECTICIDAL SOAP where foliage was sprayed to wet) with a truck-mounted Rittenhouse sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 2000 kPa and insecticides were diluted to a rate comparable to 3000 L of water/ha. Postspray (May 30), plots were sampled by tapping. Each tree was tapped five times and the number of mullein plant bugs recorded. Observations were also made to assess fruit damage. Fifty fruit per plot were examined and percent injured fruit recorded. Data were analysed using an analysis of variance and Duncan's multiple range test at the 0.05 significance level. Percent fruit damage was first angularly transformed from percent to degrees prior to AOV and Duncan's.

RESULTS: In the prespray sample May 22 an average of 5.5 mullein plant bugs (predominantly nymphs) was caught per tree. Postspray results are presented in the table below.

CONCLUSIONS: Plots treated with GUTHION 50 WP, IMIDAN 50 WP, MALATHION 25 WP, and NTN-33893 240 FS had significantly fewer mullein plant bugs than plots treated with SAFERS INSECTICIDAL SOAP or the control. Percent fruit damaged in IMIDAN 50 WP and NTN-33893 240 FS plots was statistically less than in control plots. There is no evidence of organophosphorous resistance in mullein plant bugs from Ontario.

Treatment (May 22)	Rate g AI/ha	Mullein Plant Bugs / plot (May 30)	% Fruit Damaged
GUTHION 50 WP	1050	0.3 B*	4.0 AB
IMIDAN 50 WP	1875	0.8 B	2.5 B
MALATHION 25 WP	1000	1.0 B	5.0 AB
NTN-33893 240 FS	45	1.3 B	1.0 B
PIRIMOR 50 WP	850	4.5 AB	3.5 AB
SAFERS INSECTICIDAL SOAP	1:100 ratio	8.3 A	7.4 AB
Control	---	10.5 A	12.0 A

* Means followed by the same letter not significantly different P<0.05, Duncan's multiple range test).

#014

STUDY DATA BASE: 353-1461-9007

CROP: Apple cv. Red Delicious

PEST: Rosy apple aphid, *Dysaphis plantaginea* (Passerini)

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TITLE: EVALUATION OF PIRIMOR 50 WG FOR ROSY APPLE APHID CONTROL

MATERIALS: PIRIMOR 50 WG (pirimicarb)
PIRIMOR 50 WP (pirimicarb)
CYGON 480 EC (dimethoate)

METHODS: The test site was a 15 year old orchard of apple cv. Red Delicious spaced 4 m by 5m and planted on Beautiful Arcade rootstock. Treatments were replicated in a completely randomized design using five single tree plots per insecticide; five untreated trees were included as a control comparison. On June 6th, prior to spraying, four fruit spur leaf clusters were randomly taken from each tree and examined for aphid colonies. Insecticides were applied with a truck-mounted sprayer equipped with a handgun. Treatments were sprayed until run-off and diluted to a rate of 3300 L/ha; a pressure of 2800 kPa was maintained. Five days post treatment plots were again sampled and mortality determined. Data was analysed using ANOVA and means separated by Tukey's pairwise comparison at the 0.05 significance level.

RESULTS: As given in the following table.

CONCLUSIONS: There was no difference in pre-treatment numbers of aphid colonies. Both formulations of PIRIMOR proved as effective as CYGON in suppressing rosy apple aphid populations. All treatments significantly controlled the aphids compared to the untreated check.

Treatment June 4th	Rate of product per 100 L	Pretreatment colonies per leaf cluster june 10	Percent mortality post treatment
PIRIMOR 50 WG	50.4 g	1.0a	100.0a
PIRIMOR 50 WP	50.4 g	1.0a	100.0a
CYGON 480 EC	25.2 ml	1.0a	85.0a
CHECK	-	1.0a	15.0b

Means within a column sharing a common letter are not significantly different (P<0.05, Tukey's pairwise comparison test).

#015

STUDY DATA BASE: 348-1461-4802

CROP: Apple cv. Paulared

PEST: Spotted tentiform leafminer, *Phyllonorycter blancardella* (F.)

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TITLE: EVALUATION OF PYRETHROID APPLICATION TIMING FOR THE CONTROL OF LEAFMINER

MATERIALS: KARATE (lambda-cyhalothrin) 50 g AI/L EC

METHODS: A 15-year-old orchard at the Smithfield Experimental Farm was used. Trees were spaced 3 m by 10 m. The orchard was divided into 24 blocks of 5-7 trees each. The three treatments were replicated eight times using a randomized complete block design. Sample trees consisted of 2-3 central trees in each block, a total of 20 trees for each treatment. The rest of the trees in the block served as guard trees. The first generation control spray was made on 11 May at the full recommended rate of KARATE (12.5 g AI/ha), and the second generation control spray on 4 July was at 30% of the recommended rate (4.75 g AI/ha). Trees were sprayed to run-off (approximately 3000 L/ha) using a hydraulic handgun attached to truck-mounted Rittenhouse sprayer operating at a pressure of 2700 kPa. The trees were sampled every other week from the beginning of June to the end of August, a total of seven times. Each sample consisted of 10 leaves taken randomly from each of 60 trees. The leaves were examined for mines using a dissecting microscope at the magnification of 10 x. Data were subjected to an analysis of variance and Duncan's multiple range test at the 5% significance level.

RESULTS: The results are presented in the table below.

CONCLUSIONS: KARATE at the full field recommended rate sprayed to control the first generation leafminer significantly reduced the number of mines up to 17 July, and did not significantly affect the leafminer populations from the end of July to the end of August compared with the control. However, the spray at the beginning of July at 30% of the recommended rate significantly reduced the second generation of the leafminer. Population density of the second generation was much higher than that of the first one.

Treatment*	Rate g AI/ha	Mean no. of mines per 10-leaf sample** 5 June	19 June	3 July	17 July	31 July	14 Aug.	23 Aug.
F (11 May)	12.5	0.9 a	1.6 a	7.4 a	16.1 a	55.9 b	45.8 b	53.3 ab
S (4 July)	4.75	5.6 b	5.5 b	13.6 b	17.7 ab	28.2 a	23.1 a	29.3 a
Control		6.9 b	6.3 b	16.4 b	24.2 b	56.1 b	46.8 b	67.3 b

* F = First generation spray for control of the leafminer; S = Second generation spray for control of the leafminer.
** Means in the same column followed by the same letter are not significantly different (P>0.05, Duncan's multiple range test).

#016

STUDY DATA BASE: 352-1461-8501

CROP: Apple cv. Red Delicious

PEST: Spotted tentiform leafminer, *Phyllonorycter blancardella* (F.)

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TITLE: CONTROL OF FIRST GENERATION SPOTTED TENTIFORM LEAFMINER

MATERIALS: AC 303,630 120 EC
DECIS 2.5 EC (deltamethrin)
NTN-33893 240 FS (imidacloprid)
RH-5992 240 F
LATRON 1956 (adjuvant)

METHODS: A four-year-old orchard cv. Red Delicious in the Jordan area was used for this trial. Trees were on M26 rootstock and spaced 3.1 by 4.9 m. Five-tree plots were randomized according to a randomized complete block design and replicated four times. A prespray sample was collected May 8. Fifteen fruit spur leaf clusters were taken randomly from the overall block and examined for spotted tentiform leafminer (STLM) eggs. Tree fruit bud development was at the pink stage. On May 10, insecticides were applied until runoff (ca. 10-11 L/plot) diluted to a rate comparable to 3000 L of water/ha. Applications were made using a Rittenhouse truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 2000 kPa. Insecticides were timed for first hatch of STLM eggs. Postspray samples were collected June 18 when 25 clusters were randomly picked per plot. Samples were examined using a binocular microscope and the various STLM life stages and numbers of the parasites Pholotesor ornigis and Sympiesis spp. (Hymenoptera: Chalcidoidea) recorded. Percent data were angularly transformed to degrees prior to analysis. Data were analysed with an analysis of variance and Duncan's multiple range test at the 0.05 significance level.

RESULTS: Nineteen STLM eggs were found on 15 clusters in the May 8 prespray. None of the eggs had hatched but embryonic development was observed. Postspray results are presented in the table below.

CONCLUSIONS: All treatments significantly reduced numbers of STLM. All treated plots except those treated with RH-5992 240 F had significantly fewer mines than the control plots. Levels of parasitism by P. ornigis and by chalcids were similar in all treatments.

Treatment May 10	Rate g AI/ha	No. STLM/ plot*		No. mines/ plot**		June 18 % Parasitism*** by P. ornigis/ plot		%Parasitism by Chalcids/ plot	
AC 303,630 120 EC	200.0	9	C****	20	B	21	A	3	A
DECIS 2.5 EC	12.5	9	C	10	B	19	A	6	A
NTN-33893 240 FS	90.0	20	C	25	B	20	A	3	A
RH-5992 240 F with LATRON 1956	240.0 0.06%	49	B	61	A	28	A	5	A
Control	-----	68	A	80	A	39	A	4	A

* STLM includes living larvae, pupae, emerged adults, parasitized larvae, mines containing P. ornigis cocoons and chalcid pupae.
** Mines includes mines formed by both early and late instars.
*** % parasitism = number of larvae parasitized (by either P. ornigis or chalcids) divided by STLM x 100.
**** Means followed by the same letter not significantly different (P<0.05, Duncan's multiple range test).

#017

STUDY DATA BASE: 352-1461-8501

CROP: Apple cv. Empire

PEST: White apple leafhopper, *Typhlocyba pomaria* McAtee

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TITLE: CONTROL OF FIRST GENERATION WHITE APPLE LEAFHOPPER

MATERIALS: NTN-33893 240 FS (imidacloprid)
PIRIMOR 50 WP (pirimicarb)
GUTHION 50 WP (azinphosmethyl)
MALATHION 25 WP (malathion)

METHODS: This trial was conducted in a five-year-old orchard cv. Empire in the Victoria area. Trees were on M7 rootstock and were spaced 5.5 m by 4.3 m.

Treatments were assigned to single-tree plots, replicated four times, and randomized according to a randomized complete block design. On May 30 plots were sampled (prespray) when 100 leaves were examined/plot and the number of white apple leafhopper (WALH) nymphs recorded. Insecticides were applied May 30 until runoff (ca. 8 L/treatment) using a truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 2000 kPa. Insecticides were diluted to a rate comparable to 3000 L/ha and applications were timed for the presence of early instars. A postspray sample was taken June 4 when 100 leaves/plot were again examined and the numbers of WALH nymphs recorded. Data were analysed using an analysis of variance and Duncan's multiple range test at the 0.05 significance level.

RESULTS: As presented in the table below.

CONCLUSIONS: Prespray, all plots had similar numbers of WALH nymphs. Postspray (June 4), all insecticides significantly reduced numbers of nymphs below the control. Plots treated with NTN-33893 240 FS and PIRIMOR 50 WP had the lowest numbers of nymphs.

Treatment Applied May 30	Rate g AI/ha	Nymphs/plot May 30 (prespray)	Nymphs/plot June 4
NTN-33893 240 FS	45	107 A*	0 C
PIRIMOR 50 WP	1700	67 A	1 C
GUTHION 50 WP	1000	84 A	10 BC
MALATHION 25 WP	2000	100 A	24 B
Control	----	85 A	43 A

* Means followed by the same letter not significantly different (P<0.05, Duncan's multiple range test).

#018

STUDY DATA BASE: 402-1461-9093

CROP: Pear cv. Bartlett

PREDATOR: *Anthocoris nemoralis* F.

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TITLE: TOXICITY TO ANTHOCORID PREDATORS OF INSECTICIDES USED FOR CODLING MOTH CONTROL

MATERIALS: GUTHION 50 WP (azinphosmethyl)
IMIDAN 50 WP (phosmet)

METHODS: Adult A. nemoralis were collected from a Bartlett pear orchard using beating trays, and were held in the laboratory in petri dishes containing rust mite-infested pear leaves for 24 hours prior to insecticide treatment. Insects were anaesthetized with carbon dioxide and treated topically with commercial wettable powder formulations of each insecticide dissolved in residue grade acetone. Concentrations corresponding to 0.50, 0.10, 0.05, and 0.01 of the recommended label rate for codling moth (GUTHION: 0.375 g commercial product/L; IMIDAN: 1.000 g commercial product/L) were applied in 1 microlitre of acetone using a micropipette. Control insects were handled in exactly the same way and were treated with acetone only. Thirty A. nemoralis were treated per dose (150/experiment). Insects were held at 23!C for 24 hours and mortality was assessed. Data were analyzed using the SAS Probit Procedure.

RESULTS: As presented in the table below.

CONCLUSIONS: GUTHION is approx. 2.9 times more toxic to A. nemoralis than is IMIDAN under these laboratory conditions. However, when LD50 values are expressed as a percent of the recommended field rates for codling moth control, both materials pose similar hazards to A. nemoralis from short term exposure in the field (GUTHION: 0.0184/0.3750 = 4.9%; IMIDAN: 0.0538/1.0000 = 5.4%; calculated as LD50/field rate in g/L). Other factors, such as effective residual time, must be considered when assessing the relative hazards of these materials to beneficial predacious insects.

	LD50*	95% Confidence Limits
GUTHION 50 WP	0.0184	0.0110 - 0.0226
IMIDAN 50 WP	0.0538	0.0360 - 0.0695

* Grams commercial product/L.

#019

STUDY DATA BASE: 352-1461-8501

CROP: Pear cv. Bartlett

PEST: Pear psylla, *Psylla pyricola* (Foerster)

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TITLE: CONTROL OF PEAR PSYLLA WITH VARIOUS INSECTICIDES

MATERIALS: MITAC 1.5 EC (amitraz)
NTN-33893 240 FS (imidacloprid)
MORESTAN 25 WP (oxythioquinox)
GUTHION 50 WP (azinphosmethyl)
DECIS 2.5 EC (deltamethrin)

METHODS: A mature pear orchard cv. Bartlett in the Winona area was used for this trial. Laboratory tests showed this population was resistant to pyrethroid insecticides (ca. 20 fold to permethrin). Treatments were assigned to single tree plots, replicated four times, and randomized according to a randomized complete block design. Insecticides were applied until runoff July 3 (ca. 13 L/plot) using a truck-mounted Rittenhouse sprayer equipped with a Spraying Systems handgun with a D-6 orifice plate. Materials were diluted to a rate comparable to 3000 L of water/ha. Pressure was set at 2000 kPa. Plots were sampled prespray July 2 and postspray July 23. Ten terminals were picked per plot and the five fully expanded distal leaves plus the shoot examined using a binocular microscope. Numbers of eggs and nymphs were recorded. Data were analysed with an analysis of variance and means separated using a Duncan's multiple range test at the 0.05 significance level.

RESULTS: As presented in the table below.

CONCLUSIONS: Prespray, there were significantly higher egg numbers in plots to be treated with DECIS 2.5 EC and significantly more nymphs in the control plots than in plots to be treated with NTN-33893 240 FS. In the postspray counts, egg numbers were similar between treatments. Numbers of nymphs were highest in control plots; significantly higher than in plots treated with MITAC 1.5 EC, NTN-33893 240 FS, MORESTAN 25 WP, AND GUTHION 50 WP. Nymphs were fewer in DECIS 2.5 EC treated plots than in the controls, but differences not statistically significant.

Treatment July 3	Rate g AI/ha	July 2 (prespray) eggs	nymphs	July 11- 8 day eggs	nymphs
MITAC 1.5 EC	1100.0	34.8 B*	75.0 AB	15.8 A	1.8 B
NTN-33893 240 FS	150.0	14.3 B	52.8 B	21.5 A	4.3 B
MORESTAN 25 WP	1500.0	20.0 B	84.5 AB	15.8 A	5.5 B
GUTHION 50 WP	1050.0	8.3 B	67.5 AB	20.3 A	10.3 B
DECIS 2.5 EC	17.5	91.3 A	108.0 AB	22.3 A	24.3AB
control	------	24.0 B	162.8 A	35.8 A	46.0A

* Means followed by the same letter not significantly different (P<0.05, Duncan's multiple range test).

#020

STUDY DATA BASE: 206003

CROP: Carrots cv. Caropak

PEST: Rusty root, *Pythium* spp.

NAME AND AGENCY:
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TITLE: PASTEURIZATION OF SOIL FOR THE CONTROL OF RUSTY ROOT, PYTHIUM ROOT DIEBACK

MATERIALS: Lansa Soil Pasteurizer - Volume 1.5 bushels

METHODS: Naturally-infested muck soil from two locations in the Holland Marsh plus soil from the Muck Research Station were divided into pasteurized and non-pasteurized treatments. Carrots grown in the field on Strawberry Lane had severe symptoms of rusty root, where carrots grown in the other fields did not. Soil was pasteurized for 40 minutes at 46 degrees C. There were 6 treatments; 2 treatments per soil type. Eight 6 L pots per treatment were seeded with 20 carrot seeds per pot. Ten days after seeding, emergence was recorded. Three weeks after seeding, 4 pots per treatment were harvested and evaluated. The remaining 4 pots per treatment were thinned to 5 carrots per pot and grown for 8 more weeks. On June 5, 1991 the remaining pots were harvested and rated for rusty root. During the final 8 weeks of growing, the pots were saturated with water at all times.

RESULTS: As presented in the table below.

CONCLUSIONS: Pasteurizing soil greatly reduced the percent damage caused by Rusty Root three weeks after seeding. However, only carrots growing in non- pasteurized soil from one location showed damage when allowed to mature, indicating that carrots can "grow-out" of the rusty root symptoms when grown in soil that is not heavily infested.

Treatment	Percent Emergence	April 10, 1991 Percentage Roots Damaged	April 10, 1991 Rusty Root Rating **	June 5,1991 Percentage Roots Damaged	June 5,1991 Rusty Root Rating
M.R.S. soil pasteurized	67.5	3.7 ab *	4.3 ab	0.0 a	5.0 a
M.R.S. soil	75.0	18.7 cd	2.7 c	0.0 a	5.0 a
King St. soil pasteurized	71.5	12.6 bc	3.3 bc	0.0 a	5.0 a
King St. soil	66.5	0.0 a	5.0 a	10.0 a	4.9 a
Strawberry Lane soil pasteurized	71.5	0.0 a	5.0 a	9.3 a	4.9 a
Strawberry Lane soil	77.5	25.8 d	2.0 c	33.8 b	3.7 b

* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Protected LSD Test.
** Legend: 5.0 = No Damage 1.0 = Heavy Damage

#021

STUDY DATA BASE: 206003

CROP: Yellow Cooking Onions, cv. Taurus

PEST: Botrytis leaf blight

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TITLE: MOLASSES AND AGRI-KELP TREATMENTS AS AN ALTERNATIVE TO REGULAR FUNGICIDES IN ONIONS

MATERIALS: ZINEB 80 W, BOTRAN 75 W (dichloran), AGRI-KELP and molasses

METHODS: The onions were seeded into naturally infested organic soil at the Muck Research Station on May 1, 1991. A randomized complete block arrangement with 4 blocks per treatment was used. Each replicate consisted of 8 rows, 5 m in length. Treatments were applied as a foliar spray with an Enti field sprayer at 65 psi in the equivalent of 355 L/ha. The agricultural molasses plus AGRI-KELP was applied at 3 L/ha and 355 ml/ha, respectively; BOTRAN 75 W was applied at 3.4 kg/ha and the ZINEB 80 W was applied at 2.25 kg/ha on July 24, August 2 and August 13. On August 20, samples of 25 onions per rep were rated for percentage of green leaf tissue and number of dead leaves per plant. Onions from a 2.33 m length of row were harvested on September 16 and weighed to determine yield.

RESULTS: As presented in the table below.

CONCLUSIONS: There were no significant differences among the fungicides used to control botrytis leaf blight. When comparing the percentage of green leaves and leaf-dieback, the untreated check was significantly worse than the fungicides, with more leaf-dieback and lower percent green leaves. The 3 fungicides did control of the botrytis leaf blight but at the end of the growing season there were no significant differences in yield.

Treatment	Percent Green	Number of Dead Leaves/plant	t/ha
AGRI-KELP + molasses	82.5 a *	1.7 a	33.6a
BOTRAN	80.0 a	2.2 a	40.8a
ZINEB	79.3 a	2.0 a	31.0a
Check	55.3 b	3.4 b	40.0a

* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Protected LSD Test.

#022

STUDY DATA BASE: 206003

PEST: *Pythium* spp.

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TITLE: EFFECT OF SOIL SOLARIZATION ON PYTHIUM POPULATIONS IN ORGANIC SOIL

MATERIALS: 6 ml clear plastic 20'x 100'

METHODS: The trial was conducted in naturally infested organic soil at the Muck Research Station. Five treatment plots were prepared, approximate size 18 m x 13.7 m, for each solarization period of 0,2,4,6 or 8 weeks. The plots were covered with 6 ml clear plastic on July 18, 1991. When the solarization period was completed, the plastic was removed and soil samples were taken. The soil samples were collected at a depth of 0-10 cm with a 7.5 cm x 2 cm soil probe, 40 cores were taken from each plot along a diagonal transect. Samples were also taken prior to coverage. The soil cores were mixed together and 3- 10 g sub samples were taken from each bulk soil sample. Each subsample was air dried, weighed again and placed in 100 ml of water. The soil solutions were shaken at 60 rpm for 1 hour. From the 1 in 10 solutions, 1 ml aliquots were taken and added to 10 ml of water. 100 ml samples from each dilution were placed on plates of Pythium selective culture media, 10 plates for each treatment and each dilution (10/-2 and 10/-3). Plates were inoculated on September 30 and placed in a darkened container at room temperature. The plates were checked each day and Pythium colonies (colony forming units, cfu's) were counted until the colonies overgrew the plates usually within 3-5 days. The number of cfu/g of soil was calculated using the air-dried weights of the soil subsamples.

RESULTS: As presented in the table below.

CONCLUSIONS: Colony forming units per g of soil were less in the 10/-2 dilution than in the 10/-3 dilution. This anomaly may reflect competition between colonies on a plate or rapid overgrowth of slow-growing colonies by faster-growing colonies. The longer the solarization period the better the control of Pythium spp. A solarization period as short as 2 to 4 weeks significantly reduced Pythium populations in the top 10 cm of organic soil.

Effect of Soil Solarization on Pythium Populations in Organic Soil.

Soil Source	Solarization weeks	Dilute 10/-2 Mean Cfu/plate**	Dilute 10/-2 Mean Cfu/g soil	Dilute 10/-3 Mean Cfu/plate	Dilute 10/-3 Mean Cfu/g soil
M.R.S.	0	20.1 a *	2,486 a	5.1 a	6,300 a
M.R.S.	2	9.1 b	1,358 b	3.8 b	5,560 a
M.R.S.	4	8.3 bc	1,122 bc	1.6 c	2,200 b
M.R.S.	6	5.0 cd	804 cd	1.1 d	580 bc
M.R.S.	8	3.8 d	562 d	0 d	0 c

* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Protected LSD Test.
** cfu = colony forming units of Pythium spp.

#023

STUDY DATA BASE: 61002030

CROP: White beans var. Ex Rico

PEST: Seed corn maggot, *Delia platura*

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TITLE: INSECTICIDES FOR THE CONTROL OF SEED CORN MAGGOT IN WHITE BEANS

MATERIALS: AZTEC 2.1G (MAT-7484)
DYFONATE II 20G (fonofos)
FORCE 1.5G
FORCE ST (tefluthrin)
DI-SYSTON 15G (disulfoton)
AGROX DL PLUS (diazinon + lindane + captan)
AGROX B-3 (diazinon + lindane + captan)

METHODS: The crop was planted on 6 June in 6 m rows spaced 0.76 m apart at 100 seeds per plot, using a John Deere Max-emerge planter which was fitted with a cone seeder. Plots were single rows, arranged in a randomized complete block design with four replicates. One month prior to planting fresh cattle manure was applied and disked in. Just after planting, dried blood was sprinkled over each row at a rate of approx. 1 kg blood/plot. The granular materials were applied using a plot scale Noble applicator. T-band applications were placed in a 15 cm band over the open seed furrow. In-furrow applications were placed directly into the seed furrow. Seeds were treated in 500 g lots using a desk-top treater supplied by UNIROYAL CHEMICAL. Percent emergence was calculated by counting all the plants emerged/plot and relating that to the total number of seeds planted. Percent injury was the number of seedlings showing maggot injury over the number of seedlings dug up in a 2 m section of row.

RESULTS: Results are presented in the table below.

CONCLUSIONS: Granular materials provided better control of seedcorn maggot than seed treatments.

Treatment	Rate	Method	Percent Emergence	Percent Infestation
FORCE 1.5G	1.13 g ai/100m	IN-FURROW	19.92 a*	2.5b
FORCE ST	0.4 g ai/kg	SEED T.	10.93 a	3.2ab
DI-SYSTON 15G	6 g ai/100m	T-BAND	19.17 a	2.6ab
DI-SYSTON 15G	9 g ai/100m	T-BAND	15.81 a	0.8b
DI-SYSTON 15G	12 g ai/100m	T-BAND	13.86 a	4.3ab
AGROX B-3 STANDARD	3.2 g/kg	SEED T.	10.21 a	5.0ab
AGROX DL+ STANDARD	2.2 g/kg	SEED T.	14.40 a	3.8ab
DYFONATE II 20G	7 g ai/100m	T-BAND	17.35 a	4.7ab
DYFONATE II 20G	9 g ai/100m	T-BAND	15.73 a	0.8b
DYFONATE II 20G	11 g ai/100m	T-BAND	9.61 a	1.5b
AZTEC 2.1G	1.31 g ai/100m	T-BAND	13.29 a	4.0ab
AZTEC 2.1G	1.31 g ai/100m	IN-FURROW	11.26 a	4.4ab
NON-TREATED CONTROL			12.72 a	14.4a
LSD (.05) =			12.19	11.4
CV =			38.39	72.72

* Means followed by the same letter are not significantly different at the 5% level (New Duncan's Multiple Range test). True means are reported, data were transformed by ARCSIN(SQR(%)) before analysis and mean separation.

#024

BASES DE DONNEES DES ETUDES: 310-1452-8504

CULTURE: Brocoli, cv. Emperor

RAVAGEUR: Piride du chou, *Pieris rapae* (L.);
fausse-arpenteuse du chou, *Trichoplusia ni* (Hubner);
fausse-teigne des cruciferes, *Plutella xylostella* (L).

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TITRE: VERIFICATION DE SEUILS D'INTERVENTION POUR CONTROLER LES LARVES PHYLLOPHAGES DU BROCOLI

PRODUITS: AMBUSH 500 EC (permethrin), 70 g i.a./ha

METHODES: L'etude a ete effectuee selon un dispositif de blocs casualises contenant 8 parcelles, repetees 3 fois. Chaque parcelle avait 8 rangs de 5 m de long et espaces de 1 m. Les brocolis one ete transplantes le 4 juillet a raison de 14 plants par rang espaces de 35 cm. Un contr le a l'herbicide Treflan 2.0 L/ha a ete applique avec un pulverisateur monte sur tracteur a une pression de 2 kPa le 17 mai et un controle de la mouche du chou avec le Dasanit 720SC 25 ml/rang - 100 m a ete effectue le 5 juillet. Les traitements comprenaient l'arrosage regulier aux 2 semaines apres la transplantation (Cedule), l'arrosage a toutes les 2 semaines des la formation de la tete (Tete); et l'arrosage des l'obtention des seuils d'intervention de 0.25; 0.50; 1.0; 1.5; et 2.0 CLE (CLE: Cabbage looper equivalent). La parcelle temoin n'a recu aucun arrosage. L'Ambush etait applique au moyen d'un pulverisateur monte sur tracteur, a une pression de 5.5 kPa avec un debit de 140 ml/ha. Le depistage des 3 especes de larves sur 10 plants choisis au hasard dans les 4 rangs du centre de chaque parcelle etait effectue 1 fois par semaine pour un total de 8 depistages. La recolte a eu lieu les 29 et 31 aout et le poids, le diametre et la qualite commerciale de 30 brocolis choisis au hasard dans les rangs du centre de chaque parcelle one ete enregistres.

RESULTATS: Voir tableau ci-dessous.

CONCLUSIONS: Le traitement Cedule qui a recu au total 3 arrosages d'Ambush pendant la saison de croissance a maintenu des populations larvaires significativement plus faibles que les autres traitements avec des arrosages ou non de l'insecticide. Le traitement base sur le seuil 0.25 CLE a necessite 2 arrosages a l'Ambush tandis que celui de 0.5 CLE et le traitement Tete n'ont recu qu'un seul arrosage chacun de l'insecticide. Pour les traitements 1.0, 1.5 et 2.0 CLE aucun arrosage n'a ete necessaire car les niveaux larvaires n'ont jamais atteint ces seuils. Les niveaux des populations larvaires des traitements qui ne recurent aucun insecticide ne sont pas differents de ceux obtenus avec les traitements qui ont recu un (0.5 CLE, Tete) ou deux (0.25 CLE) arrosages. A l'exception du traitement 1.5 CLE il n'y a aucune difference significative pour la qualite commerciale des tetes des autres traitements et ce, qu'il y ait eu arrosage ou non de l'insecticide. La difference significative enregistree pour le traitement 1.5 CLE ne peut etre attribuee a une plus grande population larvaire. Les seuils d'intervention les plus eleves demontrent des rendements en qualite qui ne sont pas significativement differents de ceux qui recurent un ou des arrosages d'Ambush. Les populations de larves enregistrees cette annee etaient beaucoup plus faibles que celles observees dans une autre etude de meme genre effectuee l'ete passe. Dans un tel contexte de faibles populations, l'arrosage selon une cedule rguliere (Cedule) avec l'Ambush ne contribue pas a ameliorer la qualite marchande du produit par rapport a un traitement ou 1 seul arrosage est effectue (Tete).

Traitements	Nb. d'arrosage	CLE (Moyenne)	Poids (g)	Diametre (cm)	Qualite** (%)
Cedule	3	0.233g*	253.1a	13.2a	100.0a
Tete	1	0.293defg	249.8a	12.9a	100.0a
O.25 CLE	2	0.503abcdef	252.0a	13.3a	100.0a
0.5 CLE	1	0.754abcde	256.6a	13.2a	98.9a
1.0 CLE	0	0.815abcd	246.2a	13.5a	97.8a
1.5 CLE	0	0.935abc	256.3a	13.2a	87.8b
2.0 CLE	0	0.984a	253.7a	13.4a	96.7a
Temoin	0	0.881ab	246.2a	13.0a	95.6a

* Les valeurs suivies de la meme lettre ne sont pas significativement differentes au seuil 5% (Duncan's Multiple Range Test).
** Transformation arcsin edes moyennes avant le test.

#025

STUDY DATA BASE:

CROP: Cabbage cv. Market Prize

PEST: Imported cabbage worm, *Pieris rapae* (L.)

NAME AND AGENCY:
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TITLE: THE EVALUATION OF CGA-237218 50WP (B. thuringiensis) FOR THE CONTROL OF IMPORTED CABBAGE WORM II

MATERIALS: CGA-237218 50WP (B. thuringiensis)
DECIS 2.5EC (deltamethrin)
LANNATE L (methomyl)
THIODAN 4EC (endosulfan)
THURICIDE 4000 I.U./mg (B. thuringiensis)

METHODS: TREFLAN 545g/L (trifluralin) was applied preplant incorporated at 1.1 kg AI/ha to the test area at Honeywood Research Farm, Plattsville, Ontario on 10 June 1991. The cabbage was transplanted on 13 June 1991. Row width was 91cm and plant spacing was 40cm. A starter solution was applied as 200ml/plant of .75L of 28% N in 200L of water immediately after transplanting. DURSBAN 4E (chlorpyrifos) was applied to each side of the cabbage rows for control of root maggots at a rate of 210ml product in 130L of water/1000m of row and 1.0kg of 42-0-0 was incorporated between each row on 19 June. Three weeks later an additional .25kg of 42-0-0 was spread between rows and incorporated. Plots were 6m long by 3 rows wide. Each treatment was replicated four times in a randomized complete block design. Counts for Imported cabbage worm (ICW) began in early July. Eight cabbage plants/plot were inspected for ICW larvae. When the threshold of .25 larva/plant was reached the first application was made. Subsequent applications were applied when the threshold was met in the CGA-237218 treated plots. The ICW insecticides were applied 15 July, 7 & 23 Aug. ICW counts were taken on 16, 19, 22, 26 July, 6, 8, 12, 14, 21, 26, 30 Aug. Treatments were applied using a CO2 pressurized 2.5m hand boom with TXSS10 hollow cone spray tips delivering 400L/ha spray solution at 450 kPa pressure.
RESULTS: Results are summarized in the table below.

CONCLUSIONS: Overall, CGA-237218 50WP performance was equivalent to the commercial standards. The duration of control for all treatments was between 14-21 days under heavy insect pressure. The 1.0 kg rate of CGA-237218 was slower to kill ICW larvae after the second application but still showed significant activity compared to the CHECK plots and activity equivalent to THURICIDE and not significantly different than the 1.5 L rate of THIODAN.

TREATMENT	RATEa	NUMBER OF LARVAE PER PLANT 1/1b	4/1	7/1	11/1	24/1	1/2	5/2	8/2	14/2	3/3	7/3
CHECK	------	0a*	.8b	1.2b	.9b	1.8a	1.5c	3.6b	4.0b	2.7d	2.0b	.9b
CGA-237218	1.0 kg	.3a	.1a	0a	0a	2.0a	.7b	.4a	.1a	.3abc	.1a	0a
CGA-237218	1.5 kg	.3a	0a	0a	0a	1.1a	.3ab	.1a	0a	.4abc	.1a	0a
THURICIDE	2.25 L	.1a	.2a	.1a	.1a	1.7a	.7b	.3a	.2a	.9bc	.3a	0a
THURICIDE	4.5 L	.3a	.1a	.2a	.1a	1.4a	.4ab	.3a	.2a	.8abc	.2a	0a
DECIS	.3 L	.3a	0a	0a	0a	1.2a	.1a	0a	0a	.1ab	.1a	0a
DECIS	.4 L	.3a	.1a	0a	0a	1.1a	.1a	.1a	0a	.1ab	0a	0a
LANNATE	2.25 L	.3a	0a	0a	0a	3.8b	0a	.1a	0a	1.1c	.1a	0a
THIODAN	1.5 L	.2a	.1a	.1a	.1a	1.8a	.2ab	.1a	0a	0a	0a	0a
THIODAN	2.0 L	.1a	.1a	.1a	0a	1.9a	.1a	.1a	0a	.1ab	.1a	0a

a Rates are given in amount of product/ha.
b Days after application/number of application eg 1/2 = 1st day after 2nd app.
* Numbers within the same column followed by the same letter are not significantly different (DMRT P=.05)

#026

CROP: Cabbage cv. Market Prize

PEST: Imported cabbage worm, *Pieris rapae* (L.)

NAME AND AGENCY:
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TITLE: THE EVALUATION OF CGA-237218 50WP (*B. thuringiensis*) FOR THE CONTROL OF IMPORTED CABBAGE WORM I

MATERIALS: CGA-237218 50WP (*B. thuringiensis*)
DECIS 2.5EC (deltamethrin)
LANNATE L (methomyl)
THIODAN 4EC (endosulfan)
THURICIDE 4000 I.U./mg (B. thuringiensis)

METHODS: The test site was located near Milverton, One. TREFLAN 545 g/L (trifluralin) was applied preplant incorporated to the test area at 1.1 kg AI/ha on 13 June 1991. The cabbage was transplanted on 13 June 1991 with a starter solution of 0.75L 28% N in 200L water applied at 200mL/plant. Row width was 91cm and plant spacing was 40cm. RIPCORD 400EC (cypermethrin) was applied to the test area on 17 June 1991 at a rate of 0.5kg AI/ha to control flea beetles.

DURSBAN 4E (chlorpyrifos) was applied to each side of the cabbage rows on 19 June 1991 at a rate of 210mL product in 130L of water/1000m of row for control of root maggots. On the same day, 1.0kg of 34-0-0 was spread between each row and incorporated. Three weeks later an additional 0.25kg of 42-0-0 was spread between each row and incorporated. Plots were 6m long by 3 rows wide. Each treatment was replicated four times in a randomized complete block design. Counts for Imported cabbage worm (ICW) began in early July. Eight cabbage plants/plot were inspected for ICW larvae. When the threshold of .25 larvae/plant was reached the first application was made. Subsequent applications were made when the threshold was met in the plots treated with CGA-237218. The ICW insecticides were applied 12 & 26 July, and 16 Aug. ICW counts were taken on 15, 19, 25 July; 6, 12, 15, 19, 23, 30 Aug. Treatments were applied using a CO2-pressurized 2.5m hand boom with TXSS10 hollow cone spray tips delivering 400L/ha at 450 kPa.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: CGA-237218 50WP performed equal to or better than all other treatments. For a period of 13 days after the first application and 17 days after the second application, the number of ICW larvae per plant in plots treated with CGA-237218 50WP was significantly less than that in the check.

TREATMENT	RATEa	NUMBER OF LARVAE PER PLANT								
		3/1b	7/1	13/1	11/2	17/2	20/2	3/3	7/3	14/3
CHECK	------	0.3a*	1.2b	1.1b	0.6b	1.5d	0.9ab	0.4bc	0.4c	0.2a
CGA-237218	1.0 kg	0.1a	0.1a	0.5a	0.0a	0.6abc	1.6abc	0.0a	0.0a	0.1a
CGA-237218	1.5 kg	0.2a	0.2a	0.4a	0.0a	0.5ab	2.1bc	0.1a	0.0a	0.0a
THURICIDE	2.25 L	0.1a	0.2a	0.6ab	0.0a	0.7abc	2.2c	0.1a	0.0ab	0.0a
THURICIDE	4.5 L	0.2a	0.2a	0.6ab	0.1a	0.9bcd	1.3abc	0.1a	0.0ab	0.0a
DECIS	0.3 L	0.2a	0.1a	0.3a	0.0a	0.2a	0.9ab	0.1a	0.1ab	0.0a
DECIS	0.4 L	0.1a	0.0a	0.1a	0.0a	0.8abc	0.7a	0.0a	0.1ab	0.0a
LANNATE	2.25 L	0.1a	0.1a	0.6ab	0.0a	1.3cd	4.0d	0.5c	0.2bc	0.2a
THIODAN	1.5 L	0.3a	0.3a	0.6ab	0.1a	0.3ab	2.1c	0.2abc	0.1ab	0.1a
THIODAN	2.0 L	0.3a	0.1a	0.2a	0.0a	0.4ab	1.8abc	0.2ab	0.2ab	0.0a

a Rates are given in amount of product/ha.
b Number of days after application/application number
* Means within a column followed by the same letter are not significantly different (P=0.05, Duncan's Multiple Range Test).

#027

STUDY DATA BASE: 303-1452-8703

CROP: Cabbage cv. Lennox

PEST: Imported cabbageworm, *Artogeia rapae* (L.)
Diamondback moth, *Plutella xylostella* (L.)

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TITLE: CONTROL OF IMPORTED CABBAGEWORM (ICW) AND DIAMONDBACK MOTH (DBM) ON CABBAGE, 1991

MATERIALS: CGA-237218 (*Bacillus thuringiensis* var. *kurstaki*)
CUTLASS (*Bacillus thuringiensis* var. *kurstaki*)
BACTOSPEINE (*Bacillus thuringiensis* var. *kurstaki*)
CONDOR (*Bacillus thuringiensis* var. *kurstaki*)
RH 5992

METHODS: Cabbage seedlings were transplanted at Harrington, P.E.I., on June 18, 1991. Plants were spaced at about 45 cm within rows and 91 cm between rows. Each four row plot measured 3.7 m wide by 14 m long. Plots were arranged in a randomized complete block design with ten treatments each replicated four times. Fertilizer was applied in accordance with recommendations for cole crop production on P.E.I. Plots were sampled weekly, beginning on August 2 and ending on September 3, by counting the number of ICW and DBM larvae on five plants randomly selected from the center two rows of each plot. Insecticides were applied on August 4 and when a threshold of 0.25 Cabbage Looper Equivalents (CLE) per plant was surpassed. The number of ICW and DBM were multiplied by 0.67 and 0.2, respectively to convert to CLE. Insecticides were applied using a

CO2-powered sprayer equipped with two drop nozzles and one overhead nozzle per row. The sprayer delivered about 580 L of mixture/ha at about 240 kPa pressure. Weeds were controlled by a pre-plant application of trifluralin (TREFLAN 545EC) at a rate of 600 g AI/ha on May 13, and several mechanical cultivations. Ten heads from the centre two rows of each plot were harvested on September 11, and weight, diameter, and marketability were recorded. Heads were marketable if they were free of insects, frass, and feeding damage. An analysis of variance was performed on the data and Least Squares Differences (LSD) were determined.

RESULTS: There were no significant differences in insect populations until August 14. The results are summarized in the table below.

CONCLUSIONS: Compared to the untreated check, all products reduced the number of ICW and DBM larvae. The higher rate of FUTURA XLV was more efficacious and produced more marketable heads of cabbage than the lower rate of this bacterial insecticide. The higher rate of RH 5992 was applied once during the growing season and was as effective as three applications of the lower rate. No phytotoxicity was noted for any of the products tested.

			Number of ICW Larvae/Plant				Number ofDBM Larvae/Plant				
Treatment	Rate per ha	No. of Sprays	Aug 14	Aug 22	Aug 27	Sept 3	Aug 14	Aug 22	Aug 27	Sept 3	Markets* (%)
Check	-	0	1.9	2.9	1.3	1.4	0.3	0.1	0.2	0.4	5
CGA-237218	0.006 kg AI	3	0.5	0.1	0.0	0.1	0.1	0.0	0.2	0.1	87
CGA-237218	0.009 kg AI	2	0.5	0.1	0.1	0.1	0.1	0.1	0.4	0.1	87
CUTLASS WP	1.1 kg prod.	3	0.3	0.4	0.1	0.1	0.1	0.1	0.0	0.1	97
FUTURA XLV	0.7 kg prod.	4	0.6	0.1	0.2	0.4	0.3	0.0	0.2	0.2	72
FUTURA XLV	1.5 kg prod.	4	0.3	0.4	0.1	0.0	0.1	0.1	0.1	0.0	82
BACTOSPEINE	2.3L prod.	3	0.9	0.5	0.2	0.1	0.1	0.0	0.1	0.1	82
CONDOR FL	2.4L prod.	2	0.2	0.5	0.1	0.1	0.1	0.1	0.0	0.0	85
RH-5992	0.14 kg AI	3	0.3	0.0	0.0	0.1	0.1	0.2	0.1	0.2	80
RH-5992	0.24 kg AI	1	0.1	0.1	0.0	0.2	0.0	0.2	0.1	0.2	72
LSD P=0.05			0.6	0.2	0.5	0.3	0.2	0.2	0.3	0.3	16

* Heads free of insect damage, frass or larvae were considered marketable.

#028

ICAR/IRAC: 86100104

CROP: Cabbage cv. Survivor

PEST: Imported cabbageworm, *Artogeia rapae* (L.)
Diamondback moth, *Plutella xylostella* (L.)

NAME AND AGENCY:
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TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF INSECTS ON CABBAGE

MATERIALS: CGA-237218 6 WP @ 1.0 and 1.5 kg prod / ha
AC 303,630 12% EC @ 100 g AI / ha
RH 5992 240 g / L @ 140 and 240 g AI / ha
LATRON (spreader-sticker) @ 0.1% v/v;
DECIS 2.5 EC (deltamethrin) @ 400 ml prod / ha

METHODS: Cabbage seedlings were transplanted on June 19 in rows 0.9 m apart. On July 31 and August 8, the insecticides were applied to 4 row x 13 m plots at a rate of 800 L/ha using a tractor mounted boom sprayer. Treatments were replicated 4 times in a randomized block design. Treatments were evaluated on August 6, 12 and 19 by removing five plants from the centre two rows and examining them for larvae. The August 19 assessment indicated that the population of insects was still under control and that no further applications were required.

RESULTS: As presented in the table below.

CONCLUSIONS: All treatments provided excellent control of the insects with just a single application.

Insecticide efficacy on cabbage. 1991. Mean* number of imported cabbageworms (ICW) and diamondback moths (DBM) per plant.

	AUG 06		AUG 12		AUG 19	
Treatments	ICW	DBM	ICW	DBM	ICW	DBM
CGA-237218 @ 1.0 kg prod/ha	8.7b	0.7a	8.9a	0.6a	12.9b	0.4a
CGA-237218 @ 1.5 kg prod/ha	5.3ab	0.6a	6.0a	0.2a	6.2ab	0.5a
AC 303,630 @ 100 g AI/ha	3.6a	0.8a	3.6a	0.2a	3.5ab	0.1a
RH 5992 + LATRON @ 140 g AI+0.1% v/v	3.2a	0.6a	4.5a	0.5a	5.2ab	0.3a
RH 5992 + LATRON @ 240 g AI+0.1% v/v	1.7a	0.6a	5.7a	0.5a	4.2ab	0.7a
DECIS @ 400 ml prod/ha	2.3a	0.1a	1.0a	0.5a	0.7a	0.2a
CHECK	14.3c	2.8b	23.4b	3.7b	27.6c	1.6b

* Means in each column followed by the same letter are not significantly different at P = 0.05 (Tukey's studentized test).

#029

ICAR: 61006535

CROP: Cabbage, cv Superette

PEST: Imported cabbageworm, *Pieris rapae* (L)

NAME AND AGENCY:
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TITLE: INSECT CONTROL IN CABBAGE

MATERIALS: MONITOR 480LC (methamidophos)
DIPEL (*B. thuringiensis* var. *Kurstaki*)
CGA-237218 0.6WP (*Bt* experimental)
AC 303,630 120EC (experimental)
BOND (surfactant)

METHODS: Cabbage was transplanted on June 6 in two row plots spaced 0.9m apart. Plots were 8m in length, replicated 4 times in a randomized complete block design. Spray applications were made with a back pack airblast sprayer at 240 L/ha of water. Insecticides were applied on July 2, 9, 17, 25 and Aug. 1. A 0.125% v/v of the surfactant BOND was added to each treatment. Insect larval counts were taken on July 4 and foliar insect leaf feeding damage ratings on July 18, Aug. 3 and Aug. 14.

RESULTS: As presented in the table below.

CONCLUSIONS: All 4 insecticides significantly reduced cabbageworm populations. AC 303,630 consistantly provided the highest level of control, significantly reducing the foliar damage compared to both DIPEL and MONITOR. CGA-237218 was almost equal to AC 303,630 and often more effective than that of DIPEL. Increasing the rates of the 2 experimental materials numerically increased the number of dead larvae observed although there was no statistical significance.

	Rate	Imported Cabbageworms /plot		Leaf Feeding Damage (0-10)*		
Treatments	product/ha	Live	Dead	July 18	Aug. 3	Aug. 14
MONITOR 480LC	1.1 L	1.3B**	9.8AB	6.5B	8.4BC	8.8B
DIPEL	1.0 kg	4.0B	7.5AB	5.5B	8.0C	7.0C
CGA-237218 0.6WP	1.0 kg	2.5B	7.0AB	8.3A	9.1ABC	8.4B
CGA-237218 0.6WP	1.5 kg	1.3B	12.3A	8.8A	9.5AB	8.8B
AC 303,630 120EC	0.83 L	1.3B	7.5AB	8.6A	10.0A	9.9A
AC 303,630 120EC	1.67 L	0.5B	12.5A	9.4A	10.0A	9.9A
Control		10.3A	1.3B	2.5C	2.5D	2.7D

* Leaf Feeding Damage (0-10) - 0, severely eaten, multiple feeding holes throughout the cabbage foliage; 10, no damage, no feeding holes observed;
** Means followed by the same letter are not significantly different (P<0.05, Duncan's multiple range test).

#030

ICAR: 86100104

CROP: Canola, cv. WW 1432

PEST: Crucifer flea beetle, *Phyllotreta cruciferae* (Goeze) and
Striped flea beetle, *Phyllotreta striolata* (Fabr.)

NAME AND AGENCY:
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TITLE: CONTROL OF FLEA BEETLE IN CANOLA BY SEED TREATMENTS AND GRANULAR INSECTICIDES

MATERIALS: See Table 1.

METHODS: Seed treatments were measured volumetrically and added to a 0.5 kg sample of seed. The sample was mixed for 15 min and allowed to dry. The appropriate amount of seed for each plot was taken from the mixture and placed into individual packets. The granular insecticides,FORCE 1.25G and 2.5G, were weighed and added to the appropriate packets of preweighed seed. The seeding rate was equivalent to 2 million plants/ha. Plots of canola were sown on May 4 using a 6-row, tractor-mounted cone seeder that evenly delivered treated seed and/or granular insecticide to rows spaced 22.0 cm apart. Plots were trimmed to 5.5 m after seedlings emerged. The number of plants in each plot was estimated by counting two rows (11 m) just after emergence and at harvest. After emergence the growth stage of seedlings and damage caused by flea beetles were recorded each week until the main raceme began to elongate. A damage index was assigned to 10 samples of 3 plants each from the middle 4 rows of each plot. Damage to the two innermost (youngest) leaves was recorded as 0 = no damage, 0.5 = < 10%, 1.0 = 11-37%, 2.0 = 38-62%, 3.0 =63-87%, and 4.0 = 88-100% of the leaf area consumed. Analysis of variance was performed on the mean of the 10 observations per plot. Yield was taken by harvesting the six rows of each plot with a combine. Seed was dried and cleaned to remove chaff, stalks and damaged seed. The sample weight was converted equivalent kg/ha before analysis.

RESULTS: Listed in Table 2.

CONCLUSIONS: All seed treatments controlled damage by the flea beetle for the entire period of this test. GRANULAR FORCE did not provide adequate control. PREMIERE, UBI-2599-2, UBI-2554-1, and VITAVAX gave rise to faster development, larger stands and greater yields than the other treatments.

Table 1. Materials used to control flea beetles on canola cv. Triumph, 1989.

Material	Prod /100 g seed	Formulation (g AI/L)	
VITAVAX RS	2.25 mL	680	lindane
UBI-2599-2	2.25 mL	533	lindane
UBI-2554-1	1.6 mL	62.5	Vitavax, 250 cloethocarb
PREMIERE	2.8 mL	512	lindane
FORCE	2.5 mL	200	tefluthrin
FORCE	3.75 mL	200	tefluthrin
GRANULAR FORCE	8.0 gm/pkt	1.25%	tefluthrin
GRANULAR FORCE	8.0 gm/pkt	2.5%	tefluthrin

Table 2. Means* of foliar damage by flea beetles, stage of development, stand per row and yield of 'WW 1432' canola seeded with insecticide-treated seed and granular insecticides, 1991.

	DAMAGE INDEX+			DEVELOPMENT STAGE++			STAND/ROW		YIELD
Treatment	05/21	05/31	06/12	05/21	05/31	06/12	INITIAL	FINAL	
VITAVAX	0.5a	0.7a	0.1a	2.1a	2.4a	2.9ab	110.9a	104.3a	1198.4
UBI-2599-2	0.6a	0.6a	0.1a	2.1a	2.5a	2.9b	103.9ab	95.3a	1130.8
UBI-2554-1	0.4a	0.6a	0.1a	2.1a	2.5a	3.0a	112.0a	104.3a	1119.1
PREMIERE	0.8a	0.7a	0.2c	2.1a	2.5a	2.9b	99.6ab	92.9a	1030.3
FORCE@2.5	1.5bc	1.3ab	0.5b	2.1ab	2.0ab	2.6c	70.5bc	53.1b	980.9
FORCE@3.75	1.4b	1.3ab	0.7bc	2.1b	2.0ab	2.7cd	72.1b	43.9bc	862.4
GRANULAR FORCE	1.9bc	1.9bc	0.8cd	2.0cd	1.7bc	2.6d	50.0c	25.5c	414.4
GRANULAR FORCE	1.9bc	2.2c	0.8cd	2.1bc	1.3c	2.6cd	56.6c	27.8c	740.9
UNTREATED CHECK	2.0c	2.6c	0.9d	2.0d	1.1c	2.5e	42.6c	22.3c	424.9

\+ Damage 0.5 = 12.5%; 1.0 = 25%; 2.0 = 50%; 3.0 = 75%; 4.0 = 100%
++ Stage 2.0 = cotyledon; 2.1 - 2.9 = 1 to 9 true leaves
Damage was assessed on the most recent growth stage only
* Means in each column followed by the same letter are not significantly different at P = 0.05 (Tukey's studentized test).

#031

STUDY DATA BASE: 364-1421-8704

CROP: Canola var. Westar

PEST: Crucifer flea beetle, *Phyllotreta cruciferae* (Goeze)

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TITLE: CANOLA SEEDLING PROTECTION WITH GRANULAR AND SEED DRESSING INSECTICIDES

MATERIALS: FURADAN 10G (carbofuran)
VITAVAX RS (lindane 68%, carbathiin 4.5%, thiram 9%)
AMAZE (isofenphos 93%, benomyl 20%, thiram 2%)
COUNTER 5G
BIODAC 5G (terbufos)
ROVRAL ST (lindane 50%, iprodione 16.7%)
TF-3755 (tefluthrin 20%)
UBI-2554-1 (cloethocarb 25%, carbathiin 6.25%, thiram 12.5%)
NTN-33983 24FS

METHODS: Canola was seeded at 6.0 kg/ha on May 21, 1991 at Glenlea, Manitoba with a double disc press drill to a depth of 2 to 3 cm with 18 cm row spacings.

Plots 1.25 m by 5.0 m were replicated 8 times in a randomized complete block design. Four samples of 25 seeds/treatment were tested for germination at 25°C on moistened filter paper for 7 days. Flea beetle damage was assessed June 17 and 26 with a rating scale based on % of leaf surface area damaged; 0 = no damage; 0.5 = 1-10%; 1.0 = 11-25%; 2 = 26-50%; 3 = 51-75%; 4 = 76-100%. Two plant counts of 0.25 m2/plot were taken June 17. Plots were harvested by straight combining on September 3.

RESULTS: Rates in table below refer only to the insecticidal component of the pesticide formulation.

CONCLUSIONS: Granular treatments of FURADAN and COUNTER with VITAVAX and seed dressings of AMAZE, UBI-2554-1 and VITAVAX had highest yields and lowest flea beetle damage to seedlings. COUNTER, ROVRAL ST, and TF-3755 did not increase yields and only slightly reduced flea beetle damage. BIODAC was more effective at increasing yields and preventing flea beetle damage than COUNTER. NTN-33983 flea beetle damage was comparable to that of AMAZE, but yields were lower.

Treatments	Rate (g AI/ kg seed)	Seed Germ. (%)	Beetles /100 plants	Plant Damage JN 17	Plant Damage JN 26	Canola Plants /m2	Canola Yield (g/m2)
CHECK	-	92	7.9	3.2	2.8	28.8g*	146.3h
FURADAN	50	94	2.9	2.0	1.8	58.8de	201.2c-f
FURADAN + VITAVAX RS	50 + 15	96	3.3	0.8	0.6	89.3a	229.0a-d
AMAZE	12	97	4.7	1.4	1.4	71.0bcd	222.7a-d
FURADAN + AMAZE	25 + 12	98	3.9	1.1	1.0	72.5bc	223.0a-d
FURADAN + AMAZE	50 + 12	89	2.5	0.4	0.2	88.8a	248.3ab
COUNTER	50	84	4.0	2.5	2.2	44.3f	175.4e-h
COUNTER + VITAVAX RS	50 + 15	89	4.4	1.0	0.9	82.3ab	240.5abc
BIODAC	50	90	3.8	2.1	1.8	52.8ef	210.2b-e
UBI-2554-1	4	95	3.4	1.2	1.0	77.3abc	251.6a
VITAVAX RS	15	96	5.6	1.3	1.0	66.0cd	232.1a-d
ROVRAL ST	16	76	6.8	2.4	2.7	30.3g	161.2gh
TF-3755	0.2	91	4.6	2.7	2.6	44.3f	169.9fgh
TF-3755	0.4	95	4.8	2.7	2.6	44.3f	167.3fgh
NTN-33983 FS	10	80	9.1	1.5	1.5	70.3bcd	196.0d-g

* Means followed by the same letter are not significantly different (Duncan's Multiple Range test, P<0.05).

#032

STUDY DATA BASE: 364-1421-8704

CROP: Canola cv. Westar

PEST: Crucifer flea beetle, *Phyllotreta cruciferae* (Goeze)

NAME AND AGENCY:
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TITLE: FLEA BEETLE CONTROL AND CANOLA PROTECTION WITH GRANULAR INSECTICIDES

MATERIALS: FURADAN 10G (carbofuran)
COUNTER 5G, BIODAC 5G (terbufos)
AMAZE (isofenphos 93%, benomyl 20%, thiram 2%)
VITAVAX RS (lindane 68%, carbathiin 4.5%, thiram 9%)

METHODS: Canola was seeded in a circular row on May 27, 1991 into sterile soil in plastic dishes. Seeds and granules were placed at equal distances in the row. The dishes were 85 mm in diameter and 35 mm deep with a 2 mm hole in the bottom for water entry. White quartz sand was placed on the soil to aid beetle assessments. A clear plastic cage with screened openings was set overtop the seedlings. Plots of 1 cage/treatment were replicated 7 times. Ten beetles/plant were added to each cage 2 days after seedling emergence, and beetle mortality and feeding injury were assessed after 48 hours. Bioassays were repeated 3, 5 and 7 days after the start of the first test. Plant damage was rated based on the percent of leaf surface damaged; 0 = no damage; 0.5 = 1-10%; 1.0 = 11-25%; 2.0 = 26-50%; 3.0 = 51-75%; 4 = 75-100%. The trial was run in a greenhouse at 25-28°C with a 16:8 photoperiod.

RESULTS: Flea beetle mortality data in table below were adjusted by arcsine transformation before analysis by Duncan's Multiple Range test.

CONCLUSIONS: FURADAN treatments gave excellent control and protected seedlings from injury. Flea beetle control with COUNTER was significantly lower than FURADAN, and feeding injury was higher. VITAVAX added to COUNTER increased control for the first 2 days, and reduced feeding injury. BIODAC gave significantly better flea beetle control than COUNTER for 2 bioassays, but flea beetle injury for both treatments was the same by the third bioassay.

Treatments	Rate (g AI/ kg seed)	Flea Beetle Mortality 2 d	5 d	7 d	9 d	Plant Damage Rating 3 d	5 d	7 d	9 d
Granules									
Check	-	0d*	3d	3c	1c	1.4	2.0	2.1	2.2
FURADAN	50	94ab	96a	94a	100a	0.2	0.4	0.3	0.2
FURADAN + VITAVAX	50 + 15	99a	100a	100a	99a	0.1	0.1	0.3	0.1
FURADAN + AMAZE	25 + 12	98a	100a	100a	99a	0.2	0.2	0.3	0.2
FURADAN + AMAZE	50 + 12	100a	100a	100a	100a	0.2	0.2	0.1	0.1
COUNTER	50	46c	41c	26b	27b	0.7	1.1	1.4	1.5
COUNTER + VITAVAX	50 + 15	93ab	46c	40b	35b	0.2	0.5	0.7	1.0
BIODAC	50	79b	86b	53b	32b	0.5	0.9	1.4	1.9

* Means followed by the same letter are not significant (DMR, P<0.05).

#033

STUDY DATA BASE: 364-1421-8704

CROP: Canola cv. Westar

PEST: Crucifer flea beetle, *Phyllotreta cruciferae* (Goeze)

NAME AND AGENCY:
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TITLE: FLEA BEETLE CONTROL IN CANOLA WITH SEED DRESSING INSECTICIDES

MATERIALS: AMAZE (isofenphos 93%, benomyl 20%, thiram 2%)
VITAVAX RS (lindane 68%, carbathiin 4.5%, thiram 9%)
TF-3755 (tefluthrin 20%)
UBI-2554-1 (cloethocarb 25%, carbathiin 6.25%, thiram 12.5%)
ROVRAL ST (lindane 50%, iprodione 16.7%)
NTN-33983 24FS

METHODS: Treatments were seeded May 27, 1991 into sterile soil in 16 dram plastic containers that had a 2 mm hole in the bottom for water entry. White quartz sand was placed on the soil, and clear plastic cages with screened openings were placed overtop the vials after seedling emergence. Plots of 1 cage/treatment were replicated 7 times. Ten beetles/plant were added to each cage 2 days after seedling emergence, and beetle mortality and feeding injury were assessed 2, 5, 7, and 9 days later. All dead beetles were replaced with live adults after each assessment. Plant damage was rated according to percent of leaf surface damaged by beetles: 0 = no damage; 0.5 = 1-10%; 1.0 = 11-25%; 2.0 = 26-50%; 3.0 = 51-75%; 4.0 = 76-100%. The trial was run in a greenhouse at 25-28°C with a 16:8 photoperiod.

RESULTS: Flea beetle mortality presented in table below were adjusted by arcsine transformation before analysis by Duncan's Multiple Range test.

CONCLUSIONS: AMAZE was only treatment not to show a loss in efficacy after 9 days. While VITAVAX and ROVRAL efficacy declined by the third bioassay, both still protected plants from feeding injury. NTN-33983 effectively prevented damage, but did not control flea beetles. UBI-2554-1 failed to either protect seedlings or control beetles. TF-3755 at the highest rate controlled beetles for 7 days, but plant damage was extensive after the final bioassay.

Treatments	Rate (g AI/ kg seed)	Flea Beetle Mortality 2 d	5 d	7 d	9 d	Plant Damage Rating 3 d	5 d	7 d	9 d
Check	-	1d*	4e	0d	8de	1.5	2.0	1.9	1.9
AMAZE	12	100a	100a	98a	100a	0.3	0.4	0.4	0.5
TF-3755	0.2	3cd	8de	9c	12de	0.9	1.2	1.3	1.7
TF-3755	0.4	1d	18cd	3cd	2e	1.0	1.4	1.7	2.1
TF-3755	1.0	78b	49b	40b	25cd	0.3	0.6	1.1	2.1
UBI-2554-1	4	8cd	31bc	5cd	8de	0.9	1.2	1.4	1.7
VITAVAX RS	15	99a	100a	46b	43bc	0.1	0.2	0.2	0.3
ROVRAL ST	16	99a	99a	55b	65b	0.1	0.2	0.2	0.4
NTN-33983	10	14c	22cd	10c	19cde	0.6	0.8	1.0	1.0

* Means followed by the same letter are not significant (DMR, $P<0.05$).

#034

STUDY DATA BASE: 364-1411-8803

CROP: Flax var. MacGregor

PEST: Potato aphid, *Macrosiphum euphorbiae* (Thomas)

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TITLE: APPLICATION TIMING FOR APHID CONTROL IN FLAX IN MANITOBA

MATERIALS: SEVIN XLR (carbaryl)
DECIS 5EC (deltamethrin)
CYGON 40EC (dimethoate)

METHODS: Flax was seeded 2 cm deep at a rate of 35 kg/ha on May 23, 1990 at Portage la Prairie, Manitoba. Plots 2.0 m by 7.5 m were separated by unseeded strips 1 m wide within blocks and 2.5 m wide between blocks, and were arranged in a randomized complete block design with 5 replicates. Treatments were made with a C02-pressurized hand sprayer, that had D4-25 disc core nozzles that applied volumes of 220 L/ha at 300 kPa. CYGON was applied weekly to separate treatments from first flower to early green boll, and to a single treatment that included all 3 applications. DECIS and SEVIN were applied at the time of the second CYGON application. SEVIN was applied to study effects of beneficial insects on aphid populations. Aphid densities were assessed weekly from July 24 to August 14 by randomly selecting 20 stems within each plot. A strip 1.33 m wide from the middle of each plot was machine-harvested on September 25.

RESULTS: Aphid densities and yields were analyzed by a two-way analyses of variance, and presented in the table below.

CONCLUSIONS: All CYGON treatments significantly decreased aphid densities and increased yields. CYGON treatments applied before July 31 or the early green boll stage had significantly higher yields. DECIS also significantly reduced aphid densities, and significantly increased yields. Aphid densities were significantly increased by SEVIN, and yields were reduced. The optimal spray timing in this trial would be on or just before July 18, or when less than 10% of plants are flowering, to minimize aphid damage and effects on nontarget organisms.

		Aphids per shoot				Yield
Treatment	Spray Date	24 Jul	31 Jul	7 Aug	14 Aug	(kg/ha)
CYGON 40EC**	July 18, 24, 31	0.51c*	0.42b	0.51c	0.79c	2322ab
CYGON 40EC	July 18	0.37c	1.99b	3.50c	2.87c	2399a
CYGON 40EC	July 24	7.74b	0.39b	2.00c	1.19c	2272ab
CYGON 40EC	July 31	7.02b	34.95a	9.11c	2.05c	1971c
DECIS 5EC	July 24	7.35b	6.61b	15.61c	12.77c	2082bc
Control	-	2.41a	45.19a	77.27b	29.22b	1680d
SEVIN XLR	July 24	7.97b	35.59a	104.59a	51.12a	1573d

** CYGON 40EC was applied at 210 g AI/ha, DECIS 5EC at 10 g AI/ha, and SEVIN XLR at 560 g AI/ha.
* Means followed by the same letter are not significant (DMR, P<0.05).

#035

STUDY DATA BASE: 364-1411-8803

CROP: Flax var. MacGregor

PEST: Potato aphid, *Macrosiphum euphorbiae* (Thomas)

NAME AND AGENCY:
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Tel. (204) 983-1450, FAX (204) 983-4604

TITLE: APPLICATION TIMING FOR APHID CONTROL IN FLAX

MATERIALS: SEVIN XLR (carbaryl)
DECIS 5EC (deltamethrin)
CYGON 40EC (dimethoate)

METHODS: Plots 2.0 m by 7.5 m were seeded at 35 kg/ha on May 15, 1990 at Glenlea, Manitoba. The crop was seeded 2 cm deep with rows 18 cm apart. Plots were separated by unseeded strips 1 m wide within blocks and 2.5 m wide between blocks, and arranged in a randomized complete block design with 5 replicates.

Treatments were made with a C02-pressurized hand sprayer, that had D4-25 disc core nozzles that applied volumes of 220 L/ha at 300 kPa. CYGON applications were made weekly to separate treatments from flowering to early boll turn, and to a single treatment that included all 3 sprays. DECIS and SEVIN were applied 1 week after initial CYGON applications. SEVIN was applied to monitor impact of predators on aphid densities. Aphids were assessed weekly from July 26 to August 9 by randomly selecting 20 stems within each plot. Yields were taken by straight combining on August 21 after the bolls had ripened.

RESULTS: Aphid densities and the yield were analyzed by a two-way analyses of variance at a significance level of $P < 0.05$ as presented in the table below.

CONCLUSIONS: All CYGON treatments significantly reduced aphid densities. DECIS also significantly controlled aphids, but to a lesser extent than CYGON. While yields were not significantly increased by CYGON, slight increases were noted the earlier applications were made. The preferred spray date for CYGON in this experiment was July 23, which was the earliest application date after the end of flowering. Aphid densities were not affected by the impact of SEVIN on aphid predators.

Treatment*	Spray Date	Aphids per shoot 26 Jul	2 Aug	9 Aug	Yield (kg/ha)
CYGON 40EC	July 16, 23, 30	0.18c*	0.22b	0.12b	1951a
CYGON 40EC	July 16	0.85c	2.65b	0.44b	1853a
CYGON 40EC	July 23	0.38c	1.80b	0.25b	1783a
CYGON 40EC	July 30	12.31ab	1.84b	0.37b	1748a
DECIS 5EC	July 23	6.64bc	16.95b	4.99a	1825a
Control	-	17.66a	53.43a	0.75b	1727a
SEVIN XLR	July 23	16.75a	49.58a	1.28b	1677a

* CYGON 40EC was applied at 210 g AI/ha, DECIS 5EC at 10 g AI/ha, and SEVIN XLR at 560 g AI/ha.

** Means followed by the same letter are not significant (DMR, $P < 0.05$).

#036

STUDY DATA BASE: 280-1452-9110

CROP: Cooking onion, cv. Blitz

PEST: Onion maggot, *Delia antiqua* (Meigen)
Darksided cutworm, *Euxoa messoria* (Harris)
Onion thrips, *Thrips tabaci* Lindeman

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TITLE: EVALUATION OF FURROW GRANULAR INSECTICIDES FOR CONTROL OF INSECT PESTS OF COOKING ONIONS ON ORGANIC SOIL

MATERIALS: AZTEC 2.1G (phosetbupirim 2.0% + cyfluthrin 0.1%)
BAY-NTN-33893 2.5G (imidachloprid)
BAY-MAT-7484 2G (phosetbupirim)
FORCE 1.5G (tefluthrin)
LORSBAN 15G (chlorpyrifos)

METHODS: Cooking onions were planted in London on May 9 in 3-row microplots (2.25 x 0.9 m) filled with insecticide residue-free organic soil; all treatments were replicated 3x in a randomized complete block design. Before the seed furrow was closed insecticides were hand-applied, with a modified salt shaker, in a 2-3 cm band in the bottom of the furrow. On May 29 a total of 250 OM eggs were buried 1 cm deep beside 1 onion row in each plot. The infested row was delineated by stakes and the number of onions counted. Infestations were repeated on June 5, 11. Surviving onions were counted 4 wk after each infestation and percent loss calculated. On June 12, when onions had 3-4 true leaves, 4 replicates of 10, 4th-5th instar larvae DSCW were confined in screened plastic cages over the treated row. The number of onion seedlings in each cage was counted; damaged onions were counted after 2 days and percent damage calculated. On July 11 when onions had developed 6-8 true leaves, 2 plants were pulled from both guard rows of each plot (12 plants/trt.) and the number of OT adults and nymphs counted. OT counts were repeated weekly until August 15.

RESULTS: See table below.

CONCLUSIONS: In all OM infestations all treatments significantly reduced OM damage relative to the CONTROL. In the latter 2 infestations, both rates of AZTEC and NTN-33893 and the higher rates of MAT-7484 and FORCE all provided significantly better control of OM damage than the commercial standard, LORSBAN. Although DSCW damage to onions was highly variable, the higher rate of FORCE significantly reduced the number of damaged onions. Numbers of OT varied greatly from plant to plant. Nonetheless seed-furrow application of AZTEC, MAT-7484 and FORCE delayed buildup of OT populations in treated plots. Although these insecticides did not eliminate OT from treated plots, growers applying them for OM control might well be able to delay initiation of foliar insecticide program for OT control.

Nb.	Insecticide	Rate (g AI/ 100 m)	Mean % Onion Loss 29/5 I	5/6 II	11/6 III	Mean % Dam. Onions	Mean Nb.OT Nymphs/ Plant 24/7	15/8
1	AZTEC	1.0 + 0.05	3.0 b*	11.3 c	4.9 d	64.3 abc	16.4 bc	15.1 b
2	AZTEC	2.0 + 0.10	6.8 b	7.0 c	3.7 d	42.0 abc	30.1 bc	11.3 b
3	MAT-7484	1.00	13.7 b	15.7 c	18.1 cd	48.2 abc	24.5 bc	17.6 b
4	MAT-7484	2.00	9.7 b	5.0 c	0.0 d	76.7 ab	29.5 bc	17.8 b
5	FORCE	1.13	19.2 b	20.8 bc	41.3 b	39.7 bc	32.5 bc	12.0 b
6	FORCE	2.25	1.7 b	11.1 c	4.2 d	15.9 c	32.1 bc	34.4 b
7	NTN-33893	1.50	15.7 b	5.0 c	9.8 d	83.3 ab	10.3 c	34.0 b
8	NTN-33893	3.00	9.7 b	12.2 c	8.8 d	49.0 abc	13.3 c	32.6 b
9	LORSBAN	4.80	13.8 b	39.4 b	34.5 bc	95.0 a	53.9 ab	42.3 b
10	CONTROL	----	69.4 a	68.9 a	68.5 a	85.5 ab	71.8 a	107.6 a

* Means within a column followed by the same letter are not significantly different (P = 0.05) as determined by Duncan's New Multiple Range Test.

#037

ICAR: 84100737

CROP: Onions, var. Taurus

PEST: Onion maggot, *Delia antiqua* (Meig.)

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TITLE: PESTICIDES FOR ONION MAGGOT CONTROL - PRECISION SEEDING

MATERIALS: Each of the following treatments was applied at 3 different rates of application: DYFONATE(R) 10 G (fonofos)
LORSBAN(R) 15 G (chlorpyrifos)
TRIGARD 3 g (cyromazine)
FORCE 1.5 G (telfluthrin)
AZTEC 2.1 G (phosetbupirin 2.0% + cyfluthrin 0.1%)
BAY-NTN-33893 2.5 G (1-[(6-Chloro-3-pyridinyl)methyl]-4,5-dihydro-N-nitro-1H-imidazol-2-amine)
PRO GRO(R) (carbathiin 30%, thiram 50%)

METHODS: The tests were done at the Holland Marsh on muck soil. The experimental plot was arranged in a randomized complete block design with four replicates. Seed was custom-coated PRO GRO-treated seed. The granular formulations were applied by using a Stan-Hay precision seeder in a bed of four double rows 24 m long. Each bed had three different rates of application of a granular treatment and an untreated row. On May 28 initial stand was based on the number of plants in each of two, 2 m lengths selected at random in each row. The designated segments for the first generation were checked on May 29, June 3, 6, 10, 13, 17, 20, 24, 27, July 2, 5, and 8, and damaged plants were counted and removed. On July 12, all plants were pulled from the same two, 2 m segments in each row and plants examined for maggot damage. On June 11, plants were measured in 2 m of each row to determine any growth effects due to toxicants. At the end of the second and third generation, all plants were pulled from the designated two, 2 m lengths in each row and plants were examined for maggot damage. On September 18, 5 m of onions of each row were harvested for yield.

RESULTS: Data are presented in Table 1.

CONCLUSIONS: In the first generation of the onion maggot, DYFONATE and LORSBAN controlled the infestation of the onion maggot. The unregistered insecticides TRIGARD, FORCE and AZTEC were as effective as the registered insecticides in controlling the onion maggot, BAY-NTN was not satisfactory. By the end of the third generation the accumulative damage of the onion maggot had increased for all treatments. All treatments provided higher yield than the untreated plots with the exception of BAY-NTN.

Table 1. Initial onion stand, percent maggot damage and yield following the indicated treatment at seeding.*

Treatments	Rate** g AI/100m	Initial plant count***	Height**** (cm)	Maggot damage (%) Gen 1/5	Gen 2/6	Gen3/6	Yield (kg/ha x10/3)/7
DYFONATE 10G	0	137	19	25.1a8	34.3a	26.3ab	58.8bcd
	4.4	164	18	4.1cd	18.5abc	16.9abc	72.0abc
	8.8	165	17	2.7cd	9.7bc	13.6abc	67.9abc
	18.0	143	17	1.9cd	8.6cd	14.1bc	65.5abc
LORSBAN 15G	0	146	19	20.4ab	33.5a	29.8a	56.8cd
	4.4	166	19	3.6cd	16.8abc	18.6abc	67.1abc
	8.8	188	18	3.2cd	11.4cd	7.8c	68.4abc
	18.0	138	18	1.1cd	4.3c	7.7c	79.4a
TRIGARD 3G	0	141	19	9.8bcd	24.4abc	19.2abc	57.0cd
	1.6	149	18	1.7cd	7.4cd	11.1bc	74.3abc
	2.4	152	19	1.7cd	8.1cd	9.1c	68.0abc
	4.8	131	19	0.2cd	6.6cd	8.3c	73.9abc
CHECK	0	114	19	12.6abc	22.3abc	18.8abc	47.6d
FORCE 1.5G	2.3	158	19	3.8cd	9.7cd	14.7abc	76.0ab
AZTEC 2.1G	2.1	161	18	1.4cd	6.1cd	16.5abc	75.7ab
BAY-NTN-33893 2.5G	3.0	124	18	11.5bcd	25.9abc	25.3ab	43.4abc

* Seeded May 3, 1991.
** Based on insecticide component.
*** Counted May 28. Based on 4 m of row, 4 replicates.
**** Measured June 11.
/5 Accumulative counts June 3, 6, 10, 13, 17, 20, 24, 27, July 2,5,8 and 12.
/6 2nd generation, final count August 23; 3rd generation, final count Sept 24.
/7 Based on 5 m, 4 replicates, Sept. 18.
/8 Means followed by the same letter are not significantly different (P=0.05) according to Duncan's Multiple Range Test.

#038

ICAR: 84100737

CROP: Onions, var. Autumn Spice

PEST: Onion maggot, *Delia antiqua* (Meig.)

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TITLE: PESTICIDES FOR ONION MAGGOT CONTROL

MATERIALS: Each of the following treatments was applied at different rates of application: DYFONATE(R) 10 G (fonofos)
LORSBAN(R) 15 G (chlorpyrifos)
TRIGARD 3 G (cyromazine)
FORCE 15 G (tefluthrin)
BAY-NTN-33893 2.5 G (1-[(6-Chloro-3-pyridinyl)methyl]-4,5-dihydro-N-nitro-1H-imidazol-2-amin e)
AZTEC 2.1 G (phosetbupirin 2.0% + cyfluthrin 0.1%)
DYFONATE ST (fonofos 431 g/L)
PRO GRO(R) (carbathiin 30%, thiram 50%)

METHODS: The tests were done at the Holland Marsh on muck soil. The experimental plot was arranged in a randomized complete block design with four replicates. Each plot had two rows 6 m long with 40 cm between the rows. In addition to the granular pesticides applied with the seed, all seed was treated by shaking it with a dust formulation of PRO GRO at 25 g PRO GRO/ 1 kg seed. The granular formulations were applied in the furrow at planting time by adding them with the seed on a V-belt planter. Estimates of the effectiveness of treatments were made as follows: one row of each plot was examined May 29, June 3, 6, 10, 13, 17, 20, 24, 27, July 2, 5 and 8 for onion maggot damage. On each date plants wilting from onion maggot were removed. On July 12, the remaining plants were pulled and examined for onion maggots. The second row was harvested on September 18 for yield.

RESULTS: Data are presented in Table 1.

CONCLUSIONS: The granular insecticide DYFONATE was not as effective as LORSBAN in controlling the high infestation (56.2%) of the onion maggot. The unregistered insecticides TRIGARD, FORCE and AZTEC were effective and showed potential for the control of the onion maggot. The seed treatment method of application of DYFONATE was as effective as the granular treatment of DYFONATE. BAY-NTN was not satisfactory. With the exception of AZTEC, all treatments provided higher yield than the untreated plots.

Table 1. Initial stand, percent maggot damage and yield following the indicated treatment at seeding.*

	Rate (g AI/100 m)	Initial plant count**	Maggot damage*** (%)	Yield (kg/ha x 10/3)****
DYFONATE 10 G	4.4	197	24.5b/7	46.4b
	8.8	192	15.3b	44.2b
LORSBAN 15 G	4.4	213	10.1b	62.7b
	8.8	205	8.7b	63.8b
TRIGARD 3 G	1.6	214	4.7b	62.9b
	2.4	200	1.4b	66.0b
	4.8	179	1.5b	62.6b
FORCE 1.5 G	2.25	220	9.4b	65.8b
BAY-NTN-33893 2.5 G	3.0	204	49.8a	36.7a
AZTEC 2.1 G	2.1	205	1.1b	65.4b
DYFONATE ST*****	0.026	160	12.7b	47.7b
	0.025	192	14.1b	50.5b
CHECK		233	56.2a	33.6a

* Seed treated with Pro Gro (carbathiin 30%, thiram 50%). Based on 4 replicates. Seeded May 6, 1991.
** Per 6 m of row May 28; mean of 4 replicates.
*** Accumulative counts June 3,6,10,13, 17, 20, 24, 27, July 2, 5, 8 & 12. Based on 6 m, 4 replicates.
**** Based on 6 m, 4 replicates, September 18.
***** ST = seed treated (Chipman Inc.).
/6 Kg ai/kg seed.
/7 Means followed by the same letter are not significantly different (P=0.05) according to Duncan's Multiple Range Test.

#039

ICAR: 84100737

CROP: Onions var. Taurus

PEST: Onion thrips, *Thrips tabaci*

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TITLE: INSECTICIDE FOLIAR TREATMENT TO CONTROL THRIPS ON ONIONS

MATERIALS: DIAZINON(R) 50% WP
CYMBUSH(R) 250 EC (cypermethrin)
DECIS(R) 5.0 EC (deltamethrin)
SAFER(R) Insecticide (potassium salts of fatty acids 49%)

METHODS: The tests were done at the Holland Marsh on muck soil. Onions were planted with a Stan-Hay precision seeder in a bed of four double rows. The experimental plot was arranged in a randomized complete design. The plots were two beds, 7 m long, replicated four times. The treatments were applied at 353 L of liquid/ha with an Enti 3200 high clearance sprayer with solid cone spray nozzles at 433 kPa. The thrips population was assessed by examining ten onions in each plot. Nymphs and adults were counted on each leaf and the leaf was stripped to count thrips in the leaf axil.

RESULT: As presented in the Table below.

CONCLUSION: One application of CYMBUSH or DECIS provided as good control up to 4 weeks after application as did DIAZINON or SAFER on a weekly schedule. Control with SAFER was not as good as with the other insecticides.

Mean number of thrips per plant after insecticide foliar application.

			Mean number of thrips per plant July			August	
Treatments	Rate (g AI/ha)	Application date	11	18	25	1	8
CYMBUSH	70	July 22			0.8b	0.6c	0.3b
CYMBUSH	70	July 29				1.0c	0.8b
DIAZINON	500	July 15		0.3b	2.1ab	0.5c	0.9b
CYMBUSH	70	Aug. 5					
DECIS	10	July 29				1.1c	2.3b
DECIS	12.5	July 29				0.7c	2.0b
DIAZINON	500	July 8,15,29 Aug. 5	0.0b2	0.2b	0.4b	0.7c	0.3b
CYMBUSH	70	July 22					
SAFER	1:501	July 8,15,22 29, Aug. 5	0.5ab	1.2b	3.8a	4.5b	4.9b
CONTROL			1.1a	2.8a	3.6a	8.7a	20.8a

1 SAFER Insecticide: H20.
2 Means followed by the same letter are not significantly different (P=0.05) according to Duncan's Multiple Range Test.

#040

STUDY DATA BASE: 206003

CROP: Spanish Onion cv. Cache

PEST: Onion mggot, *Delia antiqua* (Meigo)

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TITLE: EVALUATION OF LORSBAN 4E FOR ONION MAGGOT CONTROL ON SPANISH ONION TRANSPLANTS

MATERIALS: LORSBAN 4E (chlorpyrifos)

METHODS: Spanish onions were seeded in Plastomer trays in the greenhouse on March 27, 1991. The plants were placed outdoors to harden off on May 6. LORSBAN 4E at 1.6 mL/ 475 mL of water per tray was applied to 1/3 of the trays of plants on May 8. The Spanish onions were transplanted into organic soil at Muck Research Station on May 13. A randomized complete block arrangement with 4 blocks per treatment was used. Each replicate consisted of two 5 m rows. LORSBAN 4E at 210 mL in 1000 ml water/1000 m of row was applied to another 1/3 of the transplants as a field drench on May 28. The effectiveness of the treatments for maggot control was evaluated by counting the number of damaged plants on June 3 and July 16.

RESULTS: As presented in the table below.

CONCLUSIONS: LORSBAN 4E applied to plug plants prior to transplanting significantly reduced the incidence of onion maggot damage to Spanish onions at mid-summer (July 16). Applications of LORSBAN 4E to plug plants or in the field reduced the incidence of damage from both the first (June 3) and second (July 16) generation of maggots but these differences were not significant. Applications of LORSBAN 4E to the plug plants in the trays provides effective onion maggot control with a very small amount of insecticide.

Method	Treatment	Rate ml/L	June 3 Percent Damage	July 16 Percent Damage
Tray Drench	LORSBAN 4E	3.4	0.0 a *	0.50 a
Field Drench	LORSBAN 4E	210.0	2.25 a	2.25 ab
Check			7.00 a	9.50 b

* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Protected LSD Test.

#041

CROP: Potato cv. Russet Burbank

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)

NAME AND AGENCY:
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TITLE: EFFICACY OF BACILLUS THURINGIENSIS COMBINED WITH BOND AGAINST THE COLORADO POTATO BEETLE

MATERIALS: Bacillus thuringiensis var. san diego; B.t. var tenebrionis: TRIDENT; BOND; BELMARK 300 EC (fenvalerate)

METHODS: Plots consisted of 4 rows 7.3 m in length with rows 0.91 m apart. The treatments were replicated four times in a randomized block design. Potatoes were planted May 13 at 41 cm spacing. Treatments consisted of M-ONE + BOND 0.125% v:v (7.5 L/ha); M-ONE + BOND 0.250% v:v (7.5 L/ha); TRIDENT + BOND 0.125% v:v (10 L/ha); TRIDENT + BOND 0.250% v:v (10 L/ha); and BELMARK (0.2 L/ha). Treatments were applied on June 24, July 2 and 8. BELMARK was applied on all treatments on July 24 and GUTHION applied on July 15, 29 and August 7 and 9. Counts of the Colorado potato beetles were taken from 5 whole plants chosen randomly from the 2 center rows of each plot. Defoliation was evaluated visually in each plot. The plots were topkilled on August 13 and the two middle rows of each plot harvested September 3. All treatments were applied with a tractor mounted sprayer (800 L/ha, 1200 kPa).

RESULTS: As presented in the table below.

CONCLUSIONS: Bacterial insecticides M-ONE and TRIDENT had similar efficacy against the Colorado potato beetle larvae. Defoliation levels were similar as well as yields. In both products yields were higher than in plots treated with BELMARK and they were all higher than in the control plots which were destroyed. The addition of the product BOND had no positive effect in protecting against defoliation or in protecting against lower yields. The season was unfavorable for the testing of the agent BOND. The summer was unusually hot and very dry. The addition of BOND can only be of value when the bacterial insecticides may be washed off the leaves due to persistent or frequent rainfall. The lower rate of protection by BELMARK is the result of insecticide resistance within the test population.

Table 1. Plant defoliation, mean number of Colorado potato beetle larvae and yield in potato plots.

Treatment Insecticide	Rate	L1 June 25	L2 Jul 2	L3 Jul 8	L4 Jul 12	Yield (t/ha) Total	Yield (t/ha) Marketable
		Colorado potato beetle larvae and defoliation*					
M-ONE + BOND 0.125% v:v	7.5 L/ha	60.8	103.5(2)	25.5b(2)	19.8b(2)	14 a	2 a
M-ONE + BOND 0.250% v:v	7.5 L/ha	45.3	55.0(2)	23.5b(2)	24.3b(2)	14 a	3 a
TRIDENT+BOND 0.125% v:v	10.0 L/ha	33.0	93.3(2)	24.0b(2)	19.5b(2)	13 a	3 a
TRIDENT+BOND 0.250% v:v	10.0 L/ha	30.3	57.8(2)	45.5ab(2)	14.8b(2)	13 a	3 a
BELMARK	0.2 L/ha	53.8	67.3(3)	25.8b(3)	39.8b(3)	11 b	1 ab
Check	------	29.5	124.8(4)	63.8a(5)	120.5a(6)	3 c	0 b

* Defoliation index: scale of 0 to 8 - 0 to 100% defoliation.
** Values followed by the same letter in a column are not significantly different (P>0.05) according to Duncan's Multiple Range Test.

#042

CROP: Potato cv. Russet Burbank

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)

NAME AND AGENCY:
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TITLE: CONTROL OF THE COLORADO POTATO BEETLE WITH THE SYSTEMIC INSECTICIDE BAY-NTN-33893

MATERIALS: BAY-NTN-33893 240 FS 2.5% GR; DI-SYSTON 15G (disulfoton)

METHODS: Plots consisted of 4 rows 7.3 m in length with rows 0.91 m apart. Each treatment was replicated four times in a completely randomized block design. Potatoes were planted May 14 at 40 cm spacing. The insecticides were applied in the seed furrow at planting. To protect plants from emerging adults, Guthion (0.2 L/ha) was applied on all treatments on July 29 and August 7. Counts of the Colorado potato beetles were taken from 5 whole plants chosen randomly from the 2 center rows of each plot. Defoliation was evaluated visually in each plot. The field was topkilled on August 29 and the two center rows were harvested on September 18.

RESULTS: As presented in the table below.

CONCLUSIONS: Insect pressure in the test field was high as revealed by the low yield and high defoliation figures in the check plots. DI-SYSTON, a registered systemic insecticide with low efficacy against the Colorado potato beetle, behaved as expected, offering low crop protection. The systemic insecticide BAY-NTN-33893 prevented defoliation throughout the season with resulting excellent yields. Previous work at our laboratory has shown that a defoliation index of 2 indicates the beginning of economic yield losses. Plots treated with NTN never reached that level of defoliation indicating that the yields obtained were near optimal under the dry growing conditions of the 1991 summer. The significant differences in yield between the 3 rates of NTN are probably the result of inter-plot variations more than the result of product rate. It would seem that the lower rate of application is satisfactory to obtain good crop protection against the Colorado potato beetle. Please note that the product protection resulted in a reduced number of egg masses on plants at the beginning of the season.

Table 1. Plant defoliation, mean number of Colorado potato beetle larvae and yield in potato plots treated with systemic insecticides.

Treatment Insecticide	Rate (product/ ha)	Colorado potato beetle larvae and defoliation* L1 June 28	L2 Jul 4	L3 Jul 11	L4 Jul 17	Yield (t/ha) Total	Yield (t/ha) Marketable
NTN-33893, 2.5% Gr.	4 kg	33 ab	4 b	5 b (1)	3 b (1)	20 b	11 b
NTN-33893, 2.5% Gr.	8 kg	10 ab	1 b	0 b (1)	0 b (0)	27 a	16 a
NTN-33893, 2.5% Gr.	12 kg	0 b	0 b	2 b (1)	1 b (0)	21 b	12 b
DI-SYSTON 15G	21 kg	23 ab	56 a	50 a (4)	117 a (4)	6 c	2 c
Check	------	50 a	66 a	71 a (5)	116 a (6)	3 d	0 c

* Defoliation index: scale of 0 to 8 - 0 to 100% defoliation.
** Values followed by the same letter in a column are not significantly different (P>0.05) according to Duncan's Multiple Range Test.

#043

CROP: Potato cv. Russet Burbank

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)

NAME AND AGENCY:
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TITLE: COMPARISON OF TWO FORMULATIONS OF *BACILLUS THURINGIENSIS* AGAINST THE COLORADO POTATO BEETLE

MATERIALS: *Bacillus thuringiensis* var. *san diego*;
M-ONE, MYX 1806; BELMARK 300 EC (fenvalerate)

METHODS: Plots consisted of 4 rows 7.3 m in length with rows 0.91 m apart. The treatments were replicated four times in a randomized block design. Potatoes were planted May 13 at 41 cm spacing. Treatments consisted of M-ONE (7.5 L/ha); MYX 1806 (4.5 L/ha); MYX 1806 (6.0 L/ha); MYX 1806 (7.5 L/ha); and 3 treatments of BELMARK (0.2 L/ha). Treatments were applied on June 24, July 2, 8. BELMARK was applied on all treatments on July 24 and GUTHION (2.0 L/ha) applied on July 15, 29 and August 7, 9. Counts of Colorado potato beetles were taken from 5 whole plants chosen randomly from the 2 center rows of each plot. Defoliation was evaluated visually in each plot. The plots were topkilled on August 13 and the two middle rows of each plot harvested September 3. All treatments were applied with a tractor mounted sprayer (800 L/ha, 1200 kPa).

RESULTS: As presented in the table below.

CONCLUSIONS: The bacterial insecticide M-ONE provided control of the Colorado potato beetle that was superior to BELMARK. The registered formulation M-ONE was of similar efficacy as the encapsulated formulation of the same bacteria at the same rate. The encapsulated formulation was as effective at the lower rate as at the higher rate. Even though the MYX 1806 did not seem to have a higher efficacy as M-ONE, the ability to use a lower rate of the product might reduce costs and encourage growers to increase their use of bacterial insecticides.

Because of the heavy infestation of potato beetles in the test field, control plots were destroyed and three applications of the standard BELMARK were unable to provide full control of the pests.

Table 1. Plant defoliation, mean number of Colorado potato beetle larvae and yield in potato plots.

Treatment		Colorado potato beetle larvae and defoliation*				Yield (t/ha)	
Insecticide	Rate	L1 June 25	L2 Jul 2	L3 Jul 8	L4 Jul 15	Total	Marketable
M-ONE	7.5 L/ha	49 b (1)	50 b (1)	34 b (2)	66 bc (2)	17 a	4 a
MYX 1806	4.5 L/ha	20 b (2)	39 b (2)	33 b (2)	66 bc (2)	13 b	2 a
MYX 1806	6.0 L/ha	26 b (2)	117 a (2)	36 b (2)	54 c (2)	16 ab	5 a
MYX 1806	7.5 L/ha	45 b (1)	44 b (1)	26 b (2)	44 c (2)	15 ab	3 a
BELMARK	0.2 L/ha	28 b (2)	43 b (2)	40 b (3)	108 ab (3)	13 b	3 a
BELMARK	0.2 L/ha	134 a (2)	38 b (3)	21 b (3)	71 bc (3)	13 b	4 a
BELMARK**	0.2 L/ha	34 b (2)	123 a (4)	52 b (5)	140 a (6)	5 c	0 a
Check	------	41 b (2)	132 a (5)	92 a (6)	127 a (7)	2 c	0 a

* Defoliation index: scale of 0 to 8 - 0 to 100% defoliation.
** First applied on July 8.
*** Values followed by the same letter in a column are not significantly different (P>0.05) according to Duncan's Multiple Range Test.

#044

BASE DE DONNEES DES ETUDES: 90000394

CULTURE: Pomme de terre, cv. Superior

RAVAGEUR: Doryphore de la pomme de terre, *Leptinotarsa decemlineata* (Say)

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TITRE: STRATEGIES D'INTERVENTION CONTRE LE DORYPHORE AU QUEBEC

PRODUITS: DECIS 2,5-EC (deltametrine), GUTHION 240-EC (azinphos-methyl), M-ONE LI (Bacillus thuringiensis var. san diego), RIPCORD 400-EC (cypermethrine)

METHODES: L'essai a ete effectue selon un plan a blocs aleatoires complets avec 4 repetitions (R.C.B.D., parcelles de 7,5 m x 4 m). Les insecticides one ete appliques en juin et juillet (pression: 1723,7 k Pa, volume: 800 L/ha). Pour les N/os 1, 2 et 3, une application a ete faite a l'emergence des jeunes larves et aux 5-7 jours. (1. DECIS, 5,6 g m.a./ha; 2. DECIS, 7,5 g m.a/ha; 3. Produits en rotation a la dose maximale de l'etiquette). Les 3 autres traitements (DECIS, 5,6 g m.a./ha) ont ete faits selon des seuils de densites larvaires (4. 5 unites larvaires/plant, 1 UL = 1 L3+4 ou 5 L1+2; 5. 5 L/plant; 6. Indice de defoliation = 2). L'evaluation des densites a ete faite a partir de 10 plants /parcelle dans les 2 rangees du centre qui ont ete recoltees le 3 septembre.

RESULTATS: Voir le tableau ci-dessous.

CONCLUSIONS: Les resultats de 1991 pour les seuils d'intervention N/os 1, 4 et 5 sont relativement comparables. Le seuil de 5 UL n'a re u que 3 applications comparativement a 6 pour les N/os 1 et 5. Pour la strategie N/6, l'indice de 2 est definitivement trop eleve. Pour les modes d'intervention N/os 1, 2 et 3, on obtient une plus grande efficacite des insecticides lorsqu'ils sont utilises a leur dose maximale (N/o 2) et selon la rotation des groupes chimiques.

Nombre moyen de larves de doryphores/plant, dommage et rendement vendable, 1991.

Traitement stragegie	Population larvaire juin 17	juin 25	juillet 02	juillet 05	juillet 09	Dommage* juillet 02	juillet 15	juillet 25	Rendement (kg/parc.)
l. Emer. L1	3,4bc**	11,6c	10,2c	8,1c	7,8a	1,0c**	1,3cd	2,5c	34,93b2
2. Emer. L1	4,1bc	6,2c	4,3de	4,1de	4,7b	1,0c	1,0d	1,0d	41,61ab
3. Emer. L1***	2,5bc	11,1c	8,0cd	3,1ef	1,7cd	1,0c	1,0d	1,0d	39,87ab
4. Seuil 5 UL	4,0bc	19,4b	18,6b	13,9b	8,6a	1,0c	2,0c	3,0c	35,87b
5. Seuil 5 L	2,8bc	9,5c	7,2cd	7,3cd	7,2a	1,0c	1,3cd	2,5c	35,16b
6. Seuil defol.	12,4a	53,1a	34,8a	16,7b	7,4a	6,5b	6,3b	5,8b	19,69c
7. TEMOIN (+ trt)	0,0c	0,0d	0,2e	0,1f	0,1d	0,0d	0,0e	0,0e	44,13a
8. TEMOIN (- trt)	6,6b	55,9a	31,7a	22,1a	2,4c	7,8a	8,0a	8,0a	2,81d

* Index de defoliation de 0 a 8 (0 a 100% de defoliation).
** D.M.R.T. a un seuil de 0,05.
*** Sequence: DECIS, GUTHION, M-ONE, GUTHION, RIPCORD, DECIS.

#045

BASE DE DONNEES DES ETUDES: 87000221

CULTURE: Pomme de terre, cv. Superior

RAVAGEUR: Doryphore de la pomme de terre, *Leptinotarsa decemlineata* (Say)

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TITRE: ESSAI DE PRODUITS BIOLOGIQUES CONTRE LE DORYPHORE DE LA POMME DE TERRE

PRODUITS: M-ONE LI (endotoxine-delta de Bacillus thuringiensis var. san diego), BOND (latex synthetique 45% a 25% v/v), MYX 1806 (endotoxine-delta encapsulee de Bacillus thuringiensis var. san diego), BELMARK 300-EC (fenvalerate).

METHODES: L'essai a ete realise selon un plan a blocs aleatoires complets avec 4 repetitions. Les parcelles de 7,5 m de longueur comprenaient 4 rangs espaces de 0,91 m. Les insecticides one ete appliques les 17, 21, 25 juin, 2 et 10 juillet (dose: produit commercial/ha, pression: 1723,7 k Pa, volume: 800 L/ha). L'evaluation des densites du doryphore a ete faite sur 10 plants pris au hasard dans les 2 rangees du centre. Ces 2 rangees one ete recoltees le 4 septembre.

RESULTATS: Voir le tableau ci-dessous.

CONCLUSIONS: Les produits biologiques utilises dans cet essai se sont averes plus efficaces que l'insecticide BELMARK, tant en ce qui a trait aux densites larvaires, au dommage aux plants qu'au rendement. Apres 3 traitements, les produits M-ONE et M-ONE + BOND one reduit considerablement les populations larvaires. L'adhesif BOND n'augmente pas l'efficacite du bio-insecticide M-ONE. Les resultats obtenus avec le produit MYX 1806 aux doses de 5 et 6 L de produit commercial/ha sont plus faibles et comparables entre eux alors qu'a la dose de 7,5 L, le produit se compare a M-ONE.

Nombre moyen de larves de doryphores/plant, dommage et rendement vendable, 1991.

Traitement Insecticide	Dose	Population larvaire juin 17	Population larvaire juin 25	Population larvaire juillet 02	Population larvaire juillet 09	Dommage* juillet 02	Dommage* juillet 15	Dommage* juillet 22	Rendement (kg/parc.)
l. M-ONE	7,5L	3,1a**	22,1bc	3,0c	3,2de	1,0c**	0,8c	1,0d	37,69ab2
2. M-ONE+BOND	7,5L	3,9a	15,3cd	4,5bc	2,8de	1,0c	1,0c	1,0d	39,47a
3. MYX 1806	5,0L	5,9a	14,7d	9,7b	9,2bc	1,0c	1,5c	2,3c	31,84bc
4. MYX 1806	6,0L	3.0a	14,4d	6,3bc	11,5b	1,0c	1,5c	1,8cd	31,07c
5. MYX 1806	7,5L	2,8a	16,2cd	4,5bc	6,6cd	1,0c	1,3c	1,5cd	38,10a
6. BELMARK	125 ML	4,0a	26,3b	37,9a	41,2a	2,8b	5,5b	6,3b	22,29d
7. TEMOIN		3,8a	36,8a	40,4a	0,3e	7,8a	8,0a	8,0a	1,79e

* Evaluation visuelle par parcelle: index de defoliation de 0 a 8 (0 a 100% de defoliation).

** Les resultats suivis d'une meme lettre ne sont pas significativement differents a un seuil de 0,05 (D.M.R.T.).

#046

BASE DE DONNEES DES ETUDES: 86000718

CULTURE: Pomme de terre, cv. Superior

RAVAGEUR: Doryphore de la pomme de terre, *Leptinotarsa decemlineata* (Say)

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TITRE: ESSAI D'INSECTICIDES CHIMIQUES CONTRE LE DORYPHORE DE LA POMME DE TERRE

PRODUITS: DECIS 2,5 EC (deltametrine)
DECIS 2,5 EC + MITAC EC
DECIS 2,5 EC + INCITE 92% (butoxide de piperonyle)
LORSBAN 4-E (chlorpyrifos)
MITAC EC (amitraz)
NTN-33893 (imidacloprid)

METHODES: L'essai a ete realise selon un plan a blocs aleatoires complets avec 4 repetitions. Les parcelles de 7,5 m de longueur comprenaient 4 rangs espaces de 0,91 m. Les insecticides one ete appliques les 19, 26 juin et 3 juillet (dose: g m.a./ha, pression: 1723,7 k Pa, volume: 800 L/ha). Une quatrieme application a ete faite le 10 juillet dans les traitements 1, 4 et 5. L'evaluation des densites du doryphore a ete faite sur 10 plants pris au hasard dans les 2 rangees du centre. Ces 2 rangees one ete recoltees le 4 septembre.

RESULTATS: Voir le tableau ci-dessous.

CONCLUSIONS: Les produits NTN-33893 (25 et 50 g m.a./ha) et les melanges DECIS + INCITE et DECIS + MITAC ont donne les meilleurs resultats. Des la 2e application, NTN (50 g m.a./ha) a detruit toutes les larves L1 et L2, car aucune larve

L3 et L4 n'a ete observee pour ce traitement. Le produit NTN (25 g m.a./ha) a ete un peu moins efficace qu'a la dose de 50 g mais tres satisfaisant. L'effi- cacite de MITAC utilise seul a ete faible et celle de LORSBAN a ete mediocre.

Nombre moyen de larves de doryphores/plant, dommage et rendement vendable, 1991.

Traitement Insecticide	Dose	Population larvaire juin 18	25	juillet 02	09	Dommage* juillet 02	09	15	22	Rendement (kg/parc.)
l. DECIS	7,5	9,0a**	15,6c	17,7d	9,7c	2,0b**	2,0c	1,7d	1,5d	43,69ab
2. DECIS + MITAC	7,5 200,0	3,0b	12,0cd	2,1e	0,4d	1,0b	0,0d	0,0e	0,0e	53,62a
3. DECIS + INCITE	7,5 388,2	8,3a	10,2cd	2,0e	0,7d	1,0b	0,0d	0,0e	0,0e	51,18ab
4. LORSBAN	480,0	4,8ab	30,8b	65,9a	23,9a	5,5a	6,5a	6,5b	6,5b	17,39c
5. MITAC	560,0	6,7ab	29,7b	30,9c	19,8b	2,0b	4,0b	4,5c	3,7c	39,53b
6. NTN-33893	25,0	5,2ab	6,3d	1,1e	1,2d	1,0b	0,2d	0,2e	0,2e	47,87ab
7. NTN-33893	50,0	7,8a	10,1cd	0,0e	0,0d	1,0b	0,0d	0,0e	0,0e	54,60a
8. TEMOIN		5,8ab	39,5ab	57,5b	12,6c	5,7a	7,7a	8,0a	8,0a	6,53c

* Evaluation visuelle par parcelle: index de defoliation de 0 a 8 (0 a 100% de defoliation).

** Les resultats suivis d'une meme lettre ne sont pas significativement differents, a un seuil de 0,05 (D.M.R.T.).

#047

BASE DE DONNEES DES ETUDES: 87000221

CULTURE: Pomme de terre, cv. Superior

RAVAGEUR: Doryphore de la pomme de terre, *Leptinotarsa decemlineata* (Say)

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TITRE: ESSAI DE PRODUITS BIOLOGIQUES A DIFFERENTS INTERVALLES CONTRE LE DORYPHORE

PRODUITS: M-ONE LI (endotoxine-delta de *Bacillus thuringiensis* var. *san diego*), MYX 1806 (endotoxine-delta encapsule de *Bacillus thuringiensis* var. *san diego*), BELMARK 300-EC (fenvalerate)

METHODES: L'essai a ete realise selon un plan a blocs aleatoires complets avec 4 repetitions. Les parcelles de 7,5 m de longueur comprenaient 4 rangs espaces de 0,91 m. Les bio-insecticides ont ete appliques a des intervalles de 4, 7 et 10 jours et l'insecticide chimique aux 7 jours (pression: 1723,7 k Pa, volume: 800 L/ha). L'evaluation des densites du doryphore a ete faite sur 10 plants pris au hasard dans les 2 rangees du centre qui ont ete recoltees le 3 septembre.

RESULTATS: Voir le tableau ci-dessous.

CONCLUSIONS: Les applications aux 4 jours ne donnent pas de resultats significativement superieurs malgre un dommage et des densites larvaires legerement plus faibles. Cet ete, les traitements aux 7 jours ont tres bien reussi, mais ils pourraient etre moins favorables lors d'une saison pluvieuse. Les traitements aux 10 jours sont nettement moins bons. Pour la saison 1991, MYX est tres comparable a M-ONE.

Nombre moyen de larves de doryphores/plant, dommage et rendement vendable, 1991.

Traitement Insecticide*	Int. (jrs)	Population larvaire juin 17	25	juillet 02	09	Dommage* juillet 02	09	15	22	Rendement (kg/parc.)
l. M-ONE	4	8,1a	8,6d	2,5d	2,0c	0,0d	0,5d	0,5d	1,0c	40,65a
2. M-ONE	7	7,5a	10,9cd	3,9d	3,4bc	0,3d	0,8d	1,0d	1,3c	39,74a
3. M-0NE	10	5,5a	16,1c	33,1ab	17,2a	2,3bc	3,3c	4,0c	5,3b	28,29c
4. MYX 1806	4	6,8a	12,1cd	3,5d	6,1b	0,3d	1,0d	1,3d	2,5c	36,84ab
5. MYX 1806	7	4,6a	11,6cd	6,2d	5,1bc	0,8d	0,5d	1,0d	1,5c	39,37a
6. MYX 1806	10	7,7a	10,6cd	23,4c	17,5a	1,3cd	1,5d	2,8c	4,3b	31,91bc
7. BELMARK	7	3,3a	26,8b	29,9b	20,7a	3,0b	4,8b	5,5b	5,5b	30,51bc
8. TEMOIN		6,4a	42,6a	37,0a	6,6b	7,0a	8,0a	8,0a	8,0a	4,6ld

* Les doses etaient de 7,5 L p.c./ha pour M-ONE et MYX 1806, et de 125 ML p.c./ha pour BELMARK.
** Evaluation visuelle par parcelle: index de defoliation de 0 a 8 (0 a 100% de defoliation).
*** Les resultats suivis d'une meme lettre ne sont pas significativement differents a un seuil de 0,05 (D.M.R.T.).

#048

BASE DE DONNEES DES ETUDES: 86000718

CULTURE: Pomme de terre, cv. Superior

RAVAGEUR: Doryphore de la pomme de terre, *Leptinotarsa decemlineata* (Say)

NOM ET ORGANISME:
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TITRE: ESSAI D'INSECTICIDES SELON LA PERIODE DE LA JOURNEE

PRODUITS: M-ONE LI 7,5 L p.c./ha (endotoxine-delta de *B. thuringiensis* var. *san diego*)
GUTHION 240-EC 1,75 L p.c./ha (azinphos-m thyl)
RIPCORD 400-EC 87,5 ML p.c./ha (cypermethrine)
DECIS 2,5 EC 300 ML/ha (deltamethrine)

METHODES: L'experience a ete realisee selon un plan a blocs aleatoires complets avec 4 repetitions. Les parcelles de 7,5 m de longueur comprenaient 4 rangs espaces de 0,91 m. Les insecticides ont ete utilises en rotation selon certaines caracteristiques d'usage des produits (stade de l'insecte, temperature de la journee) pour trois periodes de la journee: matin (avant 8 h), midi (entre 11 h et 14 h) et soir (apres 16 h). Il y a eu pour chacune des periodes quatre traitements: 19 juin, M-ONE; 26 juin, GUTHION; 3 juillet, RIPCORD; 10 juillet, DECIS (pression: 1723,7 k Pa, volume: 800 L/ha). Une protection contre le vent a ete assuree pour eviter la derive des traitements faits le midi. L'evaluation des densites du doryphore a ete faite sur 10 plants pris au hasard dans les 2 rangees du centre qui ont ete recoltees le 30 aout.

RESULTATS: Voir le tableau ci-dessous.
CONCLUSIONS: Les resultats n'identifient pas une periode de la journee comme etant plus efficace. Toutefois, on retrouve significativement moins de larves dans les parcelles traitees le midi les 2 et 9 juillet. De meme, le dommage aux plants est significativement plus faible le 15 juillet. Les resultats ne permettent pas de justifier des traitements le jour. Des applications le matin et

en fin de journee basees sur des rotations de produits sont tout aussi valables et plus securitaires pour l'environnement.

Nombre moyen de larves de doryphores/plant, dommage et rendement vendable, 1991.

Periode de traitement	Population larvaire juin 18	juin 25	juillet 02	juillet 09	Dommage* juin 25	juillet 02	juillet 15	juillet 19	Rendement (kg/parc.)
l. MATIN	5,1a**	25,6b	34,6b	5,1a	1,0a**	1,2b	1,0b	1,0b	38,97a**
2. MIDI	7,4a	20,2b	12,2c	2,8b	1,0a	1,0b	0,2c	1,0b	40,85a
3. SOIR	9,3a	20,4b	29,5b	6,0a	1,0a	1,0b	1,0b	1,0b	39,08a
4. TEMOIN	5,9a	45,4a	57,1a	3,1b	1,0a	7,2a	8,0a	8,0a	3,12b

* Evaluation visuelle par parcelle: index de defoliation de 0 a 8 (0 a 100% de defoliation).
** Les resultats suivis d'une meme lettre ne sont pas significativement differents a un seuil de 0,05 (D.M.R.T.).

#049

BASE DE DONNEES DES ETUDES: 86000718

CULTURE: Pomme de terre, cv. Superior

RAVAGEUR: Doryphore de la pomme de terre, *Leptinotarsa decemlineata* (Say)

NOM ET ORGANISME:
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TITRE: ACTION SYNERGIQUE DU BUTOXIDE DE PIPERONYLE AVEC LE FENVALERATE

PRODUITS: BELMARK 300 EC (fenvalerate), INCITE 92% (butoxide de piperonyle).

METHODES: L'essai a ete realise selon un plan a blocs aleatoires complets avec 4 repetitions. Les parcelles de 7,5 m de longueur comprenaient 4 rangs espaces de 0,91 m. Les insecticides one ete appliques les 17, 21, 25 juin, 2 et 10 juillet (dose: g m.a./ha, pression: 1723,7 k Pa, volume: 800 L/ha).
L'evaluation des densites du doryphore a ete faite sur 10 plants pris au hasard dans les 2 rangees du centre. Ces 2 rangees one ete recoltees le 4 septembre.

RESULTATS: Voir le tableau ci-dessous.

CONCLUSIONS: L'action synergique du produit INCITE augmente significativement l'efficacite de l'insecticide BELMARK pour lequel on constate au Quebec des cas de resistance du doryphore.

Nombre moyen de larves de doryphores/plant, dommage et rendement vendable, 1991.

Traitement Insecticide	Dose	Population larvaire juin 17	20	25	juillet 02	09	Dommage* juillet 02	15	22	Rendement (kg/parc.)
l. BELMARK	37,5	4,0a**	17,1b	26,3b	37,9a	41,2a	2,8b**	5,5b	6,3b	22,29b**
2. BELMARK + INCITE	37,5 388,2	6,8a	15,0b	9,4c	2,3b	2,5b	1,0c	0,3c	0,3c	41,75a
3. TEMOIN		3,8a	23,1a	36,8a	40,4a	0,3b	7,8a	8,0a	8,0a	1,79c

* Evaluation visuelle par parcelle: index de defoliation de 0 a 8 (0 a 100% de defoliation).

** Les resultats suivis d'une meme lettre ne sont pas significativement differents au seuil de 0,05 (D.M.R.T.).

#050

STUDY DATA BASE: CA30-91-E601

CROP: Potato cv. Kennebec

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* Say

NAME AND AGENCY:
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TITLE: EVALUATION OF VARIOUS INSECTICIDES FOR COLORADO POTATO BEETLE CONTROL IN POTATO

MATERIALS: TRIDENT SL (Bacillus thuringiensis var. tenebrionus
CYMBUSH 250EC (250 g AI/L cypermethrin)
IMIDAN 50WP (500 g AI/kg phosmet)
APM 350SC (350 g AI/L azinphos-methyl)

METHODS: Plots consisted of 2 rows, each 5 m long, replicated 3 times in a randomized complete block design. The trial was seeded on May 23; at Grimsby, Ontario; 16 seeds/5 m of row. Treatments were applied on June 26 with a CO2 sprayer calibrated to deliver 500 L/ha at a pressure of 275 kPa through a single hollow cone nozzle. The two row plots were assessed by randomly selecting 20 leaves, and counting the total number of adults, small larvae (1st and 2nd instars) and large larvae (3rd and 4th instars) at 1, 3 and 6 days after application. Later assessments included percent plant defoliation and tuber yields.

RESULTS: As presented in the table below.

CONCLUSIONS: All treatments significantly reduced the number of small larvae one day after application. IMIDAN and APM provided superior control of the large larvae 6 days after the treatments were applied. The addition of TRIDENT to CYMBUSH at 0.005 kg AI/ha improved activity as shown by the reduction in plant defoliation and the increase in tuber weights compared to CYMBUSH alone.

Potatoes treated with IMIDAN and APM provided the highest tuber weights, those plots treated with TRIDENT alone and with CYMBUSH were not significantly different in respect to tuber weight.

TREATMENT	RATE *(L pr/ha) (kg AI/ha)	LARVAL SMALL 27/06	COUNTS LARGE 02/07	% PLANT DEFOLIATION 04/07	TUBER KG/ROW ---- 20/08	WEIGHTS KG/HA ----
1 UNTREATED	---	75.3 a	30.0 ab	66.7 a	0.73d	733 d
2 TRIDENT SC	6*	18.0 b	16.0 bcd	25.0 cd	2.67 bc	2667 bc
3 TRIDENT SC	12*	13.7 b	9.7 cd	20.0 d	2.87 bc	2867 bc
4 CYMBUSH 250 EC	0.035	7.0 b	22.7 abc	40.0 bc	2.03 cd	2033 cd
5 CYMBUSH 250 EC	0.005	21.3 b	31.7 a	55.0 ab	1.30 cd	1300 cd
6 TRIDENT SC	6 *	15.7 b	23.7 abc	21.7 d	2.73 bc	2733 bc
6 CYMBUSH 250 EC	0.005					
7 IMIDAN 50 WP	1.12	0.3 b	1.0 d	18.3 d	3.77 ab	3767 ab
8 APM 350 SC	0.25	2.0 b	3.7 d	10.0 d	4.67 a	4667 a
LSD (.05) =		29.4	13.9	15.2	1.59	1585
Standard Dev. =		16.79	7.94	8.70	0.91	905.18
CV =		87.58	45.93	27.13	34.87	34.87

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05)

#051

CROP: Potato cv. Kennebec

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* Say

NAME AND AGENCY:
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TITLE: EVALUATION OF VARIOUS INSECTICIDES FOR COLORADO POTATO BEETLE CONTROL IN POTATO

MATERIALS: TRIDENT SL (*Bacillus thuringiensis* var. *tenebrionus*)
CYMBUSH 250EC (250 g AI/L cypermethrin)
IMIDAN 50WP (500 g AI/kg phosmet),
APM 350SC (350 g AI/L azinphos-methyl)

METHODS: Plots consisted of 2 rows, 5 m long, replicated 3 times in a randomized complete block design. The trial was seeded on May 8; at Copetown, Ontario; 16 seeds/5 m of row. Treatments were applied on June 13 and June 20 with a CO2 sprayer calibrated to deliver 500 L/ha at a pressure of 275 kPa through a single hollow cone nozzle. The two row plots were assessed by randomly selecting 20 leaves, and counting the total number of adults, small larvae (1st and 2nd instars) and large larvae (3rd and 4th instars) at 1, 3 and 6 days after application. Later assessments included percent plant defoliation and tuber yields.

RESULTS: As presented in the table below.

CONCLUSIONS: All treatments significantly reduced the small larval population for 6 days after the first application compared to the check. The second application of the treatments reduced the larval populations, specifically the third and fourth instars. The tank mix of CYMBUSH and TRIDENT at the low rates provided acceptable CPB control and tuber weights equivalent to those products commercially available. The treatments of IMIDAN and APM reduced larval populations and subsequently second generation adult populations throughout the season which resulted in reduced plant defoliation supported by the increased tuber weights.

TREATMENT	RATE *(L pr/ha) (kg AI/ha)	LARVAL COUNTS small 19/06	large 24/06	PERCENT defol. 08/07	ADULTS 22/07	TUBER WEIGHT KG/5M 14/08	KG/HA 14/08
1 UNTREATED		131.7 a	43.7 a	97.7 a	41.0 a	1.93 c	1933 c
2 TRIDENT SC	6*	28.3 bc	6.0 c	20.0 bc	15.0 bcd	4.87 b	4867 b
3 TRIDENT SC	12*	46.3 bc	3.0 c	16.0 bc	17.7 bcd	6.30 ab	6300 ab
4 CYMBUSH 250EC	0.035	11.7 c	2.7 c	4.3 c	30.0 ab	6.63 ab	6633 ab
5 CYMBUSH 250EC	0.005	52.3 b	18.3 b	91.0 a	8.0 cd	2.20 c	2200 c
6 TRIDENT SC	6*	38.0 bc	2.3 c	21.7 bc	25.7 abc	5.60 ab	5600 ab
6 CYMBUSH 250EC	0.005						
7 IMIDAN 50 WP	1.12	25.7 bc	1.0 c	5.0 c	4.7 d	8.00 a	8000 a
8 APM 350 SC	0.25	30.3 bc	4.0 c	30.0 b	7.7 cd	6.73 ab	6733 ab
LSD (.05) =		33.1	11.9	19.5	18.6	2.28	2284
Standard Dev. =		18.91	6.79	11.14	10.64	1.30	1304.00
CV =		41.52	67.03	31.21	56.88	24.68	24.68

* Means followed by same letter do not significantly differ (Duncan's MRT, P=.05)

#052

STUDY DATA BASE: 303-1451-8702

CROP: Potato cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)

NAME AND AGENCY:
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TITLE: EVALUATION OF BACTERIAL INSECTICIDES MIXED WITH CHEMICAL INSECTICIDES FOR COLORADO POTATO BEETLE CONTROL

MATERIALS: TRIDENT (*Bacillus thuringiensis* var. *tenebrionis*)
BELMARK 300EC (Fenvalerate)
GUTHION 2405C (Azinphos-methyl)

METHODS: Small, whole seed pieces were planted in four row plots 7.6 m long by 3.6 m wide at Sherwood, P.E.I. on May 9, 1991. Plots were separated by two rows of potatoes which were kept free of insects by applications of chlorpyrifos (LORSBAN 4E) at 509 g AI/ha on June 25 and endosulfan (THIODAN) at 560 g AI/ha on July 11. Plots were arranged in a randomized complete block design with six treatments each replicated four times. Plots were treated with insecticides on July 3 and whenever a threshold of 10 Colorado potato beetle adults or larvae/10 net sweeps were surpassed, using a plot sprayer which delivered approximately 300 L of mixture/ha at a pressure of about 240 kPa. TRIDENT was applied on July 3, 11, 15, 24, and 31; TRIDENT and BELMARK was applied on July 3, 15, and 24; BELMARK was applied on July 3, 11, 24, and 31; GUTHION was applied on July 3, 11, and 24; TRIDENT and GUTHION was applied on July 3, 15, 24, and 31. Each week, beginning on July 2 and ending on July 29, the number of insects per ten net sweeps (0.37 m diam. opening) from the centre two rows of each plot were counted. Weeds were controlled with an application of LEXONE at 0.5 kg AI/ha and plants topkilled with REGLONE at 370 g AI/ha on August 14. Tubers from the centre two rows of each plot were harvested on September 24. Analysis of variance were performed on the data and least squares differences (LSD) determined.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: CPB populations were significantly lower on all treated plots compared to the untreated check plots, but more applications of TRIDENT were required to keep populations below the threshold of 10 CPB per 10 net sweeps compared with a mixture of TRIDENT and BELMARK or GUTHION. Total and marketable yields of tubers were also significantly improved for all treated plots compared to those of the untreated check.

Treatment	Product per Ha	No. of Sprays	Number of CPB per 10 Net Sweeps, July 2	8	15	22	29	Tuber Yield (t/ha) Total	Market
Check	-	0	20	126	168	303	108	10	7
TRIDENT	14L	5	17	29	41	41	43	13	12
TRIDENT+ BELMARK	14L+0.1L	3	17	8	11	12	9	14	12
BELMARK	0.1L	4	14	11	4	15	10	15	14
GUTHION	1.8L	3	20	24	2	50	3	14	13
TRIDENT+ GUTHION	14L+1.8L	4	15	7	31	47	16	12	10
LSD P=0.05			NS	35	56	50	39	3	3

#053

STUDY DATA BASE: 303-1452-8702

CROP: Potato cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)

NAME AND AGENCY:
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TITLE: EVALUATION OF BACTERIAL INSECTICIDES FOR CONTROL OF COLORADO POTATO BEETLE (CPB) ON POTATOES, 1991

MATERIALS: M-ONE 12.5% (*Bacillus thuringiensis* var. *san diego*)
MYX 1806 10% (*Bacillus thuringiensis* var. *san diego*)
ENTICE 97.5% (Pharmamedia)

METHODS: Small, whole, seed pieces (cv. 'Superior') were planted at about 40 cm within rows and about 90 cm between rows in four-row plots at Sherwood, P.E.I. on May 9, 1991. Each four-row plot measured 26 m long by 3.6 m wide. Plots were separated by two rows of potatoes which were kept free of Colorado potato beetles (CPB) by applications of chlorpyrifos (LORSBAN 4E) at 509 g AI/ha on June 25 and endosulfan (THIODAN) at 560 g AI/ha on July 11. Plots were arranged in a randomized complete block design with six treatments each replicated four times. Insecticides were applied with a plot sprayer, delivering approximately 300 L of mixture/ha at a pressure of about 240 kPa, when a threshold of 10 CPB adults or larvae per 10 sweeps was reached or surpassed. Each week starting on July 2 (Pre-Spray) and ending on August 7, the number of CPB per ten sweeps was counted from the centre two rows of each plot. Plots were treated with M-ONE on July 3, 11, 16, 24 and 31; with lower rate of MYX 1806 on July 3, 16 and 24; with the middle rate of MYX 1806 on July 3, 11, 24 and 26; with the high rate of MYX 1806 on July 3, 11, and 24; and with the MYX 1806, ENTICE mixture on July 3, 16, and 24. Weeds were controlled with metribuzin (LEXONE) at 0.5 kg AI/ha and summer adults were controlled with deltamethrin (DECIS) at 7.5 g AI/ha on August 6. Plants were treated with diquat (REGLONE) at 370 g AI/ha on August 21 to desiccate the foliage and tubers were harvested from the center two rows of each plot on September 25. Analysis of variance were performed on the data and least squares differences (LSD) were calculated.

RESULTS: The results are summarized in the tables below.

CONCLUSIONS: The mean number of young and older larvae in plots of the untreated check were significantly higher than that for plots protected with an insecticide on July 15 and 22 except for young larvae of M-ONE on July 22. Although not significantly different from each other, the mean number of adults in plots protected with an insecticide was significantly less than that of the untreated check on August 7. Total and marketable yields from plots protected with M-ONE, MYX 1806, or MYX 1806 + ENTICE were significantly greater than that of the check. The combination of Entice and MYX 1806 did not result in higher mortalities of larvae or adults or higher yields compared to plots protected with MYX 1806 alone. There appears to be no advantage to adding ENTICE to the MYX 1806. No rate of response in beetle control or yield was noted for the three rates of MYX 1806 tested. No phytotoxicity was noted for any of the products tested.

Table 1. CPB Larvae

			Number of Young* Larvae per 10 Net Sweeps					Number of Older** Larvae per 10 Net Sweeps				
	Rate	No. of	July				Aug.	July				Aug.
Treatment	L/Ha	Sprays	8	15	22	29	7	8	15	22	29	7
Check	-	0	27	79	200	36	3	2	21	169	110	12
M-ONE	7.5	5	21	33	141	62	5	0	1	22	143	71
MYX 1806	4.5	3	15	21	37	57	4	1	5	8	28	68
MYX 1806	6.0	4	25	35	59	24	7	0	6	15	74	62
MYX 1806	7.5	3	20	21	15	24	5	0	7	6	4	32
MYX+ ENTICE	4.5+ 11.2	4	15	30	25	26	7	0	4	10	20	40
LSD P=0.05			NS	37	78	NS	NS	NS	13	37	131	43

* Young larvae were 1st and 2nd instar CPB
** Older larvae were 3rd and 4th instar CPB

Table 2. CPB Adults and Tuber Yield.

Treatment	Rate L/Ha	Number of Adults Per 10 Net Sweeps July 8	July 15	July 22	July 29	Aug. 7	Tuber Yield (t/ha) Total	Market
Check	-	2.7	0.2	0.7	3.5	33.5	15	12
M-ONE	7.5	3.0	0.5	0.5	0.2	9.2	20	18
MYX 1806	4.5	3.0	0.7	0.7	0.5	9.2	19	17
MYX 1806	6.0	4.0	0.5	0.5	2.2	11.0	19	18
MYX 1806	7.5	4.5	0.0	1.2	0.7	5.7	20	18
MYX+ENTICE	4.5+11.2	5.7	0.5	1.2	1.0	9.0	20	18
LSD P=0.05		NS	NS	NS	2.8	13.3	4	4

#054

STUDY DATA BASE: 303-1452-8702

CROP: Potato cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say),
Potato flea beetle, *Epitrix cucumeris* (Harr.)

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TITLE: EVALUATION OF SYNTHETIC INSECTICIDES FOR CONTROL OF INSECT PESTS ON POTATOES, 1991

MATERIALS: NTN-33893 2.5G (imidacloprid)
NTN-33893 FS (imidacloprid)
LORSBAN 4E (chlorpyrifos)

METHODS: Small, whole, seed pieces were planted in four row plots 7.6 m long by 3.6 m wide at Sherwood, P.E.I. on May 9, 1991. Plots were separated by two rows of potatoes which were kept free of insects by applications of LORSBAN 4E at 1.0 L product/ha on June 25 and THIODAN 4E at 1.0 L product/ha on July 11. Plots were arranged in a randomized complete block design with seven treatments each replicated four times. The NTN-33893 2G was applied at planting. The NTN-33893 FS or chlorpyrifos was foliar applied using a sprayer that delivered approximately 300 L of mixture/ha at a pressure of about 240 kPa whenever a threshold of 10 Colorado potato beetles (CPB)/10 net sweeps was surpassed. LORSBAN was applied on July 4, 15, and 31. The lower rate of NTN-33893 FS was applied on July 11 and 24, and the higher rate of NTN-33893 FS was applied on July 11 and 31. Each week, beginning on June 24 and ending on July 29, the number of Colorado potato beetles or potato flea beetles per ten net sweeps (0.37 cm diam.) and the number of flea beetle- induced holes per fourth terminal leaflet were counted from the centre two rows of each plot. Plants were rated for defoliation weekly, beginning on July 5 and ending July 31. Weeds were controlled with LEXONE at 0.5 kg AI/ha and plants were treated with REGLONE at 0.37 kg AI/ha on August 14 for top desiccation. Tubers from the centre two rows of each plot were harvested on September 24. Analysis of variance were performed on the data and least squares differences (LSD) were calculated.

RESULTS: The results are summarized in the tables below. Tuber yields which were

affected by a dry growing season and early desiccation were not included.
CONCLUSIONS: All treatments effectively controlled CPB populations relative to the untreated check plots. NTN-33893, applied either as a granular or a foliar treatment, was more efficacious against the Colorado potato beetle than LORSBAN. The treatments appeared to have little, if any, effect in suppressing PFB populations or damage.

Table: INSECT COUNTS

Treatment	Rate (g AI/ha)	No. of Applic.	Colorado Potato Beetle Mean Number /10 Sweeps/Plot July 2	8	15	22	29	Potato Flea Beetle Mean Number /10 Sweeps/Plot July 2	15	22	29
Check	-	0	3.7	37	30	152	81	86	62	4	215
NTN-33893G	113	1	2.0	6	8	18	27	74	68	9	172
NTN-33893G	226	1	1.5	9	3	3	4	76	83	4	160
NTN-33893G	339	1	1.0	8	3	1	4	74	79	4	103
NTN-33893FS	25	2	7.5	41	1	12	1	62	86	18	218
NTN-33893FS	50	2	3.2	30	1	2	14	88	77	13	301
LORSBAN 4E	480	3	15.5	9	19	9	14	83	58	4	459
LSD P=0.05			12.0	NS	18	65	29	NS	NS	10	113

Table: INSECT DAMAGE

Treatment	Rate (g AI/ha)	Defoliation Rating* July 5	11	18	25	31	Number of PFB Holes per 4th Terminal Leaflet July 2	8	15	22	29
Check	-	2	2.7	3.7	4.7	5.7	208	205	274	189	704
NTN-33893G	113	2	2.5	3.0	3.2	4.2	207	200	196	176	214
NTN-33893G	226	2	2.0	2.5	2.7	3.2	163	201	206	178	523
NTN-33893G	339	2	2.0	2.0	2.2	2.7	224	138	154	128	213
NTN-33893FS	25	2	2.7	3.2	3.2	4.2	180	196	224	181	557
NTN-33893FS	50	2	2.5	3.0	3.0	3.7	182	204	254	205	795
LORSBAN 4E	480	2	2.5	3.2	3.5	4.5	187	178	220	167	711
LSD P=0.05		NS	0.6	0.5	0.6	0.8	NS	54	48	58	-**

* 0 = no defoliation; 1 = some holes; 2 = some leaflets consumed; 3 = 0-9% of stems mostly defoliated; 4 = 10-24%; 5 = 25-49%; 6 = 50-74%.

** Due to a high number of holes and severe defoliation, only one replication per treatment was counted on this date.

#055

ICAR IDENTIFICATION NUMBER: 61006535

CROP: Potato, cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say),
Potato leafhopper, *Empoasca fabae* (Harris)

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology, Ridgetown, Ontario NOP2CO

TITLE: REDUCTION OF PESTICIDE RATES USING BIOLOGICAL CATALYSTS

MATERIALS: CATALYST (citric acid, 9-18-9, Agri Kelp, Molasses),
GUTHION 240SC (azinphos-methyl)
AMBUSH 500 (permethrin)
THIODAN 400EC (endosulfan)
M-ONE (*B. thuringiensis* var. *san diego*)
IVOMEC 5EC (ivermectin)

METHODS: Potatoes were planted in two row plots, 6m in length with rows spaced 1 m apart, replicated 4 times in a randomized complete block design. Potato seed pieces were planted with a commercial planter on May 2. Spray applications were made using a back pack airblast sprayer using 240 L/ha of water. Treatments were applied on June 3, 7, 14, 26 and July 15. Spray water pH was adjusted to 5.5 using the CATALYST formulae (adding sufficient citric acid to lower the pH to 5.5, the addition of 11.2 L product (pr)/ha foliar fertilizer 9-18-9, 0.35 L pr/ha Agri Kelp and 1.4L pr/ha Molasses). Assessments were taken by counting Colorado potato beetle (CPB) larvae and adults reporting the total counts per plot, foliage damage caused by beetle feeding and leafhopper foliar damage throughout the season and yield on July 30.

RESULTS: As presented in the tables below.

CONCLUSIONS: The addition of the CATALYST ingredients to half rates of various insecticides improved the level of insect control for some products while having little or no effect on others. The CATALYST did not improve the control of GUTHION, THIODAN, or IVOMEC. The addition of the CATALYST to THIODAN appeared at times to reduce the insecticidal property of THIODAN. However there was improved larval CPB control after the June 7 application with half rate of AMBUSH when the CATALYST was included . The CATALYST also increased the CPB activity of M-ONE. Improvement control was noted both as an adulticide as well as a larvicide and was revealed in higher potato yields. Leafhopper control was not improved with the CATALYST.

Table 1: Colorado potato beetle larval counts.

Treatment	Rate	CPB Larval counts - # of Days After Spraying June 3 0*	June 3 3	June 7 3	June 7 7	June 14 5
CATALYST		71.3A*	68.8DEF	231.3A	560.0AB	262.5B
GUTHION 240SC	360.0 g AI/ha	87.5A	82.5B-F	4.0HI	11.8HI	15.0D-G
GUTHION 240SC	180.0 g AI/ha	93.8A	150.0A	23.8DE	36.3FG	42.5C
GUTHION 240SC+ CATALYST	180.0 g AI/ha	113.8A	135.0ABC	30.0D	36.3FG	243.8B
AMBUSH 500	75.0 g AI/ha	118.8A	50.0F	92.5B	286.3BC	95.0B
AMBUSH 500	37.5 g AI/ha	153.8A	87.5A-E	271.3A	390.0BC	287.5B
AMBUSH 500 + CATALYST	37.5 g AI/ha	126.3A	85.0A-F	111.3B	118.8DE	147.5B
THIODAN 400EC	560.0 g AI/ha	168.8A	2.5H	0.0J	0.8J	0.0H
THIODAN 400EC	280.0 g AI/ha	140.0A	2.5H	2.5I	1.8J	5.0G
THIODAN 400EC+ CATALYST	280.0 g AI/ha	155.0A	15.0G	16.3EF	17.5GH	26.3CDE
M-ONE	7.5 L pr/ha	120.0A	77.5C-F	6.3GH	36.5FG	16.3DEF
M-0NE	3.7 L pr/ha	131.3A	57.5EF	55.0C	166.3CD	123.8B
M-ONE + CATALYST	3.7 L pr/ha	93.8A	120.0A-D	17.5EF	66.3EF	27.5CD
IVOMEC 5EC	0.5 g pr/ha	162.5A	50.0EF	8.8G	5.0I	6.3FG
IVOMEC 5EC	0.25 g pr/ha	81.3A	65.0DEF	11.3FG	17.5GH	11.3EFG
IVOMEC 5EC + CATALYST	0.25 g pr/ha	128.8A	22.5G	7.5GH	20.0GH	0.8H
Control		103.8A	140.3AB	400.0A	875.0A	503.8A

* Means followed by the same letter are not significantly different (P<0.05, Duncan's multiple range test). Prespray counts

Table 2: Insect counts, ratings and potato yields.

Treatment	Rate	CPB Adult Counts Days After June 26 Spray Date 1	7	Foliar Damage Ratings (0-10)** CPB June 20	Leafhopper July 4	Yield kg/plot
CATALYST		46.3B*	43.8A	3.0F	1.0F	5.5D
GUTHION 240SC	360.0 g AI/ha	9.0D	7.5H	8.9A	7.8A	22.0A
GUTHION 240SC	180.0 g AI/ha	5.0D	11.3E-H	7.4BC	3.8CD	20.5A
GUTHIION 240SC+ CATALYST	180.0 g AI/ha	8.8D	18.8C-F	7.1ABC	4.3C	13.8BC
AMBUSH 500	75.0 g AI/ha	60.0AB	42.5AB	5.7DE	8.0A	13.0C
AMBUSH 500	37.5 g AI/ha	99.3A	40.0ABC	5.1E	7.8AB	11.3C
AMBUSH 500 + CATALYST	37.5 g AI/ha	87.5A	48.8A	5.7CD	7.3AB	14.3BC
THIODAN 4EC	560.0 g AI/ha	0.0E	20.0B-E	9.7A	8.0A	19.3A
THIODAN 4EC	280.0 g AI/ha	1.3E	8.8GH	9.6A	8.0A	20.8A
THIODAN 4EC + CATALYST	280.0 g AI/ha	7.5D	16.3D-G	7.7AB	6.0B	19.8A
M-ONE	7.5 L pr/ha	5.0D	8.8GH	9.0A	2.5E	17.0AB
M-ONE	3.7 L pr/ha	26.3C	27.5A-D	6.4CD	3.0DE	11.8C
M-ONE + CATALYST	3.7 L pr/ha	4.0D	10.0FGH	8.6AB	2.5E	21.3A
IVOMEC 5EC	0.5 g pr/ha	5.0D	33.8AB	9.2A	3.0DE	17.3AB
IVOMEC 5EC	0.25 g pr/ha	7.5D	22.5B-E	8.7A	3.0DE	12.8C
IVOMEC 5EC + CATALYST	0.25 g pr/ha	6.3D	16.3D-G	9.4A	3.8CD	19.8A
Control		47.5BC	36.3AB	1.7G	1.0F	4.0E

* Means followed by the same letter are not significantly different ($P<0.05$, Duncan's multiple range test).

** Foliar Damage Ratings - 0, no control, foliage severely damaged; 10, omplete control.

#056

ICAR IDENTIFICATION NUMBER: 61006535

CROP: Potato cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say),
Potato leafhopper, *Empoasca fabae* (Harris)

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology, Ridgetown, Ontario NOP2CO

TITLE: BIOPESTICIDE CONTROL OF POTATO INSECTS

MATERIALS: ISK 66895L (experimental Bt)
M-ONE (*Bacillus thuringiensis* var. *san diego*)
THIODAN 400EC (endosulfan)

METHODS: Potatoes were planted in two row plots, 6m in length with rows spaced 1m apart, replicated 4 times in a randomized complete block design. Potato seed pieces were planted with a commercial planter on May 2. Spray applications were made using a back pack airblast sprayer using 240L/ha of water. Treatments were applied on June 11, 17, 27, July 2, 8, and July 15. Assessments were taken by counting Colorado potato beetle (CPB) larvae and adults reporting the total counts per plot, foliage damage caused by beetle feeding and leafhopper foliar damage throughout the season and yield on July 29.

RESULTS: As presented in the tables below.

CONCLUSIONS: ISK 66985L provided equal or better Colorado potato beetle control than M-ONE and THIODAN. Although lower adult and larval counts were observed at the higher rates of ISK 66895L these differences were not statistically significant. Neither of the biological insecticides, ISK 66895L nor M-ONE provided any leafhopper control. THIODAN provided high levels of both CPB and leafhopper control resulting in the higher potato yields.

Table 1: Colorado potato beetle counts.

		CPB Larval Counts - # of Days After Spraying			
	Rate	June 11		June 17	
Treatment	L product/ha	2	6	2	7
ISK 66895L	4.0	20.0B*	13.8C	2.5D	7.5B
ISK 66895L	5.0	1.3C	3.0D	3.8CD	1.3C
ISK 66895L	7.0	0.0C	0.0E	0.0E	3.8BC
M-ONE	7.5	31.3B	22.5BC	10.5B	6.3B
THIODAN 400EC	1.4	20.3B	27.8B	7.5BC	10.0B
Control		537.5A	425.0A	387.5A	241.3A

* Means followed by the same letter are not significantly different (P<0.05, Duncan's multiple range test).

Table 2: Colorado potato beetle and leafhopper counts.

		CPB Adult Counts		Foliar Damage Ratings*		
		Days After June 24				Yield
	Rate	Spray Date		CPB	Leafhopper	kg/plot
Treatment	L PR/ha	4	8	June 20	June 26	July 29
ISK 66895L	4.0	11.3BC**	21.3A	9.50A	4.0B	11.0C
ISK 66895L	5.0	6.3C	16.3A	9.50A	4.3B	12.8BC
ISK 66895L	7.0	2.8D	17.5A	9.50A	4.3B	12.3C
M-ONE	7.5	7.5BC	16.3A	8.50B	4.0B	13.8AB
THIODAN 4EC	1.4	12.5B	15.0A	8.63B	8.0A	14.8A
Control		48.8A	35.0A	4.00C	4.0B	8.8D

* Foliar Damage Ratings (0-10) - 0, no control, foliage severely damaged, 10, complete control.

** Means followed by the same letter are not significantly different (P<0.05, Duncan's multiple range test).

#057

ICAR IDENTIFICATION NUMBER: 61006535

CROP: Potatoes cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say),
Potato leafhopper, *Empoasca fabae* (Harris)

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology, Ridgetown, Ontario NOP 2CO

TITLE: SCREENING FOLIAR INSECTICIDES FOR THE CONTROL OF COLORADO POTATO BEETLES AND LEAFHOPPERS

MATERIALS: DECIS 5.0EC (deltamethrin)
GUTHION 240SC (azinphos-methyl)
LORSBAN 480E (chlorpyrifos)
MITAC 1.8EC (amitraz)
M-ONE (*B.thuringiensis* var. *san diego*)
AC 303,630 120EC (experimental)
BOND (surfactant experimental)
MYX 1806 (*B.t.* var. *san diego*)

METHODS: Potatoes were planted in two row plots, 6m in length with rows spaced 1m apart, replicated 4 times in a randomized complete block design. Potato seed pieces were planted with a commercial planter on May 2. Spray applications were made using a back pack airblast sprayer using 240L/ha of water. Treatments were applied on June 3, 7, 21, 27 and July 15. Assessments were taken by counting Colorado potato beetle (CPB) larvae and adults reporting the total counts per plot, foliage damage caused by beetles and leafhoppers throughout the season and yield on July 29.

RESULTS: As presented in the tables below.

CONCLUSIONS: The initial control of CPB larvae with many of the products was relatively poor after the first spray application on June 3. This required a second application 4 days later on June 7 which provided better control. The highest level of Colorado potato beetle and leafhopper control was provided by AC 303,630 + BOND, DECIS and GUTHION. DECIS was significantly more effective controlling leafhoppers than AC 303,630 + BOND and was more effective as a larvicide than as an adulticide. LORSBAN was the least effective CPB material but was effective in controlling leafhoppers. MITAC was only moderately effective for control of both CPB and leafhoppers. Significantly better control was shown when DECIS was added to MITAC or when it was alternately sprayed with M-ONE. CPB larval numbers were equally and significantly reduced with both M-ONE and MYX 1806, however, greater adult control was achieved with M-ONE with the addition of the high rate of the surfactant BOND and with all the rates of MYX 1806. This same level of control was observed in the foliar ratings of June 20, again indicating improved control of M-ONE with the addition of BOND and improved control of MYX 1806 over M-ONE for CPB control. Neither M-ONE nor MYX 1806 provided any level of leafhopper control.

Table 1: Colorado potato beetle larval counts.

		CPB Larval Counts - # of days after spraying				
	Rate	June 3			June 7	
Treatment	/ha	0*	3	3	6	12
DECIS 5.0EC	7.5 g AI	43.8BCD**	16.8DEF	5.0C	7.5D	15.8DE
GUTHION 240SC	360.0 g AI	28.8D	12.5DEF	1.3C	3.5D	78.4BC
LORSBAN 480E	480.0 g AI	37.5BCD	67.5B	51.3B	111.3B	148.6AB
MITAC 1.8EC	560.0 g AI	40.0BCD	52.5BCD	16.3C	56.3C	46.3BCD
MITAC 1.8EC + DECIS 5.0EC	200.0 g AI 7.5 g AI	50.0BCD	1.3F	0.0C	0.8D	0.4F
M-ONE; MITAC 1.8EC***	7.5Lproduct 560.0 g AI	48.3BCD	12.5DEF	5.0C	5.0D	32.5CDE
AC 303,630 120EC + BOND	100.0 g AI 0.125%	106.3AB	23.8C-F	13.8C	4.0D	7.9E
AC 303,630 120EC + BOND	200.0 g AI 0.125%	53.8BCD	31.3B-F	1.3C	0.0D	7.9E
M-ONE	7.5Lproduct	35.0CD	7.5EF	2.5C	10.5D	41.2BCD
M-ONE + BOND	7.5Lproduct 0.125%	106.3AB	20.0C-F	10.0C	13.8D	38.8BCD
M-ONE + BOND	7.5Lproduct 0.25%	98.8ABC	22.5C-F	5.0C	14.8D	27.2CDE
MYX 1806	5.0Lproduct	57.5BCD	45.0B-E	5.0C	15.8D	25.6CDE
MYX 1806	6.0Lproduct	81.3A-D	57.5BC	5.0C	18.3D	21.4CDE
MYX 1806	7.5Lproduct	137.5A	16.3DEF	0.0C	3.5D	11.6DE
Control		51.3BCD	108.8A	418.8A	1000.0A	472.2A

* Pre-spray counts.
** Means followed by the same letter are not significantly different ($P<0.05$, Duncan's multiple range test).
*** M-ONE; MITAC 1.8EC - Sprays were alternated commencing with M-ONE

Table 2: Insect counts and yield.

Treatment	Rate /ha	CPB Adult Counts Days After Spray 1	CPB Adult Counts June 27 Spray Date 7	Foliar Damage Ratings (0-10)* CPB June 20	Foliar Damage Ratings (0-10)* Leafhopper July 4	Yield kg/plot July 29
DECIS 5.0EC	7.5 g AI	15.0BC**	15.0B	8.5BC	9.4AB	16.8AB
GUTHION 240SC	360.0 g AI	0.0C	3.8D	6.4D	8.5BC	16.3AB
LORSBAN 480E	480.0 g AI	22.5B	13.8BC	5.2E	8.2C	14.3BC
MITAC 1.8EC	560.0 g AI	0.0C	8.8BCD	6.5D	5.0E	14.5BC
MITAC 1.8EC + DECIS 5.0EC	200.0 g AI 7.5 g AI	0.0C	6.3CD	9.9A	9.6A	14.0BC
M-ONE; MITAC 1.8EC***	7.5Lproduct 560.0 g AI	0.0C	3.5D	7.8C	6.7D	15.0BC
AC 303,630 120EC + BOND	100.0 g AI 0.125%	1.3C	8.8BCD	9.4AB	8.0C	16.8AB
AC 303,630 120EC + BOND	200.0 g AI 0.125%	7.5BC	6.3CD	9.6A	7.7C	18.5A
M-ONE	7.5Lproduct	0.0C	25.0A	6.7D	3.7F	15.0BC
M-ONE + BOND	7.5Lproduct 0.125%	2.5C	10.3BCD	6.6D	3.2F	14.3BC
M-ONE + BOND	7.5Lproduct 0.25%	1.3C	6.3CD	8.5BC	3.0F	14.0BC
MYX 1806	5.0Lproduct	6.3BC	8.8BCD	8.2BC	3.0F	12.5C
MYX 1806	6.0Lproduct	7.5BC	7.5BCD	8.5BC	3.0F	13.8BC
MYX 1806	7.5Lproduct	7.5BC	12.5BC	9.0ABC	3.0F	13.5BC
Control		55.0A	25.0A	2.2F	3.0F	7.5D

* Foliar Damage Ratings - 0, no control, foliage severely damaged; 10, complete control
** Means followed by the same letter not significantly different (P<0.05, Duncan's multiple range test).
*** M-ONE; MITAC 1.8EC - Sprays were alternated commencing with M-ONE

#058

ICAR: 61006535

CROP: Potato cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)
Potato leafhopper, *Empoasca fabae* (Harris)

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology, Ridgetown, Ontario NOP 2CO

TITLE: FOLIAR INSECT CONTROL IN POTATOES

MATERIALS: GUTHION 360F, GUTHION 240SC (azinphos-methyl)
NTN-33893 240F (experimental)

METHODS: Potatoes were planted in two row plots, 6m in length with rows spaced 1m apart, replicated 4 times in a randomized complete block design. Potato seed pieces were planted with a commercial planter on May 2. Spray applications were made using a back pack airblast sprayer using 240L/ha of water. Treatments were applied on June 3, 21, 27 and July 15. Soon after the initial spray of June 3 the number of larvae found on the GUTHION treated plots compared to the NTN product was sufficiently high to warrant a repeat application only to the GUTHION treatments. Assessments were taken by counting Colorado potato beetle (CPB) larvae and adults reporting the total counts per plot, foliage damage caused by beetle feeding and leafhopper foliar damage throughout the season and yield on July 30.

RESULTS: As presented in the table below.

CONCLUSIONS: NTN-33893 provided outstanding Colorado potato beetle control and leafhopper control. GUTHION 240SC provided equal or better insect control than GUTHION 360F. Yields reflected the level of insect pressure in this trial. An additional observation which has been noted for the past 2 years when testing NTN-33893 formulated products is the positive effect on insect control it has on the potato rows along side it.

Table 1: Colorado potato beetle larval counts.

Treatment	Application Rate g AI/ha June 3	Application Rate g AI/ha June 7	CPB Larval Counts June 6	CPB Larval Counts June 10	CPB Larval Counts June 19
GUTHION 360F		360.0	75.0A*	16.3B	155.0A
GUTHION 240SC		360.0	80.0A	1.3C	18.8B
NTN-33893 240F	25.0		0.0B	1.3C	0.0D
NTN-33893 240F	50.0		0.0B	0.0C	2.5C
Control			102.5A	235.0A	237.5A

* Means followed by the same letter are not significantly different (P<0.05, Duncan's multiple range test).

Table 2: Insect counts and yield.

Treatment	Rate g AI/ha	CPB Adult Counts Days After June 21 Spray Date 5	Foliar Damage Ratings (0-10)** CPB June 20	Foliar Damage Ratings (0-10)** Leafhoppers June 26	Foliar Damage Ratings (0-10)** Leafhoppers July 4	Yield kg/plot July 30
GUTHION 360F	360.0	15.0B*	7.0B	7.2B	6.8C	23.0A
GUTHION 240SC	360.0	6.3C	7.7AB	7.2B	7.0BC	25.5A
NTN-33893 240F	25.0	1.3D	9.6A	9.2A	8.0AB	24.3A
NTN-33893 240F	50.0	0.0E	9.9A	9.4A	8.5A	25.0A
Control		121.3A	2.2C	2.2C	1.5D	9.5B

* Means followed by the same letter are not significantly different (P<0.05, Duncan's multiple range test).

** Foliar Damage Ratings - 0, no control, foliage severely damaged; 10, complete control.

#059

ICAR IDENTIFICATION NUMBER: 61006535

CROP: Potato cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)
Potato leafhopper, *Empoasca fabae* (Harris)

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology, Ridgetown, Ontario NOP 2CO

TITLE: POTATO INSECT CONTROL USING AT PLANTING INSECTICIDES

MATERIALS: ISK 66824 5G (experimental)
NTN-33893 2.5G (experimental)
ORTHENE 75SP (acephate), TEMIK 10G (aldicarb)

METHODS: Potatoes were planted in two row plots, 6m in length with rows spaced 1m apart, replicated 4 times in a randomized complete block design. Potato seed pieces were planted with a commercial planter on May 2 for all but the first three treatments of ISK 66824 10G which were planted three weeks later on May 23. All insecticides were applied by hand in furrow, to the respective plots at the time of planting. The plots scheduled for the foliar application of ORTHENE 75SP was applied on June 14, 21, 27 and July 15 using a back pack airblast sprayer. Assessments were taken by counting the number of Colorado potato beetle (CPB) larvae and adults reporting the total counts per plot, foliage damage caused by beetle feeding and leafhopper foliar damage throughout the season and yield on July 29.

RESULTS: As presented in the table below.

CONCLUSIONS: NTN-33893 was an extremely effective potato foliar insect control material applied as a granular at planting time. Control of CPB larvae and adults, leafhoppers and flea beetles was demonstrated. It compared equal to the standard TEMIK. There was a noticeable difference between TEMIK, however, in the time, method and/or degree of CPB adult kill to NTN-33893. Large populations of adult CPB were found dead on the soil surface with NTN-33893 treated potato plants. The persistance of insect control with NTN-33893 was either shorter than TEMIK or the level of leafhopper control was not as great as TEMIK. On July 4 there was a noticeable increase in leafhopper damage on the NTN treated plots. Due to a 3 week delay in planting and application of ISK 66824, it was uncertain whether the high level of insect control observed during the summer was due to the chemical rates used or evaluation was delayed, compared to the other materials. It is clear, however, that ISK 66824 is an effective potato insect control candidate. ORTHENE was applied both as an in furrow spray at time of planting as well as a foliar treatment. The flea beetle ratings taken prior to any foliar spraying were low for this treatment.
ORTHENE was not as effective a CPB material as it is an excellent leafhopper control product.

Table 1: Colorado potato beetle adult and larval counts.

		CPB Insect Counts				
	Rate	Larvae			Adults	
Treatments	g AI/100m	June 17	June 26	July 2	June 28	July 4
ISK 66824 5G	14.0	8.8CD*	37.5AB	36.3A	11.3AB	26.3BC
ISK 66824 5G	18.0	7.5D	22.5AB	21.3BC	3.8C	15.0CD
ISK 66824 5G	26.0	7.5D	17.5AB	0.0G	0.0C	16.3CD
NTN-33893 2.5G	1.0	12.5C	20.0AB	22.5BC	12.5AB	17.5CD
NTN-33893 2.5G	2.0	0.0E	12.5BC	18.8BCD	3.8C	13.8CD
NTN-33893 2.5G	3.0	0.0E	1.3D	7.5EF	0.0C	36.3AB
ORTHENE 75SP	11.2	170.0B	60.0AB	31.3AB	28.8A	26.3BC
ORTHENE 75SP	1120/ha	175.0B	50.0AB	12.5DE	22.5A	25.0BC
TEMIK 10G	22.4	6.3D	10.0CD	5.0F	2.5BC	8.3D
Control		1000.0A	68.8A	16.3CD	30.0A	65.0A

* Means followed by the same letter are not significantly different (P<0.05, Duncan's multiple range test).

Table 2: Colorado potato beetle, leafhopper and flea beetle counts.

			Foliar Damage Ratings**			Yield
	Rate	CPB	Leafhopper		Flea Beetle	kg/plot
Treatments	g AI/100m	June 20	June 26	July 4	June 5	July 29
ISK 66824 5G	14.0	6.5C*	6.0BC	8.0A	-	5.5C
ISK 66824 5G	18.0	7.3B	7.0B	8.0A	-	5.0C
ISK 66824 5G	26.0	8.8A	8.6A	8.5A	-	5.5C
NTN-33893 2.5G	1.0	9.3A	8.4A	6.9B	10.0A	15.3A
NTN-33893 2.5G	2.0	10.0A	8.9A	7.4AB	10.0A	16.5A
NTN-33893 2.5G	3.0	10.0A	9.2A	7.4AB	10.0A	16.3A
ORTHENE 75SP	11.2	5.3D	5.2C	6.7B	10.0A	12.3B
ORTHENE 75SP	1120/ha	5.8D	8.6A	8.5A	4.0B	12.8B
TEMIK 10G	22.4	9.5A	9.1A	9.6A	10.0A	17.5A
Control		4.3E	4.0D	3.5C	4.0B	10.8B

* Means followed by the same letter are not significantly different (P<0.05, Duncan's multiple range test).
** Foliar Damage Ratings (0-10) - 0, no control, foliage severely damaged; 10, complete control

#060

ICAR IDENTIFICATION NUMBER: 61006535

CROP: Potatoes, cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say),
Potato leafhopper, *Empoasca fabae* (Harris)

NAME AND AGENCY:
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TITLE: EFFECT OF THE ADDITION OF INCITE TO THE SYNTHETIC PYRETHROIDS DECIS 5.0EC AND AMBUSH 500EC

MATERIALS: DECIS 5.0EC (deltamethrin)

INCITE (synergist)
AMBUSH 500EC (permethrin)

METHODS: Potatoes were planted in two row plots, 6m in length with rows spaced 1m apart, replicated 4 times in a randomized complete block design. Potato seed pieces were planted with a commercial planter on May 2. Spray applications were made using a back pack airblast sprayer using 240L/ha of water. Treatments were applied on June 3, 7, 21, 27 and July 15. Assessments were taken by counting Colorado potato beetle (CPB) larvae and adults reporting the total counts per plot, foliage damage caused by beetle feeding and leafhopper foliar damage throughout the season and yield on August 7.

RESULTS: As presented in the table below.

CONCLUSIONS: DECIS provided a higher level of Colorado potato beetle control, for both larvae and adults than did AMBUSH. The addition of the synthetic pyrethroid synergist INCITE significantly extended the larval activity of AMBUSH and provided increased adulticide activity of DECIS and to an even greater extent of AMBUSH. Both DECIS and AMBUSH provided excellent leafhopper control which was not statistically improved with the addition of INCITE. The level of insect control was reflected in yield.

Table 1: Colorado potato beetle counts.

Treatment	Rate g AI/ha	CPB Larval Counts - days after June 3 Spray Date: 0	1	3	7	14
DECIS 5.0EC	100	58.8A*	0.0C	5.0C	11.3C	46.3B
DECIS 5.0EC + INCITE	100 290	56.3A	8.8BC	5.0C	3.3D	8.8C
DECIS 5.0EC + INCITE	100 440	73.8A	7.5BC	1.3D	0.0E	3.8C
AMBUSH 500EC	150	43.8A	32.5A	25.0B	63.8B	297.3A
AMBUSH 500EC + INCITE	150 290	71.3A	7.5BC	5.0C	4.5D	51.3B
AMBUSH 500EC + INCITE	150 440	42.5A	7.5B	6.3C	5.5D	26.3B
Control		40.0A	80.0A	415.0A	787.5A	687.5A

* Means followed by the same letter are not significantly different (P<0.05 Duncan's Multiple Range Test)

Table 2: Colorado potato beetle and leafhopper counts.

Treatment	Rate g AI/ha	CPB Adult Counts June 27 1	CPB Adult Counts Spray Date 7	Foliar Damage Ratings** CPB June 20	Foliar Damage Ratings** Leafhopper July 4	Yield kg/plot July 30
DECIS 5.0EC	100	12.5B*	22.5B	8.6A	8.7A	17.0AB
DECIS 5.0EC + INCITE	100 290	0.0D	6.3D	9.6A	9.2A	18.0A
DECIS 5.0EC + INCITE	100 440	0.0D	5.0D	9.9A	9.1A	19.5A
AMBUSH 500EC	150	46.3A	56.3A	6.4C	8.7A	15.8B
AMBUSH 500EC + INCITE	150 290	5.0C	18.8BC	7.6B	9.2A	19.8A
AMBUSH 500EC + INCITE	150 440	1.3CD	12.5C	8.6A	9.0A	19.3A
Control		63.8A	25.0B	3.2D	3.0B	9.8C

* Means followed by the same letter are not significantly different (P<0.05 Duncan's Multiple Range Test)

** Foliar Damage Ratings (0-10) - 0, no control, foliage severely damaged; 10, complete control

#061

ICAR IDENTIFICATION NUMBER: 61006535

CROP: Potato cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say),
Potato leafhopper, *Empoasca fabae* (Harris)

NAME AND AGENCY:
PITBLADO, R.E.
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TITLE: EVALUATION OF EXP-6043A 80WG FOR FOLIAR INSECTS ON POTATOES

MATERIALS: DECIS 5.0EC (deltamethrin), EXP-6043A 80WG (experimental)

METHODS: Potatoes were planted in three row plots, 6m in length with rows spaced 1m apart, replicated 4 times in a randomized complete block design. Potato seed pieces were planted with a commercial planter on May 2. Spray applications were made using a back pack airblast sprayer using 240L/ha of water. Treatments were applied on June 3, 20, 27 and July 15. Assessments were taken by counting Colorado potato beetle (CPB) larvae and adults reporting the total counts per plot, foliage damage caused by beetle feeding and leafhopper foliar damage throughout the season and yield on July 30.

RESULTS: As presented in the tables below.

CONCLUSIONS: EXP-6043A is an effective Colorado potato beetle larvicide as well as an adulticide. Adult beetle control was demonstrated for at least 7 days with larval control being extended for 14 days. Greater CPB adult control was achieved at the higher rate of EXP-6043A. Although EXP-6043A was shown to provide greater CPB control than the standard DECIS, it did not provide commercial control of leafhoppers. Insect control resulted in a significant increase in potato yields.

Table 1: Colorado potato beetle larval counts.

Treatment	Rate g AI/ha	CPB Larval Counts - days after June 3 Spray Date 0	1	3	7	14
DECIS 5.0EC	7.0	192.5A*	10.0B	22.5B	28.8B	205.0B
EXP-6043A 80WG	12.5	192.5A	15.0B	20.0B	12.5C	38.8C
EXP-6043A 80WG	25.0	152.5A	8.8B	0.0C	1.3C	23.8C
Control		173.8A	152.5A	432.5A	782.5A	987.5A

* Means followed by the same letter are not significantly different (P<0.05 Duncan's Multiple Range Test)

Table 2: Colorado potato beetle and leafhopper counts.

Treatment	Rate g AI/ha	CPB Adult Counts June 27 spray date 1	7	Folair Damage Ratings (0-10)* CPB June 20	Leafhopper July 4	Yield kg/plot July 30
DECIS 5.0EC	7.0	68.8A**	47.5A	6.0B	9.0A	22.3
EXP-6043A 80WG	12.5	10.0B	12.5B	7.2A	3.0B	23.3A
EXP-60434 80WG	25.0	1.3C	2.0C	8.6A	3.0B	23.5A
Control		46.3A	100.0A	2.5C	2.0C	8.0B

* Foliar Damage Ratings (0-10) - 0, no control, foliage severely damaged; 10, complete control

** Means followed by the same letter are not significantly different (P<0.05 Duncan's Multiple Range Test).

#062

ICAR: 86100104

CROP: Potato, Solanum tuberosum, cv. Kennebec

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)

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TITLE: CONTROL OF COLORADO POTATO BEETLE WITH *BACILLUS THURINGIENSIS* (B.t.) AND CONVENTIONAL INSECTICIDES

MATERIALS: M-ONE (*B.t. san diego*), 9.5 g toxin / L, @ 7.5 L prod / ha
BOND (latex spreader sticker) @ .25% v/v
MYX 1806 (*B.t. san diego*), 15.8 g/L, @5.0, 6.0 & 7.5 L prod/ ha
DECIS 50 (deltamethrin), 50 g / L, @ 7.5 g AI/ ha
INCITE (piperonyl butoxide [Pbo]), 920 g / L, @ 500 ml prod / ha
AC 303 630 (pyrrole), 120 g / L, @ 100 and 200 g AI / ha
CYMBUSH (cypermethrin), 250 g / L, @ 35 g AI / ha
TRIDENT (*B.t. tenebrionis*), 3.3 billion tenebrionis units / L @ 7 and 14 L prod / ha

METHODS: Potatoes were seeded on May 3 in 4-row plots, 15 m long. Rows were spaced at 0.9 m and plots were separated by 3 m spray lanes. Treatments were arranged in a randomized complete block design. Insecticides were applied with a tractor-mounted, four-row boom sprayer that delivered 800 L/ha at 450 kPa. One hundred egg masses were tagged on May 28 and checked daily to determine hatch. May 31 there was 1% hatched; June 3, 50% had hatched and all the treatments were applied on June 4. Applications of subsequent treatments were made June 11 and June 17. Populations of Colorado potato beetle were monitored 3-5 days after the treatments were applied by examining 5 plants in each plot.

The number of beetle larvae and adults was recorded and the percent defoliation caused by the beetle was estimated. Yield data was obtained by harvesting and weighing the centre 2 rows of each plot on August 19.

CONCLUSIONS: All the treatments controlled the Colorado potato beetle larvae. Defoliation was kept to a minimum and yield was greatly increased by all the treatments. The percent defoliation increased in the treated plots in July because of the large number of first generation adults emerging from surrounding untreated areas and moving into the plots. Only DECIS + piperonyl butoxide (Pbo) kept the adult defoliation in check.

Table 1. Number of Colorado potato beetles per 5 plants, cv. Kennebec 1991.

(LL) = 1st generation large larvae, AD = over-wintered adults and PDEF = percent defoliation.

	June 10-14			June 17-21		
	LL	AD	PDEF	LL	AD	PDEF
M-ONE @7.5 L	0.6a	0.5	7.9a	2.7a	0.6ab	4.2a
M-ONE @ 7.5 L + BOND @ 0.25%	0.5a	0.5	5.3a	3.5a	0.7ab	3.5a
MYX 1806 @ 5.0 L	0.4a	0.8	6.5a	2.9a	0.9ab	5.1a
MYX 1806 @ 6.0 L	0.3a	0.6	6.9a	0.7a	0.7ab	3.5a
MYX 1806 @ 7.5 L	0.2a	0.4	6.1a	0.7a	0.4ab	2.6a
DECIS @ 7.5 g	0.0a	2.0	8.0a	2.8a	1.6bc	5.6a
DECIS @ 7.5 g + Pbo @ 0.5 L	0.0a	0.3	3.9a	0.0a	0.2a	1.5a
AC 303 630 @ 100 g	0.3a	0.6	7.5a	1.3a	0.5ab	3.3a
AC 303 630 @ 200 g	0.1a	0.4	4.1a	0.2a	1.0ab	1.9a
CYMBUSH @ 5 g + TRIDENT @ 7 L	1.0a	0.5	7.4a	3.4a	0.7ab	3.1a
TRIDENT @ 14.0 L	0.9a	1.5	9.1a	1.3a	1.4abc	4.2a
TRIDENT @ 14.0 L + DECIS @7.5 g	0.0a	2.2	6.3a	0.5a	2.7c	4.1a
CHECK	16.2b	1.3	26.5b	63.2b	0.1a	54.5b

Table 2. Number of Colorado potato beetles per 5 plants, cv. Kennebec 1991.

	July 15-19			July 22-26		
	LL	AD	PDEF	LL	AD	PDEF
M-ONE @ 7.5 L	7.2ab	2.1abc	18.8abc	3.9a	3.4ab	27.3bcd
M-ONE @ 7.5 L + BOND @ 0.25%	6.8ab	2.6bc	15.5ab	3.6a	2.2ab	29.0cd
MYX 1806 @ 5.0 L	10.5bc	2.5bc	16.3ab	4.4a	4.1ab	39.5de
MYX 1806 @ 6.0 L	9.3bc	1.3ab	18.8abc	4.4a	3.6ab	27.3bcd
MYX 1806 @ 7.5 L	11.0bc	1.1ab	16.5ab	4.2a	2.3ab	27.0bcd
DECIS @ 7.5 g	7.1ab	3.1bc	34.8d	4.3a	11.6c	39.3de
DECIS @ 7.5 g + Pbo @ 0.5 L	1.5a	0.4a	10.3a	0.5a	1.0a	8.8a
AC 303 630 @ 100 g	7.0ab	1.9abc	26.3bcd	2.0a	4.3ab	29.3cd
AC 303 630 @ 200 g	2.0a	1.9abc	11.3a	0.7a	4.0ab	20.0abc
CYMBUSH @ 5 g + TRIDENT @ 7 L	7.2ab	3.8c	18.5abc	3.8a	3.5ab	29.0cd
TRIDENT @ 14.0 L	1.0a	1.7ab	11.0a	1.0a	5.0ab	13.0ab
TRIDENT @14.0 L + DECIS @7.5g	0.4a	1.8abc	12.8a	0.8a	5.1ab	15.3abc
CHECK	14.5c	6.0d	28.8cd	23.2b	5.8b	54.3e

LL = 2nd generation large larvae, AD = 1st generation emerging adults and PDEF = percent defoliation.

#063

STUDY DATA BASE: 280-1452-9110

CROP: Potato, cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)

NAME AND AGENCY:
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TITLE: EVALUATION OF FOLIAR INSECTICIDES FOR CONTROL OF COLORADO POTATO BEETLE ATTACKING POTATOES ON ORGANIC SOIL - I

MATERIALS: FRANIXQUERRA (654 g AI/L) (Na-dioctyl sulfosuccinate)
MARGOSAN-O (0.3% azadirachtin)
M-ONE 12.5WDS (28 BTU/L, *Bacillus thuringiensis* var. *san diego*)
MITAC 1.5EC (180 g AI/L) (amitraz)
INSECTAWAY (97% silicon dioxide)
AC 303,630 200SC (200 g AI/L)
CYMBUSH 250 g AI/L EC (cypermethrin)

METHODS: Potatoes were planted in London on May 10 in single-row microplots (2.25 x 0.9 m) filled with insecticide residue-free organic soil; all treatments were replicated 3x in a randomized complete block design. On June 3, 5 plants, selected at random from each microplot, were flagged. All treatments were first applied on June 5 at 250 kPa in 900 L water/ha using a single-nozzled (D-4 orifice disc, #25 swirl plate) Oxford precision sprayer. CPB life stages were counted on all flagged plants in all treated plots just prior to and 4 days after all treatments. Feeding damage to foliage was assessed visually on June 5, 12, 18, 25, July 3 & 17. Potatoes were dug on July 30. Tubers were graded, counted and weighed and marketable yields calculated.

RESULTS: See table below.

CONCLUSIONS: Neither FRANIXQUERRA nor INSECTAWAY provided significant protection against CPB damage. All other treatments significantly reduced numbers of "large" CPB larvae, reduced foliar damage and increased yields relative to CONTROL plots. Potato yields were significantly higher in plots initially treated with M-ONE followed by 3 applications of MITAC than in plots receiving 4 applications of MITAC alone. Although 4 applications of MARGOSAN-O or MARGOSAN-O + M-ONE and 5 applications of AC 303,630 provided generally excellent CPB control, similar potato yields were harvested from plots receiving only 2 applications of CYMBUSH.

#	Insecticide(s)	Rate (pdct/ha)	Mean Nb.CPB Larvae/Plant* 10/6	17/6	24/6	Foliar Damage** 18/6	10/7	Yield (t/ha)
1/3	FRANIXQUERRA	0.9 L	20.3 a/8	27.4 a	***/9	5.1 c	0.0b	0.7 c
2/3	FRANIXQUERRA	1.35 L	12.3 abc	18.3 ab	***	6.6 bc	0.3b	2.3 c
3/4	MARGOSAN-O	18.0 L	1.1 d	0.0 c	1.7 c	9.9 a	9.2a	16.0 ab
4/4	MARGOSAN-O + M-ONE	9.0 L + 3.5 L	1.7 d	0.3 c	4.5 c	9.9 a	9.3a	15.0 ab
5/5	M-ONE; MITAC	7.0 L; 2.75 L	0.6 d	1.2 c	12.5 bc	9.9 a	9.4a	16.4 a
6/4	MITAC	2.75 L	5.3 cd	7.3 bc	16.2 b	9.7 a	8.5a	11.7 b
7/4	INSECTAWAY	4.0 kg	16.3 ab	19.2 ab	31.7 a	8.0 ab	0.1b	4.8 c
8/6	AC 303,630	0.5 L	0.3 d	1.0 c	5.5 bc	9.8 a	8.5a	13.5 ab
9/7	CYMBUSH	70.0 ml	0.4 d	1.0 c	12.5 bc	9.8 a	8.5a	14.3 ab
10	CONTROL	---	7.2 ab	18.9 ab	29.5 a	8.0 ab	0.0b	1.8 c

* "large" (3rd and 4th instar) larvae;
** rating scale (0-10): 0 = no control, plants defoliated,
10 = complete control, no CPB damage;
/3 reapplied June 7,13;
/4 reapplied June 7, 13, 19;
/5 M-ONE June 5, MITAC June 7, 13, 19;
/6 reapplied June 7, 13, 19, 27;
/7 reapplied June 25;
/8 means within a column followed by the same letter are not significantly different (P = 0.05 as determined by Duncan's New Multiple Range Test;
/9 data not collected as treatments not applied.

#064

STUDY DATA BASE: 280-1452-9110

CROP: Potato, cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)

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TITLE: EVALUATION OF FOLIAR INSECTICIDES FOR CONTROL OF COLORADO POTATO BEETLE ATTACKING POTATOES ON ORGANIC SOIL - II

MATERIALS: M-ONE 12.5WDS (28 BTU/L *Bacillus thuringiensis* var. *san diego*)
TRIDENT (3.2 BTU/L *B.t.* var. *tenebrionis*)
AGRAL 90 (nonylphenoxy polyethoxy ethanol)
CYMBUSH 250 g AI/L EC (cypermethrin)
NTN-33893

METHODS: Potatoes were planted in London on May 13 in single-row microplots (2.25 x 0.9 m) filled with insecticide residue-free organic soil; all treatments were replicated 3x in a randomized complete block design. On June 10, 5 plants, selected at random from each microplot, were flagged. All treatments were first applied on June 12 at 250 kPa in 900 L water/ha using a single-nozzled (D-4 orifice disc, #25 swirl plate) Oxford precision sprayer. CPB life stages were counted on all flagged plants in all treated plots just prior to and 2-4 days after all treatments. Feeding damage to foliage was assessed visually on June 12, 18, 25, July 3 & 17. Potatoes were dug on August 29. On September 3, tubers were graded, counted and weighed and marketable yields calculated.

RESULTS: See table below.

CONCLUSIONS: Foliar application of NTN-33893 provided excellent control of CPB larvae and virtually complete protection of potato foliage. Highest yields in the trial followed application of the lower rate of NTN-33893. Although tank mix combination of below label rates of CYMBUSH and M-ONE also gave good CPB control and foliage protection and significantly increased potato yields, arithmetically better foliage protection and potato yields followed sequential application of CYMBUSH followed by M-ONE. Once again this year, addition of AGRAL 90 to TRIDENT decreased foliage protection and lowered yields; these differences, however, were not significant.

Nb.	Treatment	Rate (pdct/ha)	Mean Nb.CPB Larvae/Plant* 14/6	21/6	28/6	Foliar Damage** 25/6	17/7	Yield (t/ha)
1/3	TRIDENT	12.0 L	11.2 a/6	17.7 b	***/7	9.6 ab	6.2 bc	12.8 cde
2/3	TRIDENT + AGRAL 90	12.0 L + 0.1%	6.9 ab	12.3 bc	***	9.3 b	4.4 c	8.5 ef
3/3	M-ONE + CYMBUSH	3.5 L + 14.0 ml	1.1 b	6.1 cd	***	9.8 a	6.5 bc	18.2 bcd
4/4	CYMBUSH; M-ONE	140.0 ml; 7.0 L	1.1 b	5.1 cd	###/8	9.8 a	8.7 ab	23.7 ab
5/3	CYMBUSH	14.0 ml	4.7 ab	13.6 b	***	9.2 b	6.2 bc	12.2 de
6/5	NTN-33893	104.2 ml	0.3 b	4.5 d	4.1 b	9.8 a	9.5 a	27.6 a
7/5	NTN-33893	208.3 ml	0.0 b	0.1 d	0.4 b	9.8 a	9.6 a	19.4 bc
8	CONTROL	---	9.1 a	28.3 a	39.8 a	8.0 c	0.0 d	3.9 f

* "large" (3rd and 4th instar) larvae;
** rating scale (0-10): 0 = no control, plants defoliated, 10 = complete control, no CPB damage;
/3 reapplied June 18;
/4 CYMBUSH June 12, M-ONE June 26;
/5 reapplied June 26;
/6 means within a column followed by the same letter are not significantly different (P = 0.05) as determined by Duncan's New Multiple Range Test;
/7 data not collected as treatments not applied;
/8 missing data

#065

STUDY DATA BASE: 280-1452-9110

CROP: Potato, cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)

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TITLE: *BACILLUS THURINGIENSIS*" VAR. "*SAN DIEGO*" FOR CONTROL OF COLORADO POTATO BEETLE ATTACKING POTATOES ON MINERAL SOIL

MATERIALS: M-ONE 12.5WDS (28 BTU/L, B. thuringiensis var. san diego)
SPUD-CAP (MYX 1806) (10% encapsulated delta endotoxin B. thuringiensis var. san diego)
AGRAL 90 (nonylphenoxy polyethoxy ethanol)
BOND (combination of synthetic latex + primary aliphatic oxyalkylated alcohol)
Potassium carbonate

METHODS: Potatoes were planted in London on May 14 in single-row microplots (2.25 x 0.9 m) filled with insecticide residue-free mineral soil; all treatments were replicated 3x in a randomized complete block design. On June 3, 5 plants, selected at random from each microplot, were flagged. All treatments were applied on June 10 and 17 at 250 kPa in 900 L water/ha using a single-nozzled (D-4 orifice disc, #25 swirl plate) Oxford precision sprayer. CPB life stages were counted on all flagged plants in all treated plots just prior to and 4 days after all treatments. Feeding damage to foliage was assessed visually on June 12, 18, 25, July 3 & 17. Potatoes were dug on August 12. Tubers were graded, counted and weighed and marketable yields calculated.

RESULTS: See table below.

CONCLUSIONS: All treatments generally reduced numbers of "large" CPB larvae, reduced foliar damage and increased yields of marketable tubers relative to CONTROL plots. There were, however, no significant differences among treatments.

OBSERVATIONS: Extremely rapid development of CPB larvae during very hot weather complicated application scheduling. Earlier application of the second set of treatments against smaller larvae would have improved performance.

Nb.	Treatments	Rate (pdct/ha)	Mean Nb.CPB Larvae/Plant* 14/6	17/6	21/6	Foliar Damage** 18/6	10/7	Yield (t/ha)
1	M-ONE	7.5 L	2.5 b***	6.1 b	11.3 b	9.9 a	7.7a	13.5 a
2	M-ONE	7.0 L	3.9 ab	13.2 ab	21.4 ab	9.8 a	7.0a	12.3 a
3	M-ONE + BOND	7.0 L + 0.25%	5.0 ab	9.5 b	18.5 ab	9.7 a	8.0a	12.3 a
4	M-ONE + AGRAL 90	7.0 L + 0.1%	3.5 ab	8.3 b	18.7 ab	9.8 a	6.4a	12.0 a
5	M-ONE	4.0 L	3.7 ab	16.0 ab	32.3 a	9.8 a	7.6a	14.8 a
6	M-ONE + pot. carbonate	4.0 L + 1.5 kg	1.6 b	4.7 b	16.9 ab	9.9 a	6.8a	12.4 a
7	SPUD-CAP	6.0 L	2.7 b	3.9 b	21.5 ab	9.9 a	7.8a	15.0 a
8	CONTROL	---	13.9 a	25.5 a	29.6 ab	7.5 b	1.6b	2.9 b

* "large" (3rd and 4th instar) larvae;
** rating scale (0-10): 0 = no control, plants defoliated, 10 = complete control, no CPB damage;
*** means within a column followed by the same letter are not significantly different (P = 0.05) as determined by Duncan's New Multiple Range Test

#066

STUDY DATA BASE: 280-1452-9110

CROP: Potato, cv. Superior

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)

NAME AND AGENCY:
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TITLE: EVALUATION OF GRANULAR INSECTICIDES FOR CONTROL OF COLORADO POTATO BEETLE ATTACKING POTATOES ON MINERAL SOIL

MATERIALS: NTN-33893 2.5G (imidacloprid)
TEMIK 10G (aldicarb)
THIMET 15G (phorate)

METHODS: Potatoes were planted in London on May 14 in single-row microplots (2.25 x 0.9 m) filled with insecticide residue-free organic soil; all treatments were replicated 3x in a randomized complete block design. Granular insecticides were hand-applied with a modified salt shaker in a 5 cm band in the bottom of the furrow below the seed potatoes. Feeding damage to foliage was assessed visually on June 12, 18, 25, July 3 & 17. Potatoes were dug on August 28. Tubers were graded, counted and weighed and marketable yields calculated.

RESULTS: See table below.

CONCLUSIONS: Both NTN-33893 and TEMIK maintained excellent protection of potato foliage throughout the season, resulting in yield increases of at least 8-fold. Late in the season, foliage damage in plots treated with NTN-33893 seemed marginally less than damage in plots treated with TEMIK. Although THIMET provided a measure of protection of potato foliage, this insecticide was not nearly as effective as either NTN-33893 or TEMIK.

Nb.	Treatment	Rate (g AI/100 m)	Foliar Damage Rating* 18/6	2/7	10/7	17/7	Yield (t/ha)
1	NTN-33893 2.5G	1.0	10.0 a**	9.9 a	9.9 a	9.9 a	20.5 a
2	NTN-33893 2.5G	3.0	10.0 a	10.0 a	10.0 a	9.9 a	24.6 a
3	TEMIK 10G	16.9	10.0 a	10.0 a	9.6 a	9.3 a	24.8 a
4	THIMET 15G	26.3	9.4 a	8.5 a	7.5 a	4.3 b	14.4 b
5	CONTROL	----	7.5 a	2.0 b	1.6 b	1.1 c	2.9 c

* Rating scale (0-10): 0 = no control, plants defoliated, 10 = complete control, no CPB damage;

** Means within a column followed by the same letter are not significantly different (P = 0.05) as determined by Duncan's New Multiple Range Test.

#067

STUDY DATA BASE: 364-1421-8207

CROP: Potatoes cv. Norland

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say)

NAME AND AGENCY:
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TITLE: COLORADO POTATO BEETLE DAMAGE IN POTATOES TREATED WITH *BACILLUS THURINGIENSIS*

MATERIALS: FOIL (*Bacillus thuringiensis* var. *kurstaki*), BOND, TRIDENT (*B.t.* var. *tenebrionis*), DECIS 5EC (deltamethrin), COAX, INCITE (piperonyl butoxide)
METHODS: Norland potatoes were seeded at 1200 kg/ha on May 13, 1991 in rows 1 m apart at Winnipeg, Manitoba. Plots of 2 rows by 5 m were replicated 4 times in a randomized complete block design, and were separated by a 0.25 m wide row of spring wheat between plots. Treatments were made June 28 and repeated on July 5 with a CO2 pressurized backpack sprayer at 400 L/ha and 400 kPa, using D6-25 disc core nozzles. For treatment 8, DECIS was applied on first spray date and TRIDENT on the second. Larval counts from single stalks of 10 randomly selected plants/plot were taken at spraying, and 6 and 14 days after first applications.

Crop defoliation in each plot was assessed visually during postspray counts. Plots were harvested in August after natural top growth desiccation.

RESULTS: Yield and count data in table below were transformed to log 10X before analysis by Duncan's Multiple Range test.

CONCLUSIONS: Treatments of FOIL at 10 L/ha with BOND, TRIDENT plus BOND, and DECIS provided both significant control of larvae and increased yields. TRIDENT gave results comparable to that of DECIS when BOND or COAX were added or if TRIDENT was used after DECIS. Crop defoliation and yield improved as BOND rates were increased, with the highest rate providing yields that were both comparable to DECIS and significantly higher than the check. FOIL at rates below 10.0 L/ha reduced crop defoliation but did not significantly increase yields. DECIS efficacy decreased when it was applied at half rates with INCITE, but yields were similar to DECIS applied at full rates.

Treatments	Rate (L/ha)	Larvae/stalk Pre	Larvae/stalk 6 d	Larvae/stalk 14 d	% Crop Defoliation 6 d	% Crop Defoliation 14 d	Market Yield (t/ha)
CHECK	-	22.8a*	34.7a	16.8ab	24	83	9.52d
FOIL + BOND	2.5 + 0.15%	18.3a	30.0a	17.9a	19	64	10.16cd
FOIL + BOND	5.0 + 0.15%	16.1a	20.4b	13.3abc	8	35	11.90bcd
FOIL + BOND	10.0 + 0.15%	20.3a	12.7c	9.1cd	8	23	14.53abc
TRIDENT	7.5	17.2a	17.5bc	11.7abc	9	19	14.16a-d
TRIDENT + BOND	7.5 + 0.15%	14.3a	14.7bc	9.6cd	6	16	16.81ab
TRIDENT + COAX	7.5 + 0.125%	14.3a	13.4c	10.8bcd	5	14	18.41a
DECIS/TRIDENT	0.15/7.5	16.2a	13.3c	10.4bcd	4	15	19.21a
DECIS	0.15	12.4a	7.4d	6.9d	3	16	18.43a
DECIS + INCITE	0.075 + 0.04	13.5a	15.6bc	10.6bcd	8	21	18.34a

* Means followed by the same letter are not significantly different at the 5% level of Duncan's Multiple Range test.

#068

STUDY DATA BASE: 303-1451-8702

CROP: Potato cv. Russet Burbank

PEST: European corn borer, *Ostrinia nubilalis* (Hubner)

NAME AND AGENCY:
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TITLE: MANAGEMENT OF THE EUROPEAN CORN BORER ON LATE-SEASON POTATOES

MATERIALS: JAVELIN (*Bacillus thuringiensis* var. *kurstaki*),
DECIS 2.5EC (deltamethrin)

METHODS: 'Russet Burbank' seed was planted on May 30, 1991 at Middleton, P.E.I. at a spacing of 37 cm within a row and 91 cm between rows. Plots were arranged in a randomized complete block design with three treatments (Check, JAVELIN, DECIS), each replicated four times. Plots were treated with JAVELIN on July 12 using a CO2 back-pack sprayer which delivered approximately 300L of mixture/ha at a pressure of about 240 kPa. Plots were sprayed on July 12 with JAVELIN. Both insecticides were applied on their respective plots on July 16, 23, 30, and August 7 and 13. Each week, beginning on July 10 and ending on September 17, the number of European corn borer egg masses, larvae, and larvae-induced holes was counted on 20 stalks per plot.

Tubers from two 7.6 m rows were harvested from each plot on October 18 and October 21, and total and marketable (diameter 40 mm) yields were measured. Analysis of variance were performed on the data and the Least Squares Differences (LSD) determined.

RESULTS: The results are summarized in the table below.

DISCUSSION: European corn borer damage was significantly higher in the unprotected plots compared to the JAVELIN and DECIS plots. There was no significant difference between the JAVELIN and DECIS plots with respect to damage. Total and marketable tuber yields were not significantly different for all treatments. There were no phytotoxic effects observed for any treatment.

		Mean Number ECB Holes/20 Stalks			Mean Tuber Yield t/ha	
Treatment	Rate	Early (July 10)	Mid (July 30)	Late (Sept. 17)	Total	Markets
Check	-	0.0	0.8	8.0	27.2	22.3
JAVELIN	2.1 kg prod/ha	0.0	0.0	0.5	27.7	21.7
DECIS	5 g AI/ha	0.0	0.0	0.8	31.6	26.5
LSD ($P < 0.05$)		0.0	1.0	4.6	6.0	6.0

#069

STUDY DATA BASE: 61006538

CROP: Soybeans cvr Elgin 87.

PEST: Two-spotted spider mites, *Tetranychus urticae* Koch.

TITLE: CANDIDATE ACARICIDES FOR THE CONTROL OF SPIDER MITES IN SOYBEANS

NAME AND AGENCY:
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MATERIALS: OMITE 30W (propargite)
CARZOL 92SP (formetanate hydrochloride)
MITAC 180EC (amitraz)
APOLLO 480SC (clofentezine)
TRITON AG98
CYGON 480EC (dimethoate)
LORSBAN 480EC (chlorpyrifos)
METASYSTOX-R 240EC (oxydemeton-methyl)
IVOMEC 0.5% (ivermectin)

METHODS: Soybeans were seeded with a drill in 19 cm rows on 27 May at 555,000 pl/ha. Plots were arranged in a randomized complete block with 4 replicates. Plots ran with the row and were 2 m wide X 6 m long. Mite populations were estimated by sampling 10 leaves/plot from the centre area of the plot. Leaves were collected from the middle portion of the plant canopy. Leaves were examined under the microscope and the number of mites were counted in a circular area 4 cmxcm in size at the base of the underside of one leaflet/leaf, over the mid-rib. Average leaf area was calculated from 25 representative leaves and the counts were converted to mites/trifoliate. Acaricides were broadcast over the plots in 217 L/ha water under 275 kPa pressure using an Oxford precision sprayer (3 nozzles Allman #0) on 17 July when soybeans were in bloom. The soybeans were "yellowed" at the time of spraying as a result of mite feeding and drought. Pods were counted on 10 plants/plot on 19 Aug. Yields (0.71 X 4 m) were taken on 26 Sept and corrected to 14% moisture. Mite counts were log-transformed before ANOVA. Reported means are re-transformed.

RESULTS: Results are presented in Table 1.

CONCLUSIONS: Propargite, formetanate hyrdochloride, amitraz, and chlorpyrifos were shown to be good candidates for control of spider mites in soybeans. Dimethoate provided excellent control of mites. Application of 0.48 kg ai/ha provided better results than 0.36 kg ai/ha.

Table 1. Control of two-spotted spider mites in soybeans.

All rates are specified as kg ai/ha

Treatment	Rate	Mite counts, no./trifoliate Pre-spray 16/07	Post-spray 19/07	Post-spray 26/07	Post-spray 16/08	No. Pods /plant	Yield kg/ha
OMITE 30 W	1.0	214a	100ab	7ef	554d	16.8ab	1981ab
CARZOL 92 SP	0.56	364a	42abc	12def	807cd	17.9ab	2201a
MITAC 180 EC	0.42	294a	40abc	61bcd	1147abc	15.1ab	1755ab
APOLLO 480 SC plus	0.052	266a	82ab	173abc	1052bc	13.3b	1329bc
TRITON AG98	0.1						
CYGON 480 EC	0.36	186a	14bc	39cde	663cd	16.9ab	1778ab
CYGON 480 EC	0.48	206a	65ab	38cde	567d	19.3a	1978ab
LORSBAN 480 EC	0.56	195a	4c	2f	571d	17.1ab	1587ab
METASYSTOX-R 240 EC	0.54	253a	12bc	13def	802cd	14.3ab	1524b
IVOMEC	0.06	146a	20bc	328ab	1530ab	16.6ab	750cd
NON-TREATED CHECK		205a	175a	536a	2005a	12.8b	439d
CV % =		10.9	35.5	31.7	5.5	19.9	26.1

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05)

#070

ICAR IDENTIFICATION NUMBER: 61006535

CROP: Sweet corn cv Merit

PEST: European corn borer, *Ostrinia nubilalis* (Hubner)

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology, Ridgetown, Ontario NOP 2CO

TITLE: CHEMICAL CONTROL OF SWEET CORN INSECTS

MATERIALS: CYMBUSH 250EC (cypermethrin)
AC 303,630 120 EC (experimental)
CGA-237218 0.6 WP (Bt experimental)
NEEMIX (azadirachtin)
AGRAL 90 (surfactant)

METHODS: Sweet corn was planted on June 10. Plots were 2 rows spaced 90 cm apart, 8m in length, replicated 4 times in a randomized complete block design. The plants were artificially infested with European corn borer (ECB)egg masses on July 26 and Aug. 2. Sprays were applied Aug. 8, 15 and 22 using a back pack airblast sprayer at 240 L/ha of water. Treatments were evaluated at harvest on Aug. 26 by counting the number of ECB larvae in the stalks and cobs.

RESULTS: As presented in the table below.

CONCLUSIONS: Under a heavy infestation of European corn borers, CYMBUSH and the higher rates of AC 303,630 and CGA-237218 proved the most effective. The lower rate of CGA-237218 was ineffective in controlling corn borers.

Treatments	Rate	% ECB Infestation Stalks	Cobs
CYMBUSH 250EC	70.0 g AI/ha	61.8B*	16.0D
AC 303,630 120EC	100.0 g AI/ha	58.8B	28.3BC
AC 303,630 120EC	200.0 a AI/ha	54.5B	25.5BCD
CGA-237218 0.6WP	1.0 kg pr/ha	81.0A	30.8AB
CGA-237218 0.6WP	1.5 kg pr/ha	62.5B	20.5CD
NEEMIX +	2.0 ml pr/ha	61.8B	28.5BC
AGRAL 90	0.1 % v/v		
Control		81.3A	38.5A

* Means followed by the same letter are not significantly different (P<0.05, Duncan's multiple range test).

#071

STUDY DATA BASE: 375-1431-4733

CROP: Alfalfa cv. Beaver

PESTS: Lygus bugs *Lygus* spp.
Plant bug (APB) *Adelphocoris lineolatus* (Goeze)
Pea aphid *Acyrthosiphon pisum* (Harris)

NAME AND AGENCY:
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TITLE: EVALUATION OF INSECOLO FOR THE CONTROL OF ALFALFA PESTS

MATERIALS: INSECOLO (silicon dioxide)

METHODS: A sprig of Beaver alfalfa foliage and a partial pod of green bean cv. Stringless Green Pod were placed on moistened filter paper in 6.5 cm diam. plastic petri dishes. One half of the dishes was placed in a 1 m2 arena and the area sprayed with 7.5 g Insecolo in 100 mL distilled water using a hand-held household pump sprayer. Check dishes were similarily sprayed using a different spray pump and only distilled water. Test insects had been field-collected the previous day from a Beaver alfalfa field in late bloom and stored in the dark at 4 deg C for 24 hrs. The insects were introduced into the dishes immediately after spraying, while the foliage was still damp. Dishes and insects were placed in a growth chamber at 22 deg C, 16:8 L:D photoperiod and monitored for 5 days, whereupon the test was discontinued because of deterioration of the food supply. At 5 days the number of aphid nymphs produced during the experiment was counted.

RESULTS: Most test insects rapidly acquired a coating of Insecolo droplets on their integument as they moved around. Survival and control data are presented in the table. After 5 days, there were 238 aphid nymphs produced in the check dishes, and 144 nymphs in the treatment dishes, a significant difference in reproduction (P=0.05, t-test).

CONCLUSION: Although plant bugs in test dishes appeared to spend more time cleaning and rubbing their tarsi than check insects, Insecolo was not an effective control of any insects except possibly APB nymphs; however, surviving numbers of both test and check APB were too low for differences to be statistically significant. Insecolo had a detrimental effect on aphid reproduction.

		No. Insects Surviving*					%**
	Start	4 hr	12 hr	1 day	2 days	5 days	Control
Lygus adults	n=12 dishes						0
Untreated check	45	45	45	44	44	39	
Insecolo	42	42	42	42	42	38	
Lygus nymphs	n=4 dishes						0
Untreated check	15	15	15	14	14	7	
Insecolo	15	15	15	14	9	7	
APB nymphs	n=7 dishes						55.6
Untreated check	33	33	33	30	23	9	
Insecolo	33	33	32	26	16	4	
Aphid adults	n=18 dishes						1.8
Untreated check	90	--	83	83	80	57	
Insecolo	90	--	84	83	78	56	

* Within each column and insect category, treatment means did not differ significantly from zero at the 0.05 level of probability, t-test
** After 5 days, corrected using Abbott's formula

#072

STUDY DATA BASE:

CROP: Barley cv. Leduc

PEST: Barley thrips, *Limothrips denticornis* and *Anaphothrips* spp.

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TITLE: EVALUATION OF DECIS 5 EC AND CYGON 480 EC FOR THRIP CONTROL

MATERIALS: DECIS 5 EC (deltamethrin), CYGON 480 EC (dimethoate)

METHODS: Leduc barley was planted on May 7, 1991 at Olds, Alberta. The experimental design was a randomized complete block with two treatments, DECIS at 0.01 kg ai/ha and CYGON at 0.5 kg ai/ha. There were 4 replications per treatment. Each plot was 1.6 m wide by 4 m long with 2 m wide alleyways between plots. Insecticides were applied with a CO2 backpack sprayer with 8002 teejet flat fan nozzles delivering 375 L/ha at 275 K Pa on June 28. Thrips were sampled from ten flag leaf sheath and leaf samples per plot on each sampling date. The tiller was cut at the top node, and the flag leaf sheath, leaf and head placed in a quart jar of ethanol. Thrips were rinsed from the plant material, separated from the ethanol in a Buchner funnel apparatus, and counted. Ten tillers per plot were collected and the top four leaves examined for percent leaf area with leaf disease.

RESULTS: The thrips results are summarized in the table below. All of the leaves examined had less than 5% of the leaf area covered with disease.

CONCLUSIONS: DECIS and CYGON significantly decreased the barley thrips population level up to three weeks post-treatment. At one week post-treatment DECIS was the most effective treatment. DECIS caused a significant decrease in the population level of Anaphothrips spp. up to three weeks post-treatment. CYGON was not as effective in controlling Anaphothrips spp. as DECIS.

Treatment	Rate (g ai/ha)	Mean No. Barley Thrips/ 10 flag leaf sheaths			Mean No. Anaphothrips spp./ 10 flag leaf sheaths		
		Pre-spray June 28	1 wk Post-spray July 5	3 wks Post-spray July 19	Pre-spray June 28	1 wk Post-spray July 5	3 wks Post-spray July 19
Check		17.14a	34.13a	39.88a	10.43a	3.88a	16.88a
DECIS	10	21.63a	1.88c	4.50b	6.75a	0.38b	0.50b
CYGON	500	25.13a	9.75b	17.13b	7.88a	0.38b	20.88a

Means within columns followed by the same letter are not significantly different (P>O.05, Duncan's Multiple Range Test).

#073

STUDY DATA BASE: CA30-91-E671

CROP: Field Corn cv. C0-OP 220 (in-bred)

PEST: Northern Corn Rootworm, *Diabrotica barberi* Smith & Lawrence
Western Corn Rootworm *D. virgifera virgifera* Laconte

NAME AND AGENCY:
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TITLE: EVALUATION OF FORCE 1.5G FOR CONTROL OF CORN ROOTWORM IN FIELD CORN

MATERIALS: FORCE 15.G (tefluthrin granular; 15 g a.i./kg)
DYFONATE 20G (fonofos granular; 200 g a.i./kg)
DYFONATE II-20G (fonofos granular; 200 g a.i./kg)
COUNTER 15GR (terbufos granular; 150 g a.i./kg)

METHODS: Field corn was planted on May 15, 1991 into a fine clay loam soil at Mount Hope, Ontario, with a John Deere two-row modified planter. Granular insecticides were applied at planting in a 15cm band(B), dispensed in front of the packer wheel covering the row, or in-furrow(IF). Each plot consisted of two rows 2m by 15m replicated four times in a randomized complete block design.

Emergence and vigour ratings were recorded on June 3 and June 24, 1991. On July 9, stand counts and the number of lodged plants were recorded. Three plants per plot were extracted on July 10, and the roots thoroughly washed and rated using the ISU 1-6 scale (1- no noticeable damage; 6- 3 or more nodes of roots pruned). The washed roots were weighed, and on an average measurement recorded and analyzed. Data was analyzed using an analysis of variance and Duncan's Multiple range test at the 0.05 significant level.
RESULTS: As presented in the table below.

CONCLUSIONS: The emergence and vigour ratings were not significantly different compared to the check. All treatments significantly reduced the number of lodged plants compared to the check. The root weights were not significantly different between treatments. DYFONATE II-20G banded reduced root damage significantly compared to all other treatments, with the exception of COUNTER 15GR banded. All other treatments significantly reduced root damage compared to the check. FORCE provided acceptable corn rootworm control comparable to the commercially used products.

TREATMENT	RATE (gm ai/100m)	EMERGENCE Nb./PLOT 03/06	% CROP VIGOUR 03/06	LODGING Nb./PLOT 09/07	ROOT WEIGHT 10/07	ROOT RATING 10/07
1 UNTREATED	----	78.8 a	91.3 a	21.3 a	21.8 b	5.7 a
2 FORCE 1.5 GR	IF 1.13	82.0 a	87.5 a	1.9 b	39.9 ab	3.8 b
3 FORCE 1.5 GR	B 1.13	75.5 a	88.8 a	2.0 b	65.6 ab	3.7 b
4 DYFONATE 20 GR	B 11.0	80.3 a	88.8 a	1.3 b	53.9 ab	2.9 bc
5 DYFONATE II 20 GR	B 11.0	78.8 a	87.5 a	0.5 b	78.8 a	1.3 d
6 COUNTER 15 GR	IF 11.3	74.5 a	88.8 a	1.0 b	79.5 a	2.9 bc
7 COUNTER 15 GR	B 11.3	75.8 a	86.3	0.0 b	52.8 ab	1.5 cd
LSD (.05) =		7.7	7.8	8.4	47.83	1.40
Standard Dev. =		5.18	5.22	5.57	32.20	0.94
CV =		6.65	5.91	139.65	57.45	30.24

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05)

#074

ICAR: 88100230

CROP: Field corn, inbred C0220

PEST: Northern corn rootworm, *Diabrotica barberi* Smith and Lawrence
western corn rootworm, *D. virgifera virgifera* LeConte

NAME AND AGENCY:
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TITLE: EFFICACY OF CORN ROOTWORM INSECTICIDES IN 1991 AT ELORA, ONTARIO

MATERIALS: AZTEC 2.1G (Mat 7484 + cyfluthrin)
COUNTER 15G (terbufos)
DYFONATE II 20G (fonofos)
FORCE 1.5G (tefluthrin)

METHODS: Seven granular insecticide treatments were applied to field corn at planting time (24 May) using a John Deere Max-Emerge two-row planter equipped with granular applicators. The Noble meters on the applicators were bench-calibrated for each insecticide. Each plot was one row, 12 m long. Row spacing was 76 cm. Three treatments (AZTEC, COUNTER and FORCE) were applied in furrow; all treatments were applied in a 15-cm band over the row in front of the press wheel. One check plot was included for a total of 8 treatments which were replicated 5 times in a randomized complete block design at Elora, Ontario. Two methods were used to measure efficacy of the insecticides: 1) Four corn roots were taken per treatment from each replicate on 6 August. They were washed and rated for feeding damage using a 1-6 rating scale*. Root ratings were transformed by sq. rt x+1 before analysis; 2) Corn plants were observed for goosenecking on 20 August. Goosenecking data were transformed by arcsin sq.rt x(.01) before analysis.

RESULTS: The results are summarized in the following table.

CONCLUSIONS: Rootworm pressure was high but not as severe in 1991 as it was in 1990. One registered rootworm treatment (DYFONATE) had root ratings greater than the economic threshold of 3.0, but percentage of goosenecking was not significantly higher.

Treatment	Rate (g AI/100 m)	Mean Root Rating*	Mean % Goosenecking
AZTEC 2.1G (band)	1.31	2.5 d**	5.0 b**
AZTEC 2.1G (in furrow)	1.31	2.7 cd**	13.8 b**
COUNTER 15G (band)	11.25	2.5 d**	11.4 b**
COUNTER 15G (in furrow)	11.25	2.7 cd**	15.4 b**
DYFONATE II 20G (band)	11.00	3.4 b**	22.9 b**
FORCE 1.5G (band)	1.13	3.0 c**	23.7 b**
FORCE 1.5G (in furrow)	1.13	2.6 d**	14.2 b**
Check		4.1 a**	75.3 a**

* Root rating scale: 1 - no noticeable feeding damage, 2 - feeding scars but no root pruning, 3 - at least one root pruned to within 4 cm but less than the equivalent of an entire node of roots pruned, 4 - one node or equivalent pruned, 5 - two nodes or equivalent pruned, 6 - three or more nodes pruned.

** Values followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

#075

STUDY DATA BASE: 61002030

CROP: Field corn, inbred variety C0220.

PEST: Western corn rootworm, *Diabrotica virgifera virgifera* Leconte
Northern corn rootworm, *Diabrotica barberi* Smith and Lawrence

NAME AND AGENCY:
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TITLE: CANDIDATE INSECTICIDES FOR THE CONTROL OF CORN ROOTWORMS

MATERIALS: COUNTER 15G (terbufos)
CYGUARD 15G (terbufos plus phorate)
THIMET 15G (phorate)
FURADAN 10G (carbofuran)
AZTEC 2.1G (MAT-7484)
NTN-33893 2.5G
DI-SYSTON 15G and 720 LC (disulfoton)
FORCE 1.5G (tefluthrin)
DYFONATE II 20G (fonofos)
LORSBAN 15G (chlorpyrifos)

METHODS: The crop was planted using a John Deere Max-emerge planter at 64,000 seeds/ha in 0.76 m row spacing. Plots were single rows 10 m in length placed in a randomized complete block design with 4 replicates. There were 3 control plots per replicate and these were pooled in the ANOVA. The plots were fertilized and maintained by the grower using commercially acceptable practices. The granular materials were applied using plot-scale Noble applicators. T-band applications were placed in a 15 cm band over the open seed furrow. In-furrow applications were placed directly into the seed furrow.
Liquid materials were applied during planting using an Oxford precision sprayer fitted with a single nozzle (Allman #0) in 120 L/ha water. The number of plants emerged were counted for each plot. For each plot, the number of lodged plants

per plot were counted and 4 roots per plot were dug, washed and scored for root injury using the Iowa 1-6 root injury scale.
RESULTS: The results are summarized in Tables 1-3 below. There were no significant differences in plant stand due to phytotoxicity.

CONCLUSIONS: Drought conditions at Turnerville resulted in poor root growth providing a restricted food supply to feeding rootworms, probably the cause of the higher than expected root ratings. Under more normal conditions, all the materials provided commercially acceptable control, with the exception of DI-SYSTON.

Table 1. Rootworm insecticide efficacy test at Arkona, Ontario, planted and treated on 14 May, 1991. Normal rainfall.

TREATMENT	RATE*	METHOD	EMERG. No./10m May	PERCENT LODGING Aug.	ROOT RTG (1-6) July
COUNTER 15G	75	T-BAND	37.8 a**	11.1 abc	1.7 bc
COUNTER 15G	75	IN-FURROW	34.8 a	2.8 bc	1.7 bc
THIMET 15G	75	T-BAND	36.5 a	14.5 ab	1.9 bc
DYFONATE II 20G	55	T-BAND	33.0 a	11.1 abc	2.3 bc
LORSBAN 15G	75	T-BAND	35.3 a	12.8 abc	1.8 bc
CYGUARD 15G	75	T-BAND	36.0 a	10.1 abc	1.8 bc
DI-SYSTON 15G	75	T-BAND	36.5 a	9.4 abc	2.8 ab
DI-SYSTON 720LC	15	T-BAND	35.3 a	1.6 c	2.4 bc
FURADAN 10G	110	T-BAND	35.5 a	11.6 abc	1.8 bc
FORCE 1.5G	75	T-BAND	37.5 a	8.2 abc	1.8 bc
FORCE 1.5G	75	IN-FURROW	37.5 a	18.5 a	1.8 bc
AZTEC 2.1G	62.4	T-BAND	33.3 a	5.0 bc	1.8 bc
AZTEC 2.1G	62.4	IN-FURROW	37.0 a	14.2 abc	1.7 bc
NTN-33893 2.5G	50	T-BAND	32.3 a	5.1 bc	1.9 bc
NTN-33893 2.5G	100	T-BAND	35.5 a	7.1 abc	1.5 c
CHECK			35.9 a	11.8 abc	3.5 a
CV %			10.0	76.9	33.1

* Rates are in ml or g product/100 m row.
** Means followed by the same letter are not significantly different (P<0.05, Duncan's Multiple Range Test).

Table 2. Rootworm insecticide efficacy test at Komoka, Ontario, planted and treated on 16 May, 1991. Higher than normal rainfall.

TREATMENT	RATE*	METHOD	EMERG. No./10m May	PERCENT LODGING Aug.	ROOT RTG (1-6) July
COUNTER 15G	75	T-BAND	35.3 ab**	2.4 c	1.8 ef
COUNTER 15G	75	IN-FURROW	28.3 c	8.0 bc	1.3 f
THIMET 15G	75	T-BAND	39.5 a	9.5 bc	2.7 cde
DYFONATE II 20G	55	T-BAND	35.5 ab	0.0 c	2.4 def
LORSBAN 15G	75	T-BAND	39.3 ab	2.2 c	1.8 ef
CYGUARD 15G	75	T-BAND	39.0 ab	3.7 c	2.0 ef
DI-SYSTON 15G	75	T-BAND	38.8 ab	6.7 c	4.0 ab
DI-SYSTON 720LC	15	T-BAND	36.0 ab	6.2 c	3.1 bcde
FURADAN 10G	110	T-BAND	38.0 ab	3.1 c	2.3 ef
FORCE 1.5G	75	T-BAND	37.5 ab	1.4 c	2.4 def
FORCE 1.5G	75	IN-FURROW	40.3 a	0.8 c	2.0 ef
AZTEC 2.1G	62.4	T-BAND	38.8 ab	0.8 c	2.2 ef
AZTEC 2.1G	62.4	IN-FURROW	39.5 a	0.0 c	1.8 ef
NTN-33893 2.5G	50	T-BAND	40.0 a	2.6 c	2.4 def
NTN-33893 2.5G	100	T-BAND	36.8 ab	0.0 c	2.1 ef
CHECK			37.2 ab	38.1 a	5.0 a
CV %			9.6	102.5	28.5

* Rates are in ml or g product/100 m row.
** Means followed by the same letter are not significantly different (P<0.05, Duncan's Multiple Range Test).

Table 3. Rootworm insecticide screen at Turnerville, Ontario, planted and treated on 21 May, 1991. Drought conditions after 25 May.

TREATMENT	RATE*	METHOD	EMERG. No./10m May	PERCENT LODGING Aug.	ROOT RTG (1-6) July
COUNTER 15G	75	T-BAND	39.8 ab**	15.1 abc	3.7 bcde
COUNTER 15G	75	IN-FURROW	35.5 c	15.3 abc	3.6 cde
THIMET 15G	75	T-BAND	37.0 bc	12.7 bc	4.0 abcde
DYFONATE II 20G	55	T-BAND	39.0 abc	16.5 c	3.7 abcde
LORSBAN 15G	75	T-BAND	38.5 abc	11.0 c	3.2 e
CYGUARD 15G	75	T-BAND	37.0 bc	9.8 c	4.0 abcde
DI-SYSTON 15G	75	T-BAND	36.8 bc	11.7 bc	3.9 abcde
DI-SYSTON 720LC	15	T-BAND	38.5 abc	16.5 abc	4.0 abcde
FURADAN 10G	110	T-BAND	41.0 a	27.9 a	3.9 abcde
FORCE 1.5G	75	T-BAND	39.0 abc	19.7 abc	4.0 abcde
FORCE 1.5G	75	IN-FURROW	37.0 bc	16.9 abc	3.3 de
AZTEC 2.1G	62.4	T-BAND	37.0 bc	18.8 abc	3.4 de
AZTEC 2.1G	62.4	IN-FURROW	37.8 abc	13.9 bc	4.0 abcde
NTN-33893 2.5G	50	T-BAND	39.0 abc	7.2 c	3.9 abcde
NTN-33893 2.5G	100	T-BAND	38.8 abc	13.0 bc	4.0 abcde
CHECK			37.0 bc	20.4 abc	4.5 ab
CV %			5.9	51.2	13.2

* Rates are in ml or g product/100 m row.
** Means followed by the same letter are not significantly different (P<0.05, Duncan's Multiple Range Test).

#076

STUDY DATA BASE: 61002030

CROP: Field corn, Pioneer 3737

PEST: Western corn rootworm, *Diabrotica virgifera virgifera* Leconte
Northern corn rootworm, *Diabrotica barberi* Smith and Lawrence

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TITLE: CANDIDATE INSECTICIDES FOR SLOT INJECTION WITH AND WITHOUT 28% UAN AS THE CARRIER FOR THE CONTROL OF CORN ROOTWORMS

MATERIALS: FORCE 1.5G and 50EC (tefluthrin)
DIAZINON 5G
BASUDIN 500EC (diazinon)
COUNTER 15G (terbufos)
LORSBAN 15G (chlorpyrifos)

METHODS: The crop was planted at 64,000 seeds/ha in 0.76 m row spacing, on 14, 16, and 21, 1991 May at Arkona, Komoka, and Turnerville, Ontario. Plots were double rows, 20 m in length placed in a randomized complete block design with 4 replicates. The middle 10 m of each plot was thinned to ca. 60,000 pl/ha in early June and these portions of the plots were used for assessments. There were 2 control plots per replicate and these were pooled in the ANOVA. The granular materials were applied using plot-scale Noble applicators in a T-band application placed in a 15 cm band over the open seed furrow. Liquid insecticides were applied with a slot-injector mounted on a 3 point hitch. On both sides of each row (at 12.5 cm from centre) a fluted-coulter, 3mm thick and 44.5 cm in diameter, opened the slot 7.5 cm deep and a straight-stream nozzle (TeeJet no. 20) injected the insecticide directly behind the coulter into the open slot at 3448 kPa in 280 L water or 28% UAN liquid fertilizer/ha. All insecticide rates are g AI/100m of row. Injections were applied on 18, 13, and 19 June at the V7, V5, and V5 stage at Arkona, Komoka and Turnerville, respectively. Four roots per plot were dug, washed and scored for root injury using the Iowa 1-6 root injury scale. Yields from both rows in the middle 10 m of the plot were taken on 15, 29 and 30 Oct. at Turnerville, Komoka and Arkona, and corrected to 15.5% moisture.

RESULTS: The results are summarized in the Table below. Arkona, Ontario, Normal rainfall. Komoka, Ontario, Higher than normal rainfall. Turnerville, Ontario, Drought conditions after 25 May.

CONCLUSIONS: Insect pressure was relatively low at all the locations. Under light pressure terbufos and tefluthrin applied as a T-band at planting generally resulted in higher yields and lower root ratings than any injection application.

Treatment	Rate g ai/ 100 m	Applic. Method	Arkona site Root Rating (1-6)	Arkona site Yield (T/ha)	Komoka site Root Rating (1-6)	Komoka site Yield (T/ha)	Turnerville Root Rating (1-6)	Turnerville Yield (T/ha)
FORCE 1.5G	1.125	T-BAND	1.7c	10.63ab	1.2c	3.63e	4.2	8.06a
COUNTER 15G	11.25	T-BAND	2.2bc	10.91a	1.2c	5.21abcd	4.2	8.28a
FORCE 50EC	1.125	SLOT INJ	2.2bc	9.71bc	1.9abc	4.18cde	4.2	5.08bc
FORCE 50EC	0.75	SLOT INJ	2.2bc	9.49bc	2.1abc	3.53e	4.4	5.83b
FORCE 50EC	0.38	SLOT INJ	2.9ab	9.61bc	1.8abc	3.52e	4.5	4.45bcd
FORCE 50EC	0.75	SLOT INJ (28% UAN)	2.7ab	9.36bc	2.3abc	5.98a	4.9	4.85bc
LORSBAN 480EC	11.25	SLOT INJ	2.6abc	9.48bc	2.1abc	4.22cde	4.0	4.86bc
LORSBAN 480EC	7.5	SLOT INJ	2.2bc	9.19c	2.9ab	4.50bcde	4.8	3.53cd
LORSBAN 480EC	3.8	SLOT INJ	3.3a	9.63bc	2.8ab	4.07cde	4.2	4.39bcd
LORSBAN 480EC	7.5	SLOT INJ	2.6abc	9.85abc	2.2abc	5.41abc	4.7	2.88d
		(28% UAN)						
DIAZINON 500EC	11.25	SLOT INJ	2.1bc	9.06c	2.4abc	4.57bcde	4.2	5.31bc
DIAZINON 500EC	7.5	SLOT INJ	2.6abc	9.42bc	2.5abc	4.40bcde	4.5	5.37bc
DIAZINON 500EC	3.8	SLOT INJ	3.0ab	9.64bc	1.7bc	3.97de	4.2	3.99bcd
DIAZINON 500EC	7.5	SLOT INJ	2.1bc	9.55bc	2.9ab	5.77ab	4.2	4.38bcd
		(28% UAN)						
CHECK 28% UAN			2.5abc	9.67bc	3.1a	5.43abc	4.1	4.17bcd
CHECK			3.0ab	9.09c	2.7ab	4.62abcde	4.3	4.42bcd
CV %			25.6	8.2	37.0	18.6	14.6	23.3

Means followed by the same or no letters are not different (P = 0.05, Duncan's NMRT)

#077

STUDY DATA BASE: 61002030

CROP: Field corn, Pioneer 3737.

PEST: Western corn rootworm, *Diabrotica virgifera virgifera* Leconte
Northern corn rootworm, *Diabrotica barberi* Smith and Lawrence

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TITLE: TIMING INSECTICIDE APPLICATIONS WITH SLOT INJECTION FOR THE CONTROL OF CORN ROOTWORMS

MATERIALS: FORCE 1.5G and 50EC (tefluthrin)
DIAZINON 5G and BASUDIN 500EC (diazinon)

METHODS: The crop was planted at 64,000 seeds/ha in a 0.76 m row spacing on 14, 16 and 21 May, 1991 at Arkona, Komoka and Turnerville, Ontario. Plots were double rows, 20 m in length placed in a randomized complete block design with 4 replicates. The middle 10 m of each plot was thinned ca. 60,000 pl/ha and these portions of the plots were used for assessments. There were 2 control plots per replicate and these were pooled in the ANOVA. The granular materials were applied using plot-scale Noble applicators in a T-band application placed in a 15 cm band over the open seed furrow. Liquid insecticides were applied with a slot-injector mounted on a 3 point hitch. On both sides of each row (at 12.5 cm from centre) a fluted-coulter, 3mm thick and 44.5 cm in diameter, opened the slot 7.5 cm deep and a straight- stream nozzle (TeeJet no. 20 and several others) injected the insecticide directly behind the coulter into the open slot at 3448 kPa in 280 L water/ha. All insecticide rates are g ai/100 m of row. The corn was at V 3,4,6,7, and 9 stages at Arkona, and at V3,5,6,8, and 9 stages at Komoka and Turnerville on the injection days (see results table for dates). Four roots per plot were dug, washed and scored for root injury using the Iowa 1-6 root injury scale. Yields from both rows in the middle 10 m of the plot were taken on 15, 29, 30 Oct. at Turnerville, Komoka and Arkona, and corrected to 15.5% moisture.

RESULTS: The results are summarized in the table below. Arkona, Ontario, normal rainfall. Komoka, Ontario, higher than normal rainfall. Turnerville, Ontario, drought conditions after 25 May.

CONCLUSIONS: Low insect pressure at all locations made it difficult to draw conclusions with respect to the optimum timing for slot injection. Tefluthrin, however, applied at planting as a T-band at two of the locations provided the best control as expressed by lower root injury ratings and increased yield at one location.

			Arkona site		Komoka site		Turnerville	
Treatment	Rate g ai/ 100 m	Method or Timing/ by site.	Root Rating (1-6)	Yield (T/ha)	Root Rating (1-6)	Yield (T/ha)	Root Rating (1-6)	Yield (T/ha)
FORCE 1.5G	1.125	T-BAND	2.1	10.47	1.1c	4.82	3.6abc	7.68a
FORCE 50EC	0.75	MY30 ,JN4,4	2.0	9.61	1.4bc	4.47	3.7abc	5.73b
FORCE 50EC	0.75	JN7 ,13,12	2.4	9.29	2.1abc	4.06	3.7abc	6.11b
FORCE 50EC	0.75	JN13 ,21,19	2.4	9.03	1.7abc	4.58	3.2bc	5.76b
FORCE 50EC	0.75	JN21 ,28,26	1.9	9.11	2.7ab	4.27	3.7abc	5.33b
FORCE 50EC	0.75	JN28 ,JY5,3	2.7	8.85	2.4abc	4.05	3.6abc	4.97b
DIAZINON 5G	11.25	T-BAND	2.8	10.14	2.7ab	4.34	3.7abc	6.44ab
DIAZINON 500EC	11.25	MY30 ,Jn4,4	2.4	9.42	2.3abc	5.15	3.8abc	5.37b
DIAZINON 500EC	11.25	JN7 ,13,12	1.9	9.35	2.5ab	4.90	3.2bc	5.88b
DIAZINON 500EC	11.25	JN13 ,21,19	2.9	9.01	2.0abc	4.10	4.2ab	6.18b
DIAZINON 500EC	11.25	JN21 ,28,26	2.6	9.44	2.9a	4.45	3.7abc	5.93b
DIAZINON 500EC	11.25	JN28 ,JY5,3	3.1	8.78	3.0a	4.05	3.1c	5.95b
CHECK			2.5	9.43	2.6ab	4.19	4.4a	6.00b
CV %			25.5	9.1	35.2	14.3	17.	
6 16.3								

Means followed by the same or no letters are not different (P=0.05, New Duncan's MRT)

#078

STUDY DATA BASE: 387-1431-8312

CROP: Wheat, cv. Neepawa

PEST: Russian wheat aphid, *Diuraphis noxia* (Mordvilko)

NAME AND AGENCY:
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TITLE: PROTECTION AGAINST POST-SPRAY INFESTATIONS OF RUSSIAN WHEAT APHID

MATERIALS: LORSBAN 4E (chlorpyrifos)

METHODS: Wheat plants, 4 rows 17.8 cm apart with 8 plants/row contained in metal flats (50L x 35W x 9D cm), were sprayed at the late 3-leaf stage. An indoor track sprayer with a Delavan LE-1 80 nozzle was used to spray LORSBAN at 125 g/ha, 207 kPa, in 110 L/ha water volume. At 2h, 2, 4, and 7d after spraying, the wheat (3 replicate flats per date) was infested by placing 8-12 aphids at the base of each plant. Infested plants were held in the greenhouse (20-30/10 C day/night) for up to 7d. To determine aphid numbers at each sample day, 3 plants/row (12 plants total) were randomly sampled from each flat. Counts were transformed using the square root function and differences between treatments tested by analysis of variance using a split-plot design.

RESULTS: See Table below. The 2d counts indicate the degree of aphid infestation, the 7d counts reflect the rate of reproduction. The reduced reproduction in the controls at the later infestations was attributed to the aphids infesting less vigorous older plants and to temperatures >25 C in the greenhouse. Residue analysis indicated that LORSBAN residues declined quickly (T1/2~1d). Repellency was not observed in the treated plants. Reproduction was slightly reduced in the treated plants infested 2d afterspraying.

CONCLUSIONS: LORSBAN provides no residual protection against Russian wheat aphid infestions after the day of spraying.

Treatment (g ai/ha)	Infested, days after spraying	LORSBAN residues on 3rd leaf (ppm)	No. Aphids/plant* (% Protection**), days after infesting 2d		7d	
Unspr Ctrl***	0		21 ab		103 a	
Unspr Ctrl	2		22 ab		78 b	
Unspr Ctrl	4		27 a		60 c	
Unspr Ctrl	7		19 b		43 d	
LORSBAN 125	0	2.35	1 *	(97%)	0 *	(100%)
LORSBAN 125	2	0.62	19 ns	(16%)	51 *	(35%)
LORSBAN 125	4	O.24	23 ns	(13%)	51 ns	(15%)
LORSBAN 125	7	0.035	20 ns	(-7%)	49 ns	(-15%)

* Unsprayed means (3 reps) for the same day followed by the same letter are not significantly different (P>0.05) by orthogonal contrasts. LORSBAN 125 means were compared pairwise to corresponding controls, * indicates significance (P<0.05).
** % Protection calculated as % reduction in no. aphids infesting wheat plants
compared to untreated control for that day.
*** Unsprayed control indicates population trend (no. aphids/plant).

#079

STUDY DATA BASE: 387-1431-8312

CROP: Wheat, cv. Neepawa

PEST: Russian wheat aphid, *Diuraphis noxia* (Mordvilko)

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TITLE: EFFECT OF SPRAY PARAMETERS ON CONTROL OF RUSSIAN WHEAT APHID

MATERIALS: LORSBAN 4E (chlorpyrifos)

METHODS: Wheat plants, 4 rows 17.8 cm apart with 8 plants/row contained in metal flats (50L x 35W x 9D cm), were infested at the early 3-leaf stage with 8-12 aphids per plant. Plants were sprayed 4d later at the late 3-leaf stage (aphids located inside the curled 3rd leaf) using an indoor track sprayer. The standard treatment used a Delavan LE-1 80 nozzle orientated straight down (90^) to spray LORSBAN at 125 g/ha, 207 kPa, in 110 L/ha water volume. The water volume, nozzle orientation, and LORSBAN rate were varied (4 replicate flats per treatment) in two experiments (see below). After spraying, plants were held in the greenhouse (20-25/10 C day/night) for up to 7d. To determine aphid numbers at each sample day, 2 plants/row (8 plants total) were randomly sampled from each flat. Counts were transformed using the square root function and differences between treatments tested by analysis of variance using a split-plot design.

RESULTS: See Table below. In Experiment 1, water-sensitive papers indicated an even distribution of spray at all volumes but fewer droplets/cm2 at the reduced volumes. In Experiment 2, there was higher reproduction in the unsprayed controls because the greenhouse was warmer (25 C). Previous experiments had shown that the spray must contact the vertically orientated 3rd leaf curl to obtain control. Residue analysis indicated there was increased deposition on the 3rd leaf with the 45^ nozzle orientation.

CONCLUSIONS: Under our indoor spray conditions, spray volume had no effect on LORSBAN efficacy against Russian wheat aphid. Changing nozzle orientation from 90o to 45o improved control at 65 g/ha, but not at 125 g/ha.

Treatment (g ai/ha)	Prespray count (no. aphids/ plant)	% Control* , days after spraying 2d	4d	7d
Expt 1 - (Unsprayed Ctrl)**	(24)	(30)	(44)	(77)
LORSBAN (125), volume 110 L/ha	(23)	87 a	93 a	94 a
LORSBAN (125), volume 55 L/ha	(20)	86 a	94 a	92 a
LORSBAN (125), volume 20 L/ha***	(20)	83 a	88 a	87 a
Expt 2 - (Unsprayed Ctrl)**	(49)	(78)	(111)	(152)
LORSBAN (65)	(39)	75 a	81 ab	71 a
LORSBAN (65), nozzle at 45^	(44)	75 a	76 a	86 b
LORSBAN (125)	(47)	82 a	86 ab	89 b
LORSBAN (125), nozzle at 45^	(51)	90 a	91 b	91 b

* % Control calculated using modified Abbott's. Within each experiment, means (4 reps) for the same day followed by the same letter are not significantly different (P>0.05) by orthogonal contrasts.
** Unsprayed control indicates population trend (no. aphids/plant).
*** T-Jet TPTX-1 hollow-cone nozzle was used to achieve 20 L/ha.

#080

STUDY DATA BASE: 387-1431-8312

CROP: Wheat, cv. Neepawa

PEST: Russian wheat aphid, *Diuraphis noxia* (Mordvilko)

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TITLE: INDOOR VERSUS A FIELD SPRAYER FOR CONTROL OF RUSSIAN WHEAT APHID

MATERIALS: LORSBAN 4E (chlorpyrifos)

METHODS: Wheat plants, 4 rows 17.8 cm apart with 8 plants/row contained in metal flats (50L x 35W x 9D cm), were infested at the early 3-leaf stage with 8-12 aphids per plant. Plants were sprayed 4d later at the late 3-leaf stage (aphids located inside the curled 3rd leaf) using either an indoor cabinet sprayer or a small-plot field sprayer. The indoor sprayer used a Delavan LE-1 80^ nozzle, 207 kPa, and 110 L/ha water volume. Flats were sprayed outdoors (19-21 C, slight wind) using a bicycle sprayer with a 4-nozzle boom (Delavan LF-1 80^), 276 kPa, and 110 L/ha volume. Two experiments were conducted each with 2 rates of LORSBAN (4 replicate flats per treatment). After spraying, all flats were held in the greenhouse (20-25/10 C day/night) for up to 7d. To determine aphid numbers at each sample day, 2 plants/row (8 plants total) were randomly sampled from each flat. Counts were transformed using the square root function and differences between treatments tested by analysis of variance using a split-plot design.

RESULTS: See Table below. The lower reproduction in the controls of Experiment 2 is unexplained. Residue analysis on water-sensitive papers from the 50 g/ha treatments of Experiment 2 indicated slightly more LORSBAN deposited by the bicycle sprayer.

CONCLUSIONS: The use of an indoor cabinet sprayer (to maintain a quarantine) did not exaggerate the control of Russian wheat aphid obtained with different rates of LORSBAN.

Treatment (g ai/ha)	Prespray count (no. aphids/ plant)	% Control,* days after spraying		
		2d	5d	7d
Expt 1 - (Unsprayed Ctrl)**	(48)	(63)	(79)	(115)
LORSBAN 125 (cabinet spr)	(50)	75 a	86 a	83 a
LORSBAN 125 (bicycle spr)	(47)	91 bc	96 b	97 b
LORSBAN 250 (cabinet spr)	(57)	88 b	97 b	97 b
LORSBAN 250 (bicycle spr)	(47)	94 c	100 c	100 c
		2d	4d	7d
Expt 2 - (Unsprayed Ctrl)**	(31)	(41)	(53)	(54)
LORSBAN 50 (cabinet spr)	(32)	62 ac	70 a	68 a
LORSBAN 50 (bicycle spr)	(31)	75 bc	77 a	79 ab
LORSBAN 125 (cabinet spr)	(27)	78 bd	78 a	80 b
LORSBAN 125 (bicycle spr)	(36)	91 d	98 b	93 c

* % Control calculated using modified Abbott's. Means (4 reps) for the same day followed by the same letter are not significantly different (P>0.05) by orthogonal contrasts.
** Unsprayed control indicates population trend (no. aphids/plant).

#081

STUDY DATA BASE: 387-1411-8914

CROP: Winter wheat, cv. Norstar

PEST: Russian wheat aphid, *Diuraphis noxia* (Mordvilko)

NAME AND AGENCY:
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TITLE: SEED TREATMENT FOR CONTROL OF RUSSIAN WHEAT APHID

MATERIALS: BAY-NTN-33893 (240 FS)

METHODS: NTN-33893 at the rates indicated below (see table) was applied to 0.3 kg batches of seed and tumbled for 30 minutes in one-liter jars, precoated with NTN-33893. Plots 8.2 X 10 M were established on "dryland" 10 miles east of Warner, Alberta and arranged in randomized complete blocks with four replications. Seeding was done September 4, 1990, at a rate of 100 kg/ha and because of drought conditions two centimeters of water were applied in mid-October to stimulate germination. Natural Russian wheat aphid (RWA) infestations were sampled November 15, 1990, by taking 20 randomly selected plants from each plot, and recording RWA numbers and presence of RWA induced plant symptoms. On May 6, 1991, the number of live and dead plants in six randomly selected 30 cm row sections from each plot were recorded. On August 22, 1991, plots were harvested and seed yields, test weights, thousand kernal weights, number of productive tillers, number of kernels per seedhead and the heights of the tallest tillers was recorded. Orthogonal contrasts tested for significant differences.

RESULTS: See table below. Significant differences between NTN-33893 treatments and checks were not detected in seed yields, test weights, number of tillers, number of kernels per seedhead or tiller heights. No differences were detected between NTN-33893 treatments for any parameter examined. All three rates tested appear to reduce RWA numbers, infested plants and symptoms on plants, and improved plant overwintering. Kernels from untreated plots weighed less than those from NTN-33893 plots.

CONCLUSIONS: NTN-33893 appears to give protection from the RWA. However, this protection did not result in yield differences.

Treatment (g ai/kg of seed)	RWA/Plot	Infested plants	Symptomed plants (%)	Surviving plants(%)*	Yield (g/M2)
Untreated (0.0)	95.0 a**	11.0 a	82.5 a	64.9 a	308.0 a
NTN-33893 (1.00)	3.3 b	0.8 b	8.8 b	95.1 b	319.4 a
NTN-33893 (1.25)	5.3 b	0.8 b	11.3 b	83.3 b	310.3 a
NTN-33893 (1.50)	2.3 b	0.3 b	6.3 b	92.1 b	328.6 a

Treatment (g ai/kg of seed)	Test weight (g/l)	1000 Kernal wt.(g)	Tiller numbers***	Tiller height**** (cm)	Kernels per head****
Untreated (0.0)	803.5 a	33.6 a	3.1 a	121.8 a	47.9 a
NTN-33893 (1.00)	807.6 a	36.0 b	3.0 a	119.6 a	42.8 a
NTN-33893 (1.25)	802.9 a	34.4 b	3.2 a	121.4 a	46.0 a
NTN-33893 (1.50)	809.6 a	36.0 b	3.3 a	123.4 a	41.5 a

* (Live in spring / (live+dead in spring)) X 100.
** Numbers in the same column followed by the same letter do not differ significantly (P>0.05) by orthogonal contrasts.
*** Based on ten plants per plot.
**** Based on tallest productive tiller on ten plants per plot.

#082

PEST: Horn fly, *Haematobia irritans* (L.)

HOST: Beef cattle

NAME AND AGENCY:
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TITLE: CONTROL OF THE HORN FLY, HAEMATOBIA IRRITANS (L.) ON BEEF CATTLE USING INSECTICIDAL EAR TAGS (20% FENTHION + 15% PIPERONYL BUTOXIDE) IN MANITOBA

MATERIALS: Cutter Blue Insecticidal Ear Tags**#**, containing 20% fenthion + 15% piperonyl butoxide.

METHODS: Two herds of beef cattle in the Manitoba Interlake Region were selected. Each animal in a Herd A (58 cows, 1 bull, mixed breeds) at the Gunton Bull Test Station received two ear tags on 28 June, 1991. Herd B (46cows and calves, 1 bull, mixed breeds) near Teulon was untreated. The bull from Herd A was removed between 17-22 August, while the bull from Herd B was present for the duration of the trial. Estimates of total horn flies on each of at least 10 mature animals per herd were conducted weekly until 29 August. No estimates of flies were taken on calves.

RESULTS: The results of weekly horn fly counts are presented in Table 1. The mean number of flies per animal in Herd A was significantly lower than in Herd B on 28 June. However, the numbers of flies in Herd A gradually fell to less than 10 flies per animal during the two weeks after tagging, and did not exceed that number for the remainder of the trial. No more than 100 flies on any one animal were observed in Herd A after treatment, and this only in the 7-day post treatment sample. In subsequent weeks, no animal carried more than 25 flies, and in 5 of these 8 weeks, 25% or more of the animals had no horn flies at all. In

Herd B, animals were observed with up to 1000 horn flies, and at no time did any of the sampled animals lack flies.One tag was lost during the trial period. There were no adverse reactions to the tags in any of the animals.

CONCLUSIONS: The combination fenthion/piperonyl butoxide ear tags, at two tags per animal, significantly reduced horn fly populations in the treated herd for 10 weeks following application, compared to the untreated check herd.

Table 1. Mean number of horn flies per adult animal in two beef herds in the Interlake Region of Manitoba. Numbers in brackets are the numbers of animals sampled.

	Herd A 20% Fenthion / 15% Piperonyl Butoxide		Herd B Untreated	
DATE	GUNTON	% 0 FLIES	TEULON	% 0 FLIES
June 28	24 (58)	1.7	119 (14)	0.0
July 5	18 (23)	4.4	130 (14)	0.0
July 12	6 (24)	37.5	99 (16)	0.0
July 19	4 (18)	33.3	130 (15)	0.0
July 26	7 (23)	13.0	211 (17)	0.0
August 1	7 (13)	0.0	57 (16)	0.0
August 9	3 (15)	20.0	116 (17)	0.0
August 17	3 (11)	27.3	103 (12)	0.0
August 22	5 (15)	26.7	81 (14)	0.0
August 29	4 (19)	42.1	78 (13)	0.0

#083

ICAR: 86100101

HOST: Beef Cattle

PEST: Horn fly, *Haematobia irritans* (L.)
Face fly, *Musca autumnalis* (DeGeer)

NAME AND AGENCY:
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TITLE: CONTROL OF HORN FLIES AND FACE FLIES ON CATTLE USING TWO EAR TAGS CONTAINING 20% FENTHION AND 15% PIPERONYL BUTOXIDE

MATERIALS: PVC ear tags containing 20% FENTHION and 15% PIPERONYL BUTOXIDE. BAYVET Division, 77 Belfield Road, Etobicoke, Ontario, M9W 1G6.

METHODS: Two separate herds of beef cows of mixed breeds (ca. 25 animals per herd) within 2 km of each other were used in this trial. During the third week of June one herd was tagged with two tags per animal, one tag per ear. A second herd was non-treated and served as a control. At approximately weekly intervals, numbers of horn flies per one side and face flies per face were counted on ten animals in each herd on the same day between 10:00 a.m. and 4:00 p.m. Differences in weekly means were analysed using a Student's t-test.

RESULTS: The results are summarized in the attached table.

CONCLUSIONS: Ear tags containing 20% FENTHION and 15% PIPERONYL BUTOXIDE provided 99.9% reduction of horn flies and 42.3 % reduction of face flies over the entire season. Face fly control was significant seven out of eleven weeks of the trial while horn fly control was significant every week. There was no observed loss of tags nor were any ill effects noted in tagged animals.

Mean number/a of horn flies per one side and face flies per face on cattle wearing two ear tags containing 20% FENTHION and 15% PIPERONYL BUTOXIDE, Elora, Ontario 1991.

Sampling Date	Face Flies (+/-)/b Non-treated	Face Flies (+/-)/b 20% FENTHION/ 15% PIPERONYL BUTOXIDE	Horn Flies (+/-) Non-treated	Horn Flies (+/-) 20% FENTHION/ 15% PIPERONYL BUTOXIDE
June 26	6.2 +/- 3.5	2.7 +/- 1.8*	16.6 +/- 15.7	0
July 2	20.4 +/- 8.4	12.7 +/- 4.1*	34.7 +/- 12.9	0
10	22.9 +/- 15.0	10.1 +/- 7.7*	32.5 +/- 10.3	0
18	17.5 +/- 7.2	15.2 +/- 9.7	41.5 +/- 27.0	0.2 +/- 0.6*
24	18.4 +/- 7.2	9.4 +/- 3.3*	85.5 +/- 40.4	0.1 +/- 0.3*
31	29.3 +/- 11.6	5.3 +/- 3.8*	71.5 +/- 29.1	0
August 7	20.8 +/- 12.1	22.4 +/- 10.8	79.5 +/- 45.0	0.1 +/- 0.3*
12	23.6 +/- 12.4	13.9 +/- 7.3*	69.0 +/- 54.2	0
19	12.3 +/- 6.3	8.9 +/- 5.2	50.2 +/- 34.7	0
28	13.8 +/- 6.3	4.1 +/- 2.4*	73.9 +/- 46.4	0.1 +/- 0.3*
Sept. 5	7.9 +/- 3.9	6.7 +/- 4.4	48.1 +/- 38.0	0.1 +/- 0.3*
Season Mean (+/-)	17.6 +/- 7.01	10.1 +/- 5.7*	54.8 +/- 22.4	0.05+/- 0.1*

/a Based on ten animals per herd.
/b +/- standard deviation.
* significantly lower than control p < 0.05 t-test.

#084

STUDY DATA BASE: 87000180

CROP: Green ash, *Fraxinus pennsylvanica* Marsh.

PEST: Ash plant bug, *Tropidosteptes amoenus* (Reuter)

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TITLE: EVALUATION OF INSECTICIDES FOR ASH PLANT BUG CONTROL

MATERIALS: SEVIN XLR (carbaryl)
DECIS 5F (deltamethrin)
DIAZINON 12.5EC (diazinon)
MALATHION 50EC (malathion)

METHODS: The trial was conducted on a 7-year old green ash shelterbelt located on the Shelterbelt Centre. Each plot consisted of 3 trees, infested with ash plant bug. Treatments were replicated 4 times in a RCB design. At the time of application, 18% of the ash plant bug population was in the adult stage and 82% in the late nymphal stages. On June 6, treatments were applied with a high pressure hand gun sprayer at 690 kPa to the point of run-off (15-19 L/plot). Pre and post spray sampling was conducted by collecting two 20 cm branch samples (each branch consisted of six to seven developed leaves) from each tree. The sample was collected by enclosing the branch in a plastic bag, then cutting the branch and sealing the bag. Samples were placed in a freezer until counts were taken. Pre-spray sampling was conducted prior to application, whereas post-spray sampling was conducted after 24, 48, 72, and 96 hours. The number of ash plant bugs recovered during sampling from each treatment plot was recorded. Values were transformed by square root (x+1) prior to ANOVA.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: All treatments caused significant reductions in the number of ash plant bugs. By 96 hours post-treatment, the malathion treatment was not as effective as the SEVIN, DECIS, or DIAZINON treatments.

		Ash plant bugs/plot*				
	Rate		Post-Treatment			
Treatment	Kg ai/1000L	PT**	24Hrs	48Hrs	72Hrs	96Hrs
SEVIN XLR	1.25	51.8a***,****	0.0b	0.0b	0.0b	0.3c
DECIS 5F	0.01	32.0a	0.0b	0.0b	0.0b	0.3c
DIAZINON 12.5 EC	0.625	69.5a	2.3b	1.0b	1.0b	0.3c
MALATHION 50 EC	0.5	40.8a	0.3b	0.5b	2.0b	2.3c
CHECK	-	46.3a	22.0a	19.5a	18.3a	11.5a

* Plot - six 20 cm branch samples (6 to 7 developed leaves per branch) was removed from each treatment plot.
** PT = Pretreatment
*** Values transformed by square root (x+1) prior to analysis of variance.
**** Means followed by the same letter are not significantly different at the 5% level according to the Student-Newman-Keuls test.

#085

STUDY DATA BASE: 87000180

CROP: Northwest Poplar, *Populus deltoides* c. *balsimifera* 'Northwest'

PEST: Poplar bud gall mite, *Aceria parapopuli* Keifer

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TITLE: INSECTICIDES FOR THE CONTROL OF POPLAR BUD GALL MITE

MATERIALS: ACECAP 97 IMPLANTS (acephate)
CYGON 480EC (dimethoate)

METHODS: ACECAP and CYGON were applied in 2 consecutive years for control of poplar bud gall mite. Infested 'Northwest' poplar shelterbelts (10-25 years old) located on the Shelterbelt Centre were used for the trial. Treatments were; ACECAP as trunk implants, CYGON as a soil drench and a check. Treatments were replicated 3 times in a RCB design with each plot consisting of 3 trees. Treatments were applied May 11, 1990 and May 16, 1991. ACECAP implants were inserted based on a rate of 1 per 10 cm circumference at breast height. From 4 to 9 implants were required per tree. Using a 0.95 cm drill bit, holes were made to a depth of 3.2 cm from the cambium surface. Holes were spaced 10 - 15 cm apart starting 15 cm above ground and spiralling up the trunk. Wounds were sprayed with wound dressing. The CYGON soil drench treatment was applied at a rate of 5.3 g ai/cm trunk diameter at ground level. A 15 cm wide x 5 cm deep trench was dug under the drip line of each tree with 8 to 15 holes made within each trench. Holes were approximately 10 cm deep. Undiluted CYGON was added equally to each hole. The holes were covered with soil before adding 40 L of water to each trench. The trial was evaluated October 12, 1990 and October 21, 1991 by removing 9 branches (3 from each tree) from each plot. Galls from the new growth of the first 20 shoots of each branch were counted and weighed. ANOVA was conducted with means separated by a Student-Newman- Keuls test.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: After 2 consecutive years the ACECAP treatment significantly reduced the number and weight of galls compared to the CYGON treatment. No phytotoxicity was observed with the treatments tested. Wounds caused by the ACECAP implants did not heal during the test period. Despite the poor healing there did not appear to be a short term detrimental affect on the trees.

Treatment	No. of galls per 20 shoots 1990	1991	Total dry weight of galls (g) 1990	1991	Dry weight per gall (g) 1990	1991
ACECAP	54.6b	45.5b*	3.3c	2.7b	0.055b	0.037b
CYGON 480EC	68.7a	82.1a	7.7b	17.8a	0.111a	0.208a
CHECK	78.8a	86.8a	10.0a	18.3a	0.127a	0.207a

* Means followed by the same letter are not significantly different at the 5% level according to Student-Newman-Keuls test.

#086

STUDY DATA BASE: 306-1452-9016

CROP: Brussels sprouts

PEST: Diamondback moth, *Plutella xylostella* (L.)

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TITLE: TOXICITY OF SELECTED INSECTICIDES TO DIAMONDBACK MOTH LARVAE

MATERIALS: SEVIN XLR (carbaryl)
AMBUSH 500 EC (permethrin)
DECIS 2.5 EC (deltamethrin)
THIODAN 50 WP (endosulfan)
LANNATE L (methomyl)
MONITOR 480 (methadimophos)
JAVELIN (Bacillus thuringiensis)
BASIC H.

METHODS: Populations of diamondback moth (DBM) were obtained from a commercial Brussels sprouts field and a home garden. A cabbage leaf of known area was treated by dipping in insecticide solution or distilled water containing 0.5% BASIC H surfactant and placed in a 9 cm plastic petri dish containing a moistened filter paper. Five diamondback moth larvae (3rd or 4th instar) were added. Each experiment consisted of five individual tests of an insecticide at one rate plus a CONTROL and was repeated. Mortality counts were made 24 and 48 hours following addition of the larvae. percernt mortality of each DBM population was calculated for each interval.

RESULTS: Results are shown in the table below.

CONCLUSIONS: DBM from the commercial Brussels sprouts field were more resistant to AMBUSH 500 EC and MONITOR 480 than from the home garden. THIODAN 400 was the most effective registered insecticide for control of DBM in the commercial field. JAVELIN was the most effective of the compounds tested.

Mean % mortality of diamondback larvae exposed to treated cabbage leaf.

Treatment	Rate (product/ha)	Population	% mortality 24h	% mortality 48h
CONTROL	-	1*	0	0
AMBUSH 500 EC	140 mL in 675 L	1	80	94
MONITOR 480	2.25 L in 1000 L	1	66	84
CONTROL	-	2**	0	0
AMBUSH 500 EC	140 mL in 675 L	2	6	14
MONITOR 480	2.25 L in 1000 L	2	33	60
LANNATE L	2.25 L in 137.2 L	2	21	27
SEVIN XLR	5.25 L in 625 L	2	8	13
THIODAN 400	2.0 L in 137.2 L	2	43	77
JAVELIN	2 kg in 1346 L	2	38	96

* Population obtained from unsprayed home garden.
** Population obtained from commercial grower.

#087

STUDY DATA BASE: 306-1462-9020

CROP: Lowbush blueberry

PEST: Blueberry maggot, *Rhagoletis mendax* Curran

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TITLE: PERSISTENCE OF TOXICITY OF AZINPHOS-METHYL TO ADULT BLUEBERRY MAGGOT

MATERIALS: GUTHION 240 EC (azinphos-methyl)

METHODS: Lowbush blueberry plants, Kentville clone 70-27 (4/treatment) were sprayed with 280 mL/ha GUTHION 240 EC using a moving nozzle pot sprayer with 8002E flat fan nozzle delivering 293 L/ha. Adults were obtained from field collected pupae stored at 2.5 C for 14 weeks, then incubated at 22oC, 80-100% R.H. and 16 hour photoperiod. Treatments were applied 1 or 2 times with a 10 day application interval for both toxicity and residue tests, using tap water for controls. Toxicity test units (22oC, 75% R.H. and 16 hour photoperiod) consisted of a 4 L glass jar fitted with a screen covered lid, supplied with sugar, distilled water, a sprayed blueberry plant and 10 adults sorted by sex. Plants used for residue determination were maintained in a greenhouse until sampling (method of analysis available on request). Mortality was recorded for 24 and 120 hours exposure to sprayed plants.

RESULTS: Results are shown in the table below.

CONCLUSIONS: Although azinphos-methyl residues persisted at slightly higher levels following 2 sprays, insect mortality was similar. Azinphos-methyl residues on blueberry plants and mean % mortality to adult blueberry maggot.

Interval post-spray days	Azinphos-methyl residue (mg/kg) 1 spray	2 sprays	Sex	% Mortality 1 spray 24 h	120 h	2 sprays 24h	120 h
0	8.40	13.2	F	27	83	20	88
			M	25	89	35	85
1	6.28	9.08	F	-	-	43	88
			M	-	-	20	92
2	4.73	8.98	F	15	58	40	73
			M	15	80	38	95
4	4.43	4.12	F	11	95	8	35
			M	38	87	28	72
8	1.48	3.45	F	8	50	3	70
			M	5	60	5	34
16	-	2.41	F	-	-	0	68
			M	-	-	8	32

#088

STUDY DATA BASE: 280-1452-9111

CROP: Cole Crops

PEST: Diamondback moth, *Plutella xylostella* (Linnaeus)

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TITLE: INSECTICIDE RESISTANCE IN DIAMONDBACK MOTH FROM QUEBEC AND ONTARIO

MATERIALS: 13 technical grade insecticides (see table below)

METHODS: DBM were collected from treated broccoli plants in St-Eustache, Quebec (QUE) and from the London Research Farm (ONE) where no insecticides were applied. Direct contact bioassays were done in a Potter spray tower. A range of concentrations (up to 1.0%) was chosen to cause 0-100% mortality; a solvent CONTROL (19:1 acetone:olive oil) was also applied. At least 2 replicates of 10 3rd-instar larvae were sprayed with 5 ml of insecticide solution at each concentration. Mortality was assessed after 18h. Resistance levels were determined by comparing the estimated LD50's of the QUE and ONE strains.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: Although DBM from QUE exhibited high levels of insecticide resistance particularly to the pyrethroids, they were more susceptible to endosulfan than DBM from ONE. This pattern of resistance is likely related to pesticide history at transplant or migration source, as DBM is not known to overwinter in Canada. The extremely high resistance to cyhalothrin and tefluthrin indicates high levels of cross resistance among pyrethroids as neither cyhalothrin nor tefluthrin are yet available commercially. Malathion, azinphos-methyl and naled showed good activity (at 0.033% solution or less) against DBM from ONE.

Insecticide	Strain	Avg. % mortality at indicated % solution .00033	.001	.0033	.01	.033	.1	.33	1.0	Ratio QUE/ONT
deltamethrin	QUE					20	70	95	-	>10X
	ONT	0	60	60	70	100	100			
permethrin	QUE		5		5	10	8	23	85	40X
	ONT		23	63	53	95	95			
cyhalothrin	QUE						0		85	1000X
	ONT	18	85	90	90	-	100			
cypermethrin	QUE					5	35	45	80	100X
	ONT		10	50	70	90	95			
fenvalerate	QUE				0	20	15	15	55	600X
	ONT		38	75	90	95				
tefluthrin	QUE				5	25	35	30	15	>1000X
	ONT	10	42	63	85	95	100			
methamidophos	QUE						15	35	62	10X
	ONT			17	33	77	100	100		
chlorethoxy-phos	QUE						20	15	35	>25X
	ONT					17	40	85	100	
carbofuran	QUE					0	10	25	45	24X
	ONT			0	5	40	82	83	100	
endosulfan	QUE				0	0	20	45	100	0.5X
	ONT					0	15	23	63	
malathion	ONT	0	0	62	100					-
azinphos-methyl	ONT		0	10	83	100	100			-
naled	ONT			3	38	100	100			-

#089

STUDY DATA BASE: 280-1452-9105

CROP: Horticultural Crops

PEST: Weeds in horticultural crops

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TITLE: EFFECTS OF HERBICIDES ON MICROBIAL NITRIFICATION AND SULFUR OXIDATION IN SANDY SOIL

MATERIALS: Technical (>90% purity) allidochlor, bentazon, chlorbromuron, diclofop-methyl, EPTC, ioxynil, monolinuron, propazine, nitrapyrin and nitrofen (85% purity)

METHODS: Herbicides were applied to the soil at a rate of 10 ug active ingredient per gram of soil. Samples were incubated at 28oC and 60% moisture- holding capacity. The degradation of proteins and other complex nitrogenous components of organic matter is carried out by saprophytes in the soil, and the biological formation of nitrite and nitrate from ammonium-N in soil is carried out by nitrifying microorganisms. Soil nitrification was determined by phenol disulfonic acid method for nitrates. Soil filtrate was dried in a porcelain dish and phenol disulfonic acid added and neutralized with 1:1 NH4OH. The resulting yellow color was read at 410 nm in a spectrophotometer. Nitrite was determined by the diazotization method with sulfanilic acid, naphthylamine hydrochloride and sodium acetate buffer read at 525 nm. A large fraction of sulfur in the soil profile is in organic form. Microbialde composition makes sulfur available for uptake from the soil by plants. The level of sulfur oxidation was determined turbidimetrically in the soil extracts at 429 nm for sulfate. Untreated controls were included with all tests. All results are expressed in terms of oven-dried soil, and results are means of triplicate determinations. Analysis of variance was employed for statistical analyses of results.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: Nitrification was depressed up to 1 wk after treatment with chlorbromuron, diclofop-methyl, ioxynil, nitrofen and propazine, however, no inhibitory effect was observed by the end of 2 wk. The nitrification inhibitor, nitrapyrin showed inhibition throughout the experiment. Oxidation of soil sulfur was not influenced during the experiment. Although the reduction in nitrification by some treatments is significant for up to 1 wk, these effects were not considered to be deleterious to soil microbial activities important to soil fertility over periods of two of more weeks after herbicide treatment.

Treatment	Rate (ug/g)	Nitrification**		Sulfur Oxidation***
		Period of Incubation (WK)		
		1	2	8
Control	0	8	5	51
Allidochlor	10	10*	9	80
Bentazon	10	8	14*	39
Chlorbromuron	10	7*	8	65
Diclofop-methyl	10	7*	6	61
EPTC	10	8	6	83
Ioxynil	10	7*	11*	88*
Monolinuron	10	8	9	78
Nitrofen	10	7*	12*	87*
Propazine	10	7*	10	60
Nitrapyrin	10	2*	1*	61

* Significantly different from control at 5% level.
** ug(NO/2/- + NO/3/-)-N/g
*** ug(SO/4/= -S)/g

#090

STUDY DATA BASE: 280-1452-9105

CROP: Horticultural Crops

PEST: Weeds in horticultural crops

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TITLE: EFFECTS OF HERBICIDES ON MICROBIAL POPULATIONS IN SANDY SOIL

MATERIALS: Technical (>90% purity) allidochlor, bentazon, chlorbromuron, diclofop-methyl, EPTC, ioxynil, monolinuron, propazine, nitrapyrin and nitrofen (85% purity)

METHODS: Ten micrograms active ingredient of herbicide per gram of soil were dissolved in a pentane-acetone (1:1) mixture and incorporated with carrier sand. After the solvents had evaporated, the sand-herbicide mixture was incorporated with sandy loam by tumbling for 30 min. Changes in the soil microfloral numbers were determined by soil dilution plate technique using sodium albuminate agar for bacteria and streptomyces and rose-bengal streptomycin agar for fungi. Soil moisture was maintained at 60% moisture-holding capacity. Samples were incubated at 28oC for periods of 1 and 2 weeks after treatment. Analysis of variance was used in statistical analysis of results.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: Microbial populations were equal to or greater than that of control after 2 wk. These results suggest that there were no inhibitory effects of the herbicides on the numbers or biomass of microorganisms.

Treatment	Rate (ug/g)	Bacteria (x105/g)		Fungi (x103/g)	
		Period of Incubation (WK)			
		1	2	1	2
Control	0	199	87	56	19
Allidochlor	10	152*	94	44	19
Bentazon	10	128*	82	17*	13
Chlorbromuron	10	105*	56	17*	16
Diclofop-methyl	10	157	80	27	19
EPTC	10	152*	85	33*	17
Ioxynil	10	166	72	47	22
Monolinuron	10	121*	90	23*	21
Nitrofen	10	161	163*	38*	38*
Propazine	10	147*	94	29*	26

* Significantly different (P<0.05) from control.

#091

STUDY DATA BASE: 280-1452-9105

CROP: Horticultural Crops

PEST: Fungal pathogens of horticultural crops

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TITLE: FUNGICIDAL EFFECT ON ENZYMES IN SOIL

MATERIALS: Captafol (80% WP) and chlorothalonil (75% purity)

METHODS: Required amounts of fungicides were dissolved in a 1 mL petroleum ether:acetone (1:1) mixture and incorporated with 0.5 g carrier sand. After the solvents had evaporated, the sand was mixed in 10 g sandy loam. Triplicate samples of 2 g soil for each fungicide treatment were allowed to stand with 0.6 mL toluene for 15 min. with 4 mL acetone-phosphate buffer at pH 5.5, and 5 mL of 5% sucrose solution or 2% starch for invertase or amylase determination. After mixing, samples were incubated at 28oC. Invertase and amylase activities were determined using the Prussian blue method for the reducing sugar. Values for the hydrolysis of sucrose or starch by soil enzymes were corrected for the reducing sugars produced on incubation of the soil without added substrate. Reducing sugars produced were estimated as glucose. The sand-fungicide mixture was incorporated with 15 g of soil for the dehydrogenase study. Dehydrogenase activity reflects oxidative activity of soil microflora. The activity of unbound soil dehydrogenase was determined by incubating the soil samples at 28oC in a system containing 2,3,5-triphenyltetrazolium chloride (TTC), and measuring the formation of 2,3,5-triphenyltetrazolium formazan (TTF), a reduction product of TTC, using a spectrophotometer at 470 nm. Untreated controls were also included.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: None of the fungicide treatments inhibited activities of soil enzymes important to soil fertility.

Treatment		Invertase		Amylase		Dehydrogenase	
		Period of incubation (Day)					
		1	2	1	3	4	7
		(mg reducing sugar/g soil)				(mg TTF/g)	
Control	0	13	17	3.6	3.2	1.3	2.4
Captafol	10	11*	19	2.9*	2.9	1.1	2.2
Chlorothalonil	10	10*	16	2.2*	2.7	1.2	2.4

* Significantly different from control ($p<0.05$) as determined by analysis of variance.

#092

STUDY DATA BASE: 280-1452-9105

CROP: Horticultural Crops

PEST: Fungal pathogens, nematodes and insect pests of horticultural crops

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TITLE: EFFECTS OF FUMIGANTS ON MICROBIAL ACTIVITIES IN SANDY SOIL

MATERIALS: D-D (mixture of 1,3-dichloropropene, 1,2-dichloropropene and related chlorinated C3 hydrocarbons, 100%), Telone (100% chlorinated C3 hydrocarbons, including 1,3-dichloropropene), Vorlex (20% methylisothiocyanate, 80% chlorinated C3 hydrocarbons including 1,3-dichloropropene) and nitrapyrin (98.6% purity)

METHODS: Required amounts of fumigants were injected with a 1 mL syringe directly into 20 g sandy loam and mixed on a tumbler. Nitrapyrin was dissolved in a 1 mL petroleum ether:acetone (1:1) mixture and incorporated with 0.5 g carrier sand. After the solvent had evaporated, the sand was mixed in 20 g sandy loam to yield an application rate of 10 ug/g. Denitrification activity reflects gaseous nitrogen loss from NO3--N in soil. Each sample was brought to 60% moisture-holding capacity by addition of KNO3 solution to give 500 ppm NO3--N. The activity of soil denitrification was determined by measuring formation of N2O using a gas-chromatograph equipped with dualthermal conductivity detectors and Porapak Q columns. Microbial decomposition of organic sulfur in soil makes it available for plants. The level of sulfur oxidation was determined turbidimetrically in the soil extract at 429 nm for sulfate. The biological formation of nitrite and nitrate from ammonium-N in soil is carried out by nitrifying microorganisms. Soil nitrification was determined by phenoldisulfonic acid method for nitrates at 430 nm and nitrites by the diazotization method with sulfanilic acid, naphthylamine hydrochloride and sodium acetate buffer at 525 nm. Untreated controls were included with all tests. All results are expressed on an oven-dry basis and are means of triplicate determinations.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Fumigants stimulated denitrification of soil microbes after 2 weeks with treatment of D-D and for 2 weeks with Vorlex. No fumigant effect was observed in S-oxidation and nitrification.

Treatment	Rate (ug/g)	Denitrification (ug NO/2/-/g)		S-oxidation (ug SO/4/=-S/g)	Nitrification** ug(NO/2/-+NO/3/-)-N/g	
		Period of incubation (wk)				
		1	2	4	2	3
Control	0	42	54	19	126	111
D-D	300	56	79*	21	122	62
Telone	60	46	51	19	131	64
Vorlex	80	72*	81*	17	121	121
Nitrapyrin	10	49	76	16	122	118

* Significantly different from control at 5% level.
** 1000 ug/g peptone-N added.

#093

STUDY DATA BASE: 280-1452-9111

CROP: Onion, various cvs.

PEST: Onion maggot (OM), *Delia antiqua* (Meigen)

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TITLE: INSECTICIDE RESISTANCE IN ONION MAGGOT FROM ONTARIO (1991)

MATERIALS: Technical (>95% purity) chlorpyrifos, fonofos, cypermethrin

METHODS: OM larvae were collected from 8 onion fields in Ontario and reared to adults. Direct contact bioassays were done using a Potter spray tower. A range of concentrations was chosen to cause 0-100% mortality. Two replicates of 10 adults (24-48h) were sprayed at each concentration with 5 ml insecticide, plus a solvent CONTROL (19:1 acetone:olive oil). Mortality was assessed after 18h. The LD50's were estimated and resistance levels were determined relative to a susceptible OM strain reared at the London Research Centre.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: Resistance levels to chlorpyrifos and fonofos in OM populations tested in Ontario were low to moderate. With the exception of the Thedford Marsh where resistance levels have increased slightly, similar levels have been observed in Ontario for several years. Further increases in resistance to fonofos and chlorpyrifos could result in decreased control of 1st generation OM larvae. Two of three tested OM populations had not developed resistance to cypermethrin.

Collection	Resistance level to indicated insecticide		
Location	chlorpyrifos	fonofos	cypermethrin
Holland Marsh 1	8	9	-
Holland Marsh 2	7	12	5
Keswick Marsh 1	7	-	-
Keswick Marsh 2	9	1	-
Keswick Marsh 3	2	10	-
Cookstown Marsh	8	14	1
Thedford Marsh 1	5	4	1
Thedford Marsh 2	8	10	-

#094

STUDY DATA BASE: 402-1461-9093

CROP: Apple

PEST: Codling moth, *Cydia pomonella* L.

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TITLE: PHEROMONE-MEDIATED MATING DISRUPTION CONTROLS CODLING MOTH IN ORGANIC APPLES

MATERIALS: Polyethylene "Shin-etsu Rope" dispensers (171 mg ai/dispenser) at 1000 dispensers/ha (ai = E,E 8-10 dodecadien-1-ol, dodecanol and tetradecanol in a 7:4:1 blend)

METHODS: Six apple orchards, two with a conventional history and four with an organic history consisting of mixed Red and Golden Delicious, MacIntosh and Spartan blocks were treated with pheromone during the week of May 1-4 before the first codling moth had been caught in a pheromone trap. Pheromone dispensers were tied to branches in the upper third of the northeast side of the tree canopy. For comparison, 1 organic apple orchard was left untreated to serve as a control. Each of these orchards were part of a pheromone-disruption trial in 1990 and therefore, the history of codling moth was known. An additional conventional apple orchard with an unknown history was divided into 2 equal blocks. Half of the block was treated with pheromone and half was sprayed 3 times with Guthion to allow comparison between a conventional spray program and the pheromone treatment. PheroconR 1CP pheromone traps baited with 1 mg of Codlemone (E,E 8-10 dodecadien-1-ol) were placed in each orchard at a rate of 1/ha to monitor the activity of male codling moths throughout the season. Orchards were sampled during September and October as fruit maturity dictated. A minimum of 10 trees and maximum of 25 from the interior and perimeter rows were completely harvested in each orchard. All fruit were visually inspected for codling moth damage and the percentage of damage, including shallow and deep entries, and exit holes, was calculated. Location: Keremeos, British Columbia.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: 1 application of the Shin-etsu rope pheromone dispenser, applied at a rate of 1000/ha in early May, before any codling moth had flown, provided excellent season long control of codling moth damage compared to a paired insecticide-treated orchard in 1991. Damage levels in two conventional orchards treated with pheromone in 1991 were equal to or less than damage levels seen in 1990 using a GUTHION Program. Three of four organic orchards treated with pheromone for two consecutive years had significantly less damage in 1991 than in 1990. Damage in an untreated control orchard increased from 1990 to 1991 and all pheromone-treated orchards had significantly less damage than the untreated control.

HISTORY	YEAR	TREATMENT	ORCHARD AREA ha	SEASONAL MALE TRAP CATCHES	DAMAGE ESTIMATE Sample size	%
CONVENTL.*	1990	GUTHION**	4.0	176	5731	1.85 a***
	1991	PHEROMONE	4.0	4	6504	0.15 b
CONVENTL.	1990	GUTHION	2.0	144	4651	0.30 a
	1991	PHEROMONE	2.0	1	7156	0.17 a
ORGANIC	1990	PHEROMONE	2.5	36	2898	0.21 b
	1991	PHEROMONE	2.5	1	1406	1.95 a
ORGANIC	1990	PHEROMONE	2.8	15	2828	0.78 a
	1991	PHEROMONE	2.8	0	7396	0.19 b
ORGANIC	1990	PHEROMONE	2.0	39	10192	0.75 a
	1991	PHEROMONE	2.0	0	9461	0.40 b
ORGANIC	1990	PHEROMONE	2.8	21	1449	0.55 a
	1991	PHEROMONE	2.8	1	2625	0.08 b
ORGANIC	1990	CONTROL	1.0	--	4357	46.66 b
	1991	CONTROL	1.0	--	1389	56.87 a
CONVENTL.****	1991	PHEROMONE	2.0	1	2601	0.27 a
		GUTHION	2.0	40	2697	0.22 a

* Conventl. = conventional insecticide-treated orchard.
** Pheromone applied once at a rate of 1000 dispensers/ha (171 gai/ha). Guthion applied at a rate of 0.7 kg ai/ha.
*** Paired percentages followed by different letters are significantly different at the 5% level using a 2 x 2 Contingency Table of damaged and undamaged fruit and a chi-square test.
**** One orchard was divided into two blocks and each half treated as indicated.

#095

STUDY DATA BASE: 348-1461-4802

CROP: Apple cv. McIntosh

PEST: Apple scab, *Venturia inaequalis* (Cke.) Wint.

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TITLE: EVALUATION OF NOVA 40 WP AND DITHANE 75 DG FOR THE CONTROL OF APPLE SCAB

MATERIALS: DITHANE 75 DG (mancozeb)
NOVA 40 WP (myclobutanil)

METHODS: A 1.1 ha block of McIntosh apple trees, planted in 1971, was used to evaluate NOVA 40 WP for apple scab control. Plots of 0.2 ha in size were replicated three times in a randomized complete block design trial. The NOVA was sprayed using an FMC Economist orchard sprayer operating at 2700 kPa and delivering 682 L/ha.

NOVA was sprayed at a rate of 340 g product/ha on April (1/2" green) and May 4 (tight cluster). Dithane 75 DG, ata arate of 3.1 kg product/ha, was mixed with the 340 g of NOVA/ha on May 23, June 3, 14, and 24. During this time, Mill's primary scab infection periods occurred on April 14-16, 19-23, 30, May 6, 9-10, 17-18, 26-27, June 3-4, 5-6, 11-12, and 15-16. On July 8, scab was assessed on all the leaves and fruit on 20 clusters, and all the leaves on 10 randomly selected shoots on each of two trees per plot. The incidence of scab was assessed on August 14 by examining all the leaves on 20 randomly selected shoots and 100 fruit on each of two trees per plot.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: The NOVA 40 WP and DITHANE 75 DG spray program provided significant season-long scab control on both the leaves and fruit as compared to the unsprayed check treatment. Cluster leaf scab represents early season scab infections while shoot leaf and fruit scab represent infection later in the season. Scab Control, particularly on the fruit, was not as good as expected based on previous results.

	PERCENT WITH SCAB				
	July 8			August 14	
Treatment	Cluster leaves	Shoot leaves	Fruit	Shoot leaves	Fruit
Check	87.7 a*	74.0 a	76.4 a	94.0 a	97.5 a
NOVA 40 WP and DITHANE 75 DG	6.5 b	1.7 b	2.0 b	3.4 b	5.7 b

* Means followed by the same letter in each column are not significantly different using Duncan's multiple range test (P=0.05). The data were analyzed following arcsin transformation.

#096

STUDY DATA BASE: 348-1461-4802

CROP: Apple cv. McIntosh

PEST: Apple scab, *Venturia inaequalis* (Cke.) Wint.

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TITLE: EVALUATION OF FUNGICIDE MIXES FOR THE CONTROL OF APPLE SCAB

MATERIALS: CAPTAN 80 WP (captan)
DITHANE 75 DG (mancozeb)
NOVA 40 WP (myclobutanil)
NUSTAR 20 DF (flusilazole)
MANZATE 200 DF (mancozeb)

METHODS: Apple scab control was evaluated in a twenty-year-old orchard of McIntosh trees on M.9 or M.26 rootstock. Treatments were assigned to three or four tree plots and replicated three times using a randomized complete block design. The materials were sprayed to runoff (8-10 L per plot) using a hydraulic handgun attached to a truck-mounted Rittenhouse plot sprayer operating at 2700 kPa. Unsprayed guard trees were left between plots to reduce spray drift. As well, a 2.4 x 3.7 m plastic tarp supported by two 3.0 m x 4 x 9 mm boards, was placed around plots being sprayed, when necessary, in a further attempt to reduce spray drift. Treatments 3, 4, 6 and 7 were sprayed at approximately 10 day intervals on April 23 (1/2" green), May 3 (tight cluster), 13 (bloom), 23, June 3, 13, and 24. Treatments 5 and 8 were sprayed at 10 day intervals on April 23, May 3 and 13 followed by five sprays of CAPTAN 80 WP (125 g prod./100 L) on May 18, 28, June 4, 13 and 24. Treatment 2 was applied on a 5 to 11 day protectant schedule on April 18, 23, May 1, 9, 18, 28, June 4, 13, and 24. Mill's primary scab infection periods occurred on April 14-16, 19-23, 30, May 6, 9-10, 17-18, 26-27, June 3-4, 5-6, 11-12, 15-16. On July 3, all the leaves and fruit on 20 clusters and all the leaves on 10 randomly selected shoots, per plot, were examined to assess the incidence on scab. On August 21, scab was assessed on all the leaves of 20 randomly selected shoots and on 100 fruit per plot.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All sprayed treatments provided significant scab control on both the leaves and fruit, throughout the season, relative to the unsprayed check. All sprayed treatments provided equivalent season long scab protection to the fruit. The 7 spray programs using mixtures of NUSTAR or NOVA + captan or mancozeb (Treatments 3, 4, 6, 7) provided better control of scab on the shoot leaves than did captan alone. The prebloom spray programs using NUSTAR or NOVA + captan (Treatments 5 and 8) were no better than captan alone in protecting the shoot leaves from scab, as of July 3. The fungicide mixtures using NOVA or NUSTAR provided equivalent control of scab. No symptoms of phytotoxicity were observed in this trial.

		PERCENT WITH SCAB*				
	Rate of	July 3			August 21	
Treatment	product/ 100 L	Cluster leaves	Shoot leaves	Fruit	Shoot	Fruit
1/ Check		38.3 a*	72.0 a	57.1 a	79.9 a	90.0 a
2/ CAPTAN 80 WP	125.0 g	6.2 b	16.0 b	1.3 b	11.3 b	1.0 b
3/ NUSTAR 20 DF	3.3 g	1.5 bc	3.7 cd	2.0 b	1.6 d	1.0 b
+ MANZATE 200 DF	100.0 g					
4/ NUSTAR 20 DF	3.3 g	3.7 bc	5.5 cd	2.2 b	3.1 cd	2.0 b
+ CAPTAN 80 WP	62.5 g					
5/ NUSTAR 20 DF**	3.3 g	4.7 bc	10.3 bc	1.3 b	5.2 cd	2.7 b
+ CAPTAN 80 WP (to bloom)	62.5 g					
6/ NOVA 40 WP	7.5 g	1.5 bc	2.7 cd	1.1 b	3.6 cd	0.3 b
+ DITHANE 75 DG	100.0 g					
7/ NOVA 40 WP	7.5 g	0.0 c	1.2 d	0.0 b	1.4 d	0.7 b
+ CAPTAN 80 WP	62.5 g					
8/ NOVA 40 WP**	7.5 g	0.3 bc	9.7 bc	5.0 b	6.4 bc	2.0 b
+ CAPTAN 80 WP (to bloom)	62.5 g					

* Means followed by the same letter in each column are not significantly different using Duncan's multiple range test (P=0.05). The data were analyzed following arcsin transformation.

** Followed by CAPTAN 80 WP (125 g product/100 L) on May 18, 28, June 4, 13 and 24.

#097

STUDY DATA BASE: 348-1461-4802

CROP: Apple cv. McIntosh and Quinte

PEST: Apple scab, *Venturia inaequalis* (Cke.) Wint.,
Cedar apple rust, *Gymnosporangium juniperi-virginianae* (Schw.),
Frogeye leafspot, *Botryosphaeria obtusa* (Schw.) Shoemaker,
Quince rust, *Gymnosporangium clavipes* (Cke. and Pk.)

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TITLE: EVALUATION OF NUSTAR 20 DF AND MANZATE 200 DF FOR THE CONTROL OF APPLE DISEASES

MATERIALS: MANZATE 200 DF (mancozeb), NUSTAR 20 DF (flusilazole)

METHODS: A twenty four-year-old orchard of McIntosh and Quinte apple trees was used in this trial. The trees were on various semi-dwarf to standard sized rootstocks and were spaced at 6.1 x 3.7 m. Many trees had been previously removed from this orchard. The treatments were assigned to three or four row plots consisting of 9 to 31 trees. The trial was set up using a randomized complete block design replicated four times. The NUSTAR or MANZATE was sprayed using an FMC Economist orchard sprayer operating at 2700 kPa and delivering 933 L/ha. NUSTAR was applied at a rate of 200 g of product/ha on April 23 (1/2" green), May 4 (tight cluster), 13 (bloom) and 23. MANZATE 200 DF, at 6 kg product/ha, was sprayed on the same plots on May 31, June 11 and 20. Mill's primary scab infection periods occurred on April 14-16, 19-23, 30, May 6, 9-10, 17-18, 26-27, June 3-4, 5-6, 11-12, and 15-16. Wetting periods on April 30 and later would have served as rust infection periods. The incidence of scab was assessed on July 9 by examining all the leaves and fruit on 20 clusters, and all the leaves on 10 randomly selected shoots on two McIntosh trees per plot. Trees were selected near the centre of the unsprayed plots to avoid the effect of spray drift. On August 16, all the leaves on 20 randomly selected shoots and 100 fruit were checked for scab. Cedar apple rust and frogeye leaf spot were assessed by examining all the leaves on 10 randomly selected shoots per tree (cv. Quinte), checking two trees per plot on July 19. One hundred fruit from each of two Quinte trees per plot were checked for CAR and QR.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: The spray program consisting of NUSTAR 20 DF (4 sprays) and MANZATE 200 DF (3 sprays) provided significant scab control on both the leaves and fruit of the McIntosh trees compared to the unsprayed check treatment. On July 19, there was significantly less CAR on the leaves and fruit of the Quinte trees in the sprayed plots compared to the check plots. The spraytreatment reduced both the number of lesions per infected leaf and the percent of leaves infected with CAR. There was significantly less FLS in the Quinte plots sprayed with NUSTAR and MANZATE as compared to the unsprayed check plots. The percent leaves infected with FLS was reduced but the number of lesions per infected leaf was not affected by the spray treatment.

PERCENT WITH SCAB (MCINTOSH)

Treatment	July 9 Cluster leaves	July 9 Shoot leaves	July 9 Fruit	August 16 Shoot leaves	August 16 Fruit
Check	64.7 a*	46.1 a	50.0 a	59.7 a	77.8 a
NUSTAR 20 DF and MANZATE 200 DF	2.1 b	0.9 b	0.0 b	1.2 b	3.3 b

PERCENT WITH RUST**

Treatment	Shoot leaves with CAR	Fruit CAR	Fruit QR	% Shoot leaves with FLS**	Mean no. lesions per infected leaf** CAR	Mean no. lesions per infected leaf** FLS
Check	50.2 a*	9.3 a	9.5 a	23.1 a	14.9 a	1.9 a
NUSTAR 20 DF and MANZATE 200 DF	1.6 b	0.6 b	1.6 a	9.7 b	0.9 b	1.4 a

* Means followed by the same letter in each column are not significantly different using Duncan's multiple range test (P=0.05). The data were analyzed following arcsin transformation.

** Assessment from Quinte trees, July 19.

#098

STUDY DATA BASE: 348-1461-4802

CROP: Apple cv. McIntosh

PEST: Apple scab, *Venturia inaequalis* (Cke.) Wint.

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TITLE: THE EVALUATION OF FUNGICIDES FOR THE CONTROL OF APPLE SCAB

MATERIALS: CAPTAN 75 WDG (captan)
ORBIT 41.7 WP (propiconazole)

METHODS: An orchard of 20-year-old McIntosh and Delicious apple trees on M.106 rootstock was used in this trial. Treatments were applied to six tree plots, three trees each of McIntosh and Delicious, replicated four times using a randomized complete block design. Unsprayed guard trees were left between plots to reduce spray drift. The fungicides were sprayed to runoff (10-18 L/plot) using a hydraulic handgun attached to a Rittenhouse plot sprayer operating at 2700 kPa. CAPTAN was applied on April 18 (green tip), 23 (1/2" green), May 1 (tight cluster), 9, 18 (petal fall), 28, June 4, 13, and 24. Both rates of ORBIT were applied on April 23, May 3, and 13. The ORBIT treatments were followed by sprays of CAPTAN 75 WDG (133.3 g product/100 L) on May 18, 28, June 4, 13 and 24. During this time Mill's primary scab infection periods occurred on April 14-16, 19-23, 30, May 6, 9-10, 17-18, 26-27, June 3-4, 5-6, 11-12 and 15-16. The incidence of apple scab was assessed on the McIntosh trees in each plot. On June 6, all the leaves and fruit on 20 clusters and all the leaves on 10 randomly selected shoots, per plot, were examined for scab. Scab was assessed on August 21 by examining all the leaves on 20 randomly selected shoots and 100 fruit per plot.

On September 19, the length of ten randomly selected shoots per tree was measured, for both the Delicious and McIntosh cultivars, in each plot.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All sprayed treatments provided significant scab control relative to the unsprayed check treatment. CAPTAN provided significantly better protection from scab on the cluster leaves and fruit than did the lower rate of ORBIT. The low rate of ORBIT provided poorer fruit scab control than did the higher rate. This effect was significant at the 5% level at the August 21 assessment. No symptoms of phytotoxicity were observed in this study.

PERCENT WITH SCAB

Treatment	Rate of product/ 100 L	June 6 Cluster leaves	June 6 Shoot leaves	June 6 Fruit	August 21 Shoot leaves	August 21 Fruit
Check	-	48.9 a*	31.9 a	44.2 a	95.6 a	96.5 a
CAPTAN 75 WDG	133.3 g	0.0 c	9.7 b	0.0 c	13.6 b	0.5 c
ORBIT 41.7 WP	2.8 g**	4.6 b	9.7 b	8.4 b	15.6 b	12.0 b
ORBIT 41.7 WP	5.6 g**	2.2 bc	7.5 b	1.0 bc	14.8 b	2.8 c

* Means followed by the same letter in each column are not significantly different using Duncan's multiple range test (P=0.05). The data were analyzed following arcsin transformation.

** Treatment changed to CAPTAN 75 WDG (133.3 g prod./100 L) for the May 18, 28, June 4, 13 and 24 applications.

#099

STUDY DATA BASE: 402-1461-8605

CROP: Apple cv. McIntosh

PEST: Apple scab, *Venturia inaequalis* (Cke.) Wint.

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TITLE: EVALUATION OF FUNGICIDES FOR CONTROL OF APPLE SCAB, 1991

MATERIALS: CAPTAN 50WP (captan)
CAPTAN 75DF (captan)
CAPTAN 80WP (captan)
KUMULUS S 80 WDG (sulfur)
NOVA 40WP (myclobutanil)
ORBIT 41.7 WP (propiconazole)

METHODS: The apple scab trials were conducted at Creston, B.C. in a five-year-old McIntosh orchard leased by Agriculture Canada. The experimental design was a randomized complete block with five replicates. Each single tree replicate was separated by a barrier tree. The 9 treatments requiring fungicide application were applied until runoff with a handgun operated at 689 kPa. Six treatments followed a 7 day protectant schedule and were applied on May 2 (tight cluster), May 9 (pink), May 16 (full bloom), May 23 (petal fall), May 30 (first cover), June 6 (second cover), June 13 (third cover) and June 24 (fourth cover). Three treatments followed a post-infection schedule and were applied 63 hr, 95 hr, 91 hr and 84 hr after infection periods on May 9 (pink), May 22 (full bloom), June 1 (petal fall), and June 14 (first cover) respectively. There were seven infection periods from May to June 30. They occurred on May 5-6 (severe), May 7-8 (light), May 18-19 (severe), May 24-25 (moderate), May 28-29 (severe), June 11-12 (severe) and June 20-21 (light). Foliage scab was evaluated July 5 on 10 randomly selected shoots from each single tree replicate. Fruit scab was not evaluated because a severe winter freeze had killed the majority of apple fruit buds resulting in very few fruit.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Captan 75DF applied on a 7 day protectant schedule gave better control than Kumulus S alone or Nova or Orbit followed by Kumulus S. Nova tank mixed with Captan used as eradicants provided control as good as Captan applied every 7 days. The eradicant schedule provided a saving of two spray applications when compared to the protectant schedule.

Treatment	Rate of product per 100L	% Leaves Infected	Lesions per leaf
Protection Schedule (7-day interval)			
CAPTAN 50 WP	200g	6.3 cde*	1.7 bcde
CAPTAN 75 DF	133.5g	2.0 e	1.1 e
ORBIT 41.7 WP	2.8g	3.9 de	1.4 cde
NOVA 40 WP	11.3g (first two applications), and		
KUMULUS S +	200g (cover sprays)	9.3 bc	1.9 bc
ORBIT 41.7 WP	2.8g (first two applications), and		
KUMULUS S	200g (cover sprays)	11.9 b	1.7 bcd
KUMULUS S	200g	10.4 b	2.0 b
Eradicant schedule (63-95 h post-infection)			
NOVA 40 WP	11.3g	5.7 cde	1.6 bcde
ORBIT 41.7 WP	2.8g	7.6 bcd	1.4 de
NOVA 40 WP +	11.3g		
CAPTAN 80 WP	62.5g	3.3 de	1.6 bcde
CONTROL		43.6 a	3.3 a

* Treatment means in the same column followed by the same letter are not significantly different at P=<0.05 according to the Waller-Duncan K-ration test.

#100

ICAR: 91000658

CROP: Apple cv. Jersey Mac

PEST: Apple scab, *Venturia inaequalis* (Cke.) Wint.

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TITLE: EVALUATION OF STEROL INHIBITING FUNGICIDES AND APPLICATION TIMINGS FOR THE CONTROL OF APPLE SCAB

MATERIALS: NOVA 40 WP (myclobutanil)
NUSTAR 20 DF (flusilazole)
DITHANE 75 DG (mancozeb)
CAPTAN 80 WP (captan)
MANZATE 75 DF (mancozeb)
PHYGON XL 50 WP (dichlone)

METHODS: Trial was established in a eight year old plantation of Jersey Mac trees on EM7 rootstock, spaced 3.7m X 5.5m, using a R.C.B. design with two- tree plots and four replicates. Applications were made with a diaphram pump/ handgun system, operating at 1660 kPa, and were made on a spray to run-off basis. A full dilute rate of 3000L/ha was assumed and treatments mixes were diluted on this basis; the full rate of NOVA was reduced from 0.34 to 0.2 kg prod./ha using label recommendations on tree row volume adjustments. Infection periods were monitored and each of the treatments was timed with their occur- ence. INFECTION PERIODS: 22/04 (light, green tip), 30/04 (heavy, 0.25"green), 01/05 (heavy, 0.5"green), 06/05 (mod., tight cluster), 17/05 (heavy, late bloom), 26/05 (heavy, apples 6mm), 31/05 (heavy, apples 6-8mm), 12/06 (mod., apples 12-15mm), 15/06 (heavy, apples 15-18mm). TREATMENT DATES (hours from start of infection): TREATMENT 2 - PHYGON: 23/04 (29 hrs); DITHANE: 30/04 (8), 20/05 (prot.), 12/06 (prot.); MANZATE, 07/05 (22), 27/05 (24), 01/06 (prot.), 16/06 (prot./28.5); CAPTAN, 13/05 (prot.) - TREATMENT 3 - NOVA: 26/04 (78), 04/05 (92); NOVA+DITHANE: 20/05 (87), 29/05 (72), 14/06 (56) - TREATMENT 4 - 26/04 (78), 04/05 (92), 13/05 & 20/05 (prot.), 27/05 (24), 01/06 (prot.), 12/06 (prot.), 17/06 (prot./55). ASSESSMENTS: All leaves on 20 clusters and 20 terminals/plot were examined for primary scab lesions; 100 and 200 fruit/plot were examined for scab lesions, mid-season and at harvest respectively.

RESULTS: As presented in the table below.

CONCLUSIONS: All treatments controlled leaf and fruit scab. There were no significant differences between treatments in terms of control, but the programs used to obtain similar control were different. The standard (Treatment 2) had 9 "routine" treatments, NOVA was used as an eradicant (mixed with DITHANE from bloom), and the NUSTAR/CAPTAN mix was on an eradicant basis to bloom, then on a protectant basis (NUSTAR rate was half {protectant} of full label rate).

Treatment	Rate g AI/ha	% Fruit Scab * 24/07	% Fruit Scab * 15/08	% Terminal Leaf Scab - 24/07	%Cluster Leaf Scab - 24/07
1.Control	-	44.5a	61.6a	35.9a	28.4a
2.PHYGON;DITHANE; MANZATE;CAPTAN	875;4500; 4500;3000	2.8b	3.5b	0.6b	0.4b
3.NOVA; NOVA+DITHANE	80; 80+2250	2.8b	2.9b	0.9b	0.9b
4.NUSTAR+CAPTAN	20+1500	1.3b	1.9b	0.2b	0.2b

* Means in same column, followed by same letter not signif. diff.(P<.05, DMRT).

#101

STUDY DATA BASE: 402-1461-8605

CROP: Apple cv. Jonagold

PEST: Powdery mildew, *Podosphaera leucotricha* (E. & E.) Salm.

NAME AND AGENCY:
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Agriculture Canada, Research Station
Summerland, British Columbia V0H 1Z0
Tel. (604) 494-7711   Fax (604)494-0755

TITLE: DORMANT APPLICATION OF FUNGICIDES FOR POWDERY MILDEW CONTROL, 1991

MATERIALS: EASOUT 70 WP (thiophanate-methyl)
NOVA 40 WP (myclobutanil)
GUARDSMAN SURFACE TENSION REDUCER, TRITON XR

METHODS: The experiment was conducted at the Summerland Research Station on 11-year-old Jonagold trees. Twenty-seven trees in two rows were separated into 3 blocks of 9 random single tree replicates per block. The single tree replicates were separated from one another by an unsprayed tree on each side. The 9 treatments were applied until runoff with a handgun operated at 500kPa. The dormant treatments were applied once on Febuary 22, 1991 and the spring treatments were applied on May 3 (pink), May 16 (petal fall), May 31 (first cover), and June 13 (second cover). Secondary powdery mildew was evaluated on June 27, 1991 by randomly selecting 10 shoots on each single tree replicate and counting the number of leaves with mildew and the degree of mildew on each infected leaf. Twenty-five fruit per replicate were harvested on September 19. Each fruit was examined for net russetting caused by powdery mildew and fruit weight and shape (length/diameter) were taken.

RESULTS: Fruit shape or weight did not differ significantly from the control.The results on the degree of powdery mildew infection are summarized in the table below.

CONCLUSIONS: The spring applications of EASOUT and NOVA gave excellent control. Dormant application of NOVA was ineffective.

Treatment	Rate of product/100L	Timing	% of Powdery Mildew Leaves	Leaf Area	Fruit
Easout 70WP	50g	Dormant	32.7 ab*	4.9 ab	0
Easout 70WP	50g	Spring	4.7 bc	0.5 b	0
Nova 40WP	7.5g	Dormant	42.0 a	7.2 a	0
Nova 40WP	7.5g	Spring	0.7 c	0.1 b	0.01
Nova 40WP + Triton XR	7.5g 1.75%	Dormant	22.3 abc	2.9 ab	0
Nova 40WP + Guardsman	7.5g 1.75%	Dormant	20.7 abc	2.6 ab	0
Triton XR	1.75%	Dormant	20.7 abc	2.8 ab	0
Guardsman	1.75%	Dormant	26.0 abc	3.4 ab	0
Control	-	-	49.3 a	7.4 a	0.01

* Treatment means in the same column followed by the same letter are not significantly different at P=<0.05 according to the Waller-Duncan K-ration T test.

#102

STUDY DATA BASE:

CROP: Strawberry cv. Kent

PEST: Gray mold, *Botryis cinerea* Pers.

NAME AND AGENCY:
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TITLE: EVALUATION OF VINCLOZOLIN FOR GRAY MOLD CONTROL IN STRAWBERRIES

MATERIALS: RONILAN 50 DF (vinclozolin)
RONILAN 50 WP (vinclozolin)
ROVRAL 50 WP (iprodione)

METHODS: Th e trial was conducted on a three year old established planting of Kent strawberries in the Aylmer, Ontario area. Treatments were arranged in a randomized complete block design with four replicates. Plots were 5 m in length and three rows wide, with 1.2 m spacing between rows. Treatments were applied with a CO2 powered handboom sprayer with 6 nozzles (11003) with 0.5 m spacing. A water volume of 200 L/ha and pressure of 275 KPa was used. reatments were made on May 21/91 (25% flower bloom, 18C,72%RH), May 28/91 (0.5 cm fruit size, 20C,92%RH), and May 31/91, (1.0 cm fruit size, 22C,88%RH). The number of fruit infected with gray mold were counted in a 1.0 m section of the centre row of each plot on June 21. Data were analysed using an analysis of variance procedure and Duncan's multiple range test at the 0.05 level of significance.

RESULTS: As presented in the table below.

CONCLUSIONS: All fungicide treatments significantly reduced the number of fruit infected with Botrytis cinerea pers. Efficacy of fungicides did not differ for product, formulation or rate of application.

TREATMENT	RATE (g AI/ha)	Infected Fruit/m row
CONTROL		19.5 B*
RONILAN 50 WP	500	6.5 A
RONILAN 50 DF	500	7.2 A
RONILAN 50 DF	750	3.0 A
RONILAN 50 DF	1000	6.2 A
ROVRAL 50 WP	1000	3.7 A

* Means followed by the same letter are not significant (P<0.05, Duncan's multiple range test).

#103

STUDY DATA BASE:

CROP: Strawberry cv. Veestar

PEST: Gray mold, *Botrytis cinerea* Pers.

NAME AND AGENCY:
VAUGHN, F.C. and BARTON, W.
Vaughn Agriculture Research Services Ltd., 96 Inverness Drive,
Cambridge, Ontario, N1S 3P3
Tel. 519-740-8739 Fax 519-621-0198

TITLE: EVALUATION OF RONILAN FOR CONTROL OF GRAY MOLD IN STRAWBERRIES, 1991

MATERIALS: RONILAN 50 WP (vinclozolin)
RONILAN 50 DF (vinclozolin)
ROVRAL 50 WP (iprodione)

METHODS: The mature field of strawberries was located on Highway #7 north of Breslau, Ontario. Individual plot sizes were 3 x 8 m. There were two rows of strawberries approximately 1 m apart in each plot. The plot was quite weedy and required weed trimming to facilitate spraying. Applications were made with a 3 m hand held CO2-pressurized boom equipped with six TJ 8002 nozzles. Nozzles were flat fan and spaced at 50 cm. The volume was 200 L/ha and pressure was set at 206 kPa. Treatments were applied on green to ripe berries (June 6) and again on ripening to ripe berries (June 13). Two applications were made in total. Percent disease was calculated by counting the number of diseased berries in 100 randomly picked berries per plot.

RESULTS: As presented in the table below.

CONCLUSIONS: There was no significant difference between the five treatments or the three rates of RONILAN 50 DF. There was however a significant difference between the mean percent disease in the control versus the treatments. All treatments decreased the percent disease present on the berries significantly compared to the control. No crop phytotoxicity was observed.

Treatment June 6, 13	Rate Kg/ha	Mean Percent Diseased Berries June 19
Control	-	18.0 B*
RONILAN 50 DF	0.50	7.0 A
RONILAN 50 WP	0.50	9.0 A
RONILAN 50 DF	0.75	11.0 A
RONILAN 50 DF	1.00	4.3 A
ROVRAL 50 WP	1.00	5.3 A

* Means followed by the same letter not significantly different (P=0.05, Duncan's multiple range test).

#104

CROP: Canola cv. Legend

PEST: Blackleg, *Phoma lingam*

NAME AND AGENCY;
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Tel. (204) 776-2087, Fax (202) 776-2250

TITLE: BLACKLEG CONTROL IN CANOLA WITH SEED TREATMENTS

MATERIALS: EXP 80362A, EXP 80287A, EXP 80363A, EXP 80364A, EXP 80365A,
EXP 80290A, EXP-80366A, EXP-80367A
VITAVAX RS (carbathiin, thiram, lindane)
PREMIERE (thiram, TBZ, lindane)
ROVRAL ST (iprodione, lindane)

METHODS: The plots were established at Minto, Manitoba on a field which was severely infected with blackleg in 1990. The seeding date was May 17; emergence started on May 23. The plots were 2 x 7.5 m, with 4 replicates in a randomized complete block design. The row spacing was 15 cm. Pre-treated seed was sown at a seeding rate of 5 kg/ha. Phosphate was applied with the seed at a rate of 20 kg/ha. Weeds were controlled with spring applied ethalfluralin, and clopyralid on June 10. Insects were controlled with in-furrow granular carbofuran, and foliar applications of carbofuran on May 30 and deltamethrin on June 3. Seedling emergence was determined by counting 10 m of row - 2 rows x 5m - on 4, 7 and 11 days after emergence. The plots were harvested on August 28. The data were analyzed with Duncan's MRT at a 5% confidence interval.

RESULTS: Results are summarized in the following table.

CONCLUSIONS: All of the treatments tended to increase both seedling emergence and yield over that of the untreated check.

Treatment	Form.	Rate g ai/kg seed	#pl/10m 4 DAE	#pl/10m 7 DAE	#pl/10m 11 DAE	yield kg/ha
Untr. check			47 bc*	47 e	32 e	836c
EXP 80362A	FS	17	83 ab	77 abc	78 ab	1277ab
EXP 80287A	FS	18	52 abc	53 cde	48 cde	1116abc
EXP 80363A	FS	19	65 abc	82 a	57 a-e	915bc
EXP 80364A	FS	20	53 abc	49 de	41 de	955abc
EXP 80365A	FS	19	86 a	74 a-d	72 abc	1142abc
EXP 80290A	FS	20	64 abc	62 a-e	67 a-d	1150abc
EXP 80366A	FS	21	87 a	80 ab	81 a	1337a
EXP 80367A	FS	22	70 abc	48 de	52 b-e	1156abc
Vitavax RS	FS	18.3	61 abc	63 a-e	81 a	1036abc
Premiere	FS	18.5	63 abc	54 b-e	61 a-d	1356a
Rovral ST	FS	20	40 c	50 de	41 de	1122abc

* Means followed by the same letter do not differ significantly (Duncan's multiple range test, P = 0.05).

#105

STUDY DATA BASE: 206003

CROP: Carrots cv. Chancellor, XPH 3507, Cellobunch, Six Pak

PEST: Cavity spot, *Pythium* spp.

NAME AND AGENCY:
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Tel. (416) 775-3783 Fax (416) 775-4546

TITLE: CULTIVAR EVALUATION OF CAVITY SPOT DEVELOPMENT IN STORAGE

METHOD: The trial was conducted in naturally infested soil at the Muck Research Station. The four cultivars were seeded on two seeding dates, June 7 and July 9, 1990, at 55 cm row spacing, three rows per replicate and arranged in a randomized complete block design with four replicates . On November 19, 1990 the treatments were harvested and placed in a Filacel cooler where the temperature was held at 1 degree C +/- 1 degree and relative humidity at 90% +/- 2%. Cavity spot severity was rated on December 21, 1990 based on the vertical width of the largest lesion. The scale was 0 = no lesions, 1 = < 1 mm, 2 = 1-2 mm, 3 = 2-5 mm, 4 = 5-10 mm and 5 = > 10 mm. Disease severity was calculated as: sum of (number of carrots/ class x value of class) x 100 total number of carrots x 5. After the initial rating, the carrots were placed back into storage and were evaluated again on April 17, 1991.

RESULTS: As presented in the tables below.

CONCLUSIONS: In 1990, delaying seeding for one month had no effect on the severity of cavity spot in storage (Table 1). On December 21, 1990, there was no difference in cavity spot severity among cultivars. By April 17, 1991, cavity spot was significantly higher in cv. XPH 3507 than in cv. Six Pak. Cultivars Chancellor and Cellobunch seeded in June also had significantly less cavity spot than cv. XPH 3507. Seeding date did not significantly affect cavity spot within a cultivar. The severity of cavity spot increased in storage from December to April (Table 2). Disease severity increased the most in susceptible cv. XPH 3507 and least in tolerant cv. Six Pak. Cavity spot severity of cv. XPH 3507 in December was equivalent to that of cv. Six Pak in April.

Table 1. Effect of seeding date on cavity spot development on several carrot cultivars.

Cultivar	Seeding Date	Disease Severity (%) December 21/90	Disease Severity (%) April 17/91
Chancellor	June 7/90	36.0 a *	43.9 b
	July 9/90	35.3 a	49.4ab
XPH 3507	June 7/90	39.4 a	54.1a
	July 9/90	34.8 a	55.9a
Cellobunch	June 7/90	33.1 a	45.5b
	July 9/90	35.4 a	49.6ab
Six Pak	June 7/90	31.6 a	42.7b
	July 9/90	31.9 a	43.3b

* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Protected LSD Test. LSD Table 1 = 8.262.

Table 2. Cultivar effect on cavity spot development in storage.

Cultivar	Evaluation Date	Disease Severity (%)
Chancellor	December 21/90	35.6 a *
	April 17/91	46.6 c
XPH 3507	December 21/90	37.2 ab
	April 17/91	55.0 d
Cellobunch	December 21/90	34.2 a
	April 17/91	47.6 c
Six Pak	December 21/90	31.6 a
	April 17/91	42.7 bc

* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Protected LSD Test. LSD Table 2 = 5.6229

#106

STUDY DATA BASE: 206003

CROP: Carrots cv. SR-481

PEST: Cavity spot, *Pythium* spp.

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Tel. 416-775-3783 Fax 416-775-4546

TITLE: EVALUATION OF RIDOMIL DRENCH AND GROWING MEDIA FOR THE CONTROL OF CAVITY

SPOT OF CARROTS

MATERIALS: RIDOMIL MZ (metalaxyl), Pro-Mix BX, Cavity Spot infested soil.

METHODS: Carrots were seeded in pots (10 seeds per pot) containing naturally infested muck soil or Pro-Mix BX on March 7, 1991. Each treatment was replicated 5 times with three treatment dates, for a total of 15 pots per treatment. RIDOMIL MZ drenches were applied 4 weeks after seeding at the rate of 150 ml of solution per pot. Five pots from each treatment were harvested on March 28. Carrots were washed, measured and plated on Mircetich (Pythium selective) media. On May 13, treatments were evaluated for cavity spot and weighed. The final 5 pots per treatment were harvested, weighed and rated for cavity spot on July 5.

RESULTS: As presented in the table below.

CONCLUSION: Initial carrot growth was greatest in pasteurized muck soil and poorest in the raw muck soil. By the final harvest, carrots grown in Pro-Mix BX, a soilless mix, and pasteurized muck soil had the highest yields, compared to raw muck soil and muck soil that received a metalaxyl drench. Cavity spot symptoms and other rots developed on all carrots except those grown in Pro-Mix BX. Pro-Mix BX, rather than pasteurized muck soil is the best growing media for an uninfested check for studies on cavity spot of carrots.

Treatment	Rate g Product/ 1 L Water	March 28 Length (cm)	May 13 Weight (gram)	July 5 Weight (gram)	July 5 Percent Disease
Pro-Mix BX	-	5.18 ab *	45.6 a	147.0 a	0 a
Muck soil pasteurized	-	5.90 c	49.6 a	158.6 a	32.0 b
Muck soil	-	4.16 a	24.4 b	85.7 b	20.0 b
RIDOMIL MZ	4.0 g	4.76 bc	30.4 b	52.2 b	23.8 b

* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Protected LSD Test.

#107

STUDY DATA BASE: 206003

CROP: Carrot, cv. Caropak

PEST: Sclerotinia white mold, *Sclerotinia sclerotiorum* (Lib.) de Bary

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TITLE: EVALUATION OF VARIOUS FUNGICIDES FOR THE CONTROL OF SCLEROTINIA ON CARROTS IN STORAGE

MATERIALS: BOTRAN 75W (dichloran)
BENLATE 50 WP (benomyl)
BRAVO 40.4% (chlorothalanil)
ROVRAL 50 WP (iprodione)
JAVEX 6% (Sodium hypochlorite)

METHODS: On May 24, 1990 carrots were seeded in naturally-infested soil at the Muck Research Station. Field treatments were applied September 6, September 19, and October 1, 1990 using a solid cone spray nozzle at 65 p.s.i. and 350 L of water/ha. Plots were 2 rows wide, 5 m in length and replicated 4 times in a randomized block design. Approximately 10 kg of carrots from each plot were harvested on October 24, 1990 plus one extra 10 kg sample from each of the check plots for the Javex drench. Drench samples were washed and immersed in treatment solution for 5 seconds. All samples were placed in plastic containers and put in a filacell cooler where the temperature and humidity were kept at approximately 1.0 degree C and 90% respectively. On January 28 and April 11, 1991 the number of carrots with and without visible white mold were counted and percent disease and degree of disease were calculated.

RESULTS: As presented in the table below.

CONCLUSIONS: Fungicide applications in the field did not control Sclerotinia white mold in storage. The iprodione dip plus field applications, did provide the best overall control. The use of a Javex drench actually increased the degree of sclerotinia mold. No treatments were statistically different from the untreated check on the final evaluation date, April 11, 1991.

Control of Sclerotinia on Carrots in Storage - 1990-91.

Treatment	Field Appli. kg/ha	Post-Harvest Dip per L H/20	January 28 % Disease	January 28 Degree of Disease*	April 11 %	April 11 Degree of Disease
BOTRAN drench	3.3	1.67 g	9.25 abc**	4.4 a	11.90 ab	4.0 ab
BENLATE	0.75	-	9.10 abc	4.2 a	18.70 bc	3.5 ab
BRAVO	0.60 L	-	15.90 cd	3.7 a	22.50 c	3.3 ab
ROVRAL	1.0	-	12.50 bc	3.9 a	20.60 bc	3.3 ab
Javex drench	-	1.0 ml	22.40 d	3.2 a	35.18 d	2.3 b
ROVRAL drench	1.0	1.0 g	3.75 a	4.2 a	5.30 a	4.3 a
BOTRAN	3.3	-	12.60 bc	3.4 a	22.22 c	3.0 b
Check	-	-	7.00 ab	4.1 a	9.00 a	3.5 ab

* Degree of Disease - 1.0 = Severe (Liquified), 3.7 = Moderate 5.0 = No Disease.

** Numbers in a column followed by the same letter are not significantly different at the 0.05% level protected LSD.

#108

STUDY DATA BASE: 61006537

CROP: Field corn, Pioneer 3790, 3737; Funks G4106, G4148

PEST: Fusarium ear rot, *F. graminearum*, *F. moniliforme*, *F. subglutinans*

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TITLE: SOIL OR SEED -APPLIED SE, CR AND CU FOR EAR ROT CONTROL IN CORN

MATERIALS: Sodium selenite, Glucose tolerance factor chromium yeast extract

220, Chromium yeast extract 2000, copper sulfate.

METHODS: The crop was planted using a cone planter at 64,000 seeds/ha in 0.76 m row spacings. Plots were single rows 4 m in length and thinned to plants/plot. The experiment was designed as a 4 X 5 level factorial, with 4 corn hybrids and 5 soil treatments as main effects. The yeast extracts were applied as seed treatments. Lots of 500 seeds were treated with 1.25 ml of a solution made of 40 g yeast extract per 50 ml water. CANPLUS 411 at 0.06 ml/50ml was added as a wetting agent. Seeds were tumbled until dry. Copper sulfate and sodium selenite were applied in a 15 cm band over the row in 230 L/ha water shortly after planting using an Oxford precision sprayer fitted with a single nozzle (type). The number of plants emerged were counted for each plot. Individual ears were inoculated with a 1 ml suspension of a cocktail of the 3 Fusarium spp. at 10\6 spores/ml each. Ten ears per plot were inoculated with the silk channel method one week after silking for each ear and ten were inoculated using simulated bird damage (the upper surface of ten ears were damaged with a 3-pronged rake exposing and injuring kernels 3 wks after silking). An overhead mist system kept foliage wet for 4 wks after inoculation. Plots were harvested on 15 Sept and individual ears were scored for severity of ear rot (1 - Nil, 2 - trace, 3 - 5% of ear covered, 4 - 5 to 15%, 5 - 15-25%, 6 - 25-50%, and 7 - 50-100%).

RESULTS: There were no interactions between corn hybrid and treatment. Main effects are summarized in Table 1.

CONCLUSIONS: While there were significant differences in tolerance of the corn hybrids to infection by Fusarium spp., none of the treatments with any of the materials containing selenium, chromium or copper had a noticeable effect on tolerance to Fusarium ear rot. None of the treatments visibly affected emergence or plant growth.

Table 1. Effect of Se, Cu, and Cr on tolerance of corn ears to Fusarium sp.

Main effects	Plant Height cm (4 lf stage)	Plant Stand/plot (4 lf stage)	Ear rot rating (1-7) Silk Chan. Method	Sim. Bird Damage
Hybrid				
PIONEER 3790	17.5	27.7	3.56	4.23
PIONEER 3737	16.9	27.6	5.07	5.17
FUNKS G4106	15.0	24.4	3.94	4.28
FUNKS G4148	19.0	27.7	4.33	4.83
LSD (P=0.05)	1.7	3.2	0.73	0.44
Treatment				
CONTROL	16.6	25.7	4.22	4.71
GTF CHROMIUM YEAST 220	17.0	27.3	4.33	4.52
CHROMIUM YEAST 2000	17.8	27.6	4.40	4.48
SODIUM SELENITE 6 g/ha	17.3	26.4	3.80	4.74
COPPER SULFATE 200 g/ha	17.0	27.3	4.38	4.68
LSD (P=0.05)	1.9	3.6	0.82	0.49
CV %	13.6	16.0	23.5	12.7

#109

STUDY DATA BASE: 206003

CROP: Lettuce, cv. Ithaca

PEST: Lettuce drop, *Sclerotinia sclerotiorum* (Lib.) de Bary and *Sclerotinia minor* Jagger

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TITLE: EFFICACY OF FUNGICIDES FOR THE CONTROL OF SCLEROTINIA DROP OF LETTUCE

MATERIALS: DITHANE M-22 (maneb 80%)
DITHANE M-45 (mancozeb 80%)
ROVRAL (iprodione 50%)

METHODS: The lettuce was seeded in Plastomer trays in the greenhouse on April 12, 1991. Lettuce plants were transplanted into naturally infested organic soil at the Muck Research Station on May 16. A randomized complete block arrangement with 4 blocks per treatment was used. Each replicate consisted of 8 rows, 5 m in length. The ROVRAL was applied at 1.125 kg/ha on June 1 and 14. The DITHANE M-22 and DITHANE M-45 was applied at 2.25 kg/ha on June 1, 14 and 21. The number of heads infected with Sclerotinia was assessed at harvest. 25 heads per treatment were harvested on July 2.

RESULTS: As presented in the table below.

CONCLUSIONS: The level of Sclerotinia infection was not high enough to adequately assess the efficacy of these fungicides. All fungicides increased the percentage of marketable heads that were harvested.

Harvest Date	Treatments	Rate kg/ha	Percent Marketable	Percent Sclerotinia
July 2	Check		71 a *	1a
	DITHANE M-22	2.25	88 a	2a
	ROVRAL	1.12	84 a	1a
	DITHANE M-45	2.25	88 a	0a

* Numbers in a column followed by the same letter are not significantly different at the P = 0.05 level, Protected LSD Test.

#110

CROP: Monarda, cv. Morden-3

PEST: Powdery mildew, *Erysiphe cichoracearum* DC.: Merat

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TITLE: EFFICACY OF TWO FUNGICIDES AGAINST POWDERY MILDEW ON MONARDA, 1991

MATERIALS: MICRO-NIASUL W 92% WP (sulphur)
MICROTHIOL SPECIAL 80% WP (sulphur)

METHODS: The trial was conducted in an experimental plot of monarda (Monarda fistulosa L.) at the ASCHRC, Brooks. The rows were spaced 1.0 m apart and the spacing between plants within rows was 0.5 m. The plot had been established from transplants in 1988. Each fungicide treatment (see Table 1) was applied to three 20 m^2 subplots, each containing ca. 25 plants. A similar set of subplots was sprayed with tapwater as a control. The treatments were arranged in a randomized complete block design. The sprays were applied with a CO_2-propelled, hand-held boom sprayer equipped with one Tee Jet 8001 nozzle. Three passes were made down each row in order to direct the spray onto each side of the row as well as on top. Good penetration into the plant canopy was achieved using this method. The plants were ca. 30 cm tall on June 13 when the first sprays were applied. The equivalent of 200 L/ha of spray mixture was applied to each subplot using a boom pressure of 250 kPa. Powdery mildew had just begun to appear on the lower leaves of the plants at the time of spraying. Only one rate of each fungicide was used, but the timing of application was varied (see Table 1). From July 22 to 24, visual ratings of mildew severity were made by collecting 25 stems from each subplot and counting the number of leaves with mildew symptoms per stem. These counts were converted to a percentage of the total number of leaves per stem. The data were arcsin-transformed and subjected to analysis of variance (ANOVA).

RESULTS: As presented in Table 1 below.

CONCLUSIONS: Both MICRO-NIASUL and MICROTHIOL provided significant control of powdery mildew relative to the unsprayed control. A two-application regime was more effective than single sprays regardless of when they were scheduled. MICRO-NIASUL and MICROTHIOL were not significantly different in efficacy.

Table 1. Incidence of powdery mildew on the leaves of monarda plants treated with two fungicides.

Treatment	Spray schedule	Rate per ha per application	Mildew incidence* (%)
MICROTHIOL	June 13	4.5 kg	62.6 b
MICROTHIOL	June 13 + July 3	4.5 kg	25.2a
MICRO-NIASUL	June 13	4.0 kg	67.5 b
MICRO-NIASUL	June 13 + July 3	4.0 kg	37.4a
MICRO-NIASUL	July 3	4.0 kg	67.5 b
Control		--	96.4 c

* Each value is the mean of three replications. Mildew incidence data were Arcsin transformed prior to ANOVA. Detransformed means are reported in this table. Numbers followed by the same small letter are not significantly different according to a Duncan's Multiple Range Test ($P<0.05$).

#111

STUDY DATA BASE: 206003

CROP: Onion Bingo

PEST: White rot, *Sclerotium cepivorum* Berk.

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TITLE: EVALUATION OF FUNGICIDES FOR THE CONTROL OF WHITE ROT OF ONIONS ON MUCK SOILS

MATERIALS: BOTRAN 75W (dichloran) 3.5 kg/ha product
BRAVO 500 (chlorothalonil) 3.2 L/ha product
FUNGINEX 190 EC (triforine) 3.0 L/ha product, fluazinam 0.56 kg ai/ha, flusilazole 35.0 g ai/ha

METHODS: Plots were established on three farms with known histories of white rot in the Holland Marsh area and on a 12 m x 10 m plot artificially infested with white rot sclerotia (605 sclerotia/0.5 g soil) at the Muck Research Station (MRS). The farm plot sizes 11.76m/2. In the white rot plot at the M.R.S., the onions were planted with a v-belt seeder in 7 m rows spaced 42 cm apart. All treatments were replicated four times and arranged in a randomized complete block design. Treatments used in the fields off station were: untreated check, BOTRAN drench, BRAVO drench, fluazinam, flusilazole, FUNGINEX and rogueing. Treatments in the M.R.S. plot were fluazinam, flusilazole and check. Soil samples were taken with a tube soil sampler from each treatment and replicate before application of fungicides. The wet sieving technique as described by P. Oudemans, 1984, was used to count the number of sclerotia in each sample. Fungicides were applied with a back pack sprayer directed at the base of the plant on June 26, July 16 and August 7. After first application of fungicides, the plots were visited weekly and infected plants were removed from rogueing treatments. The onions were pulled, counted and rated for white rot August 14 from Site 1, August 21 from Site 2, August 22 from Site 3 and September 20 from M.R.S. A second set of soil samples was taken from plots after the onions were pulled. These samples were also counted for the number of sclerotia.

RESULTS: As presented in the table below.

CONCLUSIONS: The presence of sclerotia in soil is not a good indication of the amount of white rot that will develop in a season. When sclerotia were found in a soil sample, white rot always developed. However, when no sclerotia were found, white rot developed in 0-75% of the plots. Due to a very hot, dry summer, disease incidence was low throughout the plots and there were no significant differences found between the plots treated with fungicides and the untreated check and rogueing treatments. The timing of the fungicide applications should be studied further.

Treatment	Rate ai/ha	S I T E 1 Sclerotia/g Spring	Fall	% Onion Infection	S I T E 2 Sclerotia/g Spring	Fall	% Onion Infection
Check	-	0	0	1.72 a *	0	0	0 a
Rogueing	-	0	0	0.60 a	0	0	0.62 a
BRAVO Drench	1.6 kg	0	0	1.72 a	0	0	1.47 a
BOTRAN Drench	2.6 kg	0	0	1.10 a	0	0	0.65 a
fluazinam	0.6 kg	0	0	1.30 a	0	0	0.40 a
flusilazole	35.0 g	0	0	0.87 a	0	0	0 a
FUNGINEX	0.6 kg	0	0	0.90 a	0	0	0.42 a
		S I T E 3			M.R.S. S I T E		
Check	-	0	0.05	1.84 a *			
Rogueing	-	0	0	1.29 a			
BRAVO Drench	1.6 kg	0.05	0	0.60 a			
BOTRAN Drench	2.6 kg	0	0.05	1.40 a			
fluazinam	0.6 kg	0	0	1.62 a	0.25	0.40	4.27 a
flusilazole	35.0 g	0	0	1.60 a	0.25	0.35	3.10 a
FUNGINEX	0.6 kg	0.1	0	0.50 a	0.25	0.35	4.15 a

* Numbers in a column followed by the same letter are not significantly different at the P = 0.05 level, Protected LSD Test.

#112

ICAR: 61006534

CROP: Peppers, cv Yolo Wonder

PEST: Bacterial spot, *Xanthomonas campestris* pv. *vesicatoria* (Doidge) Dye.

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TITLE: BACTERIAL DISEASE CONTROL IN PEPPERS

MATERIALS: NIAGARA FIXED COPPER (copper oxychloride)
TENN-COP 5E (copper salts of fatty and rosin acids)
ALIETTE 80WP (fosetyl-al), DITHANE M45 (mancozeb)

METHODS: Peppers were transplanted on May 29. Plots were single rows spaced 90 cm apart, 8 m in length, replicated four times in a randomized complete block design. Spray applications were made using a back pack airblast sprayer using 240 L/ha of water. Treatments were sprayed July 5, 17, 25, Aug. 1, 7, 15 and 24. Treatments were evaluated by rating the severity of bacterial spot affecting the foliage on Aug. 23.

CONCLUSIONS: Bacterial spot in peppers was significantly reduced with combinations of ALIETTE 80WP + NIAGARA FIXED COPPER, DITHANE M-45 + NIAGARA FIXED COPPER and by NIAGARA FIXED COPPER when used alone. The level of control, however, using a rating scale of 0-10, averaged only around 5, indicating a moderate to low level of effectiveness. The two remaining products tested, ALIETTE 80WP and a liquid copper formulation TENN-COP 5E were no better than the untreated check in controlling bacterial spot.

Treatment	Rate Product/ha	Bacterial Spot Foliar Rating (0-10)*
NIAGARA FIXED COPPER	4.0 kg	4.8AB**
TENN-COP 5E	8.4 L	3.0C
ALIETTE 80WP	5.0 kg	4.0BC
ALIETTE 80WP +	2.5 kg	4.0A
NIAGARA FIXED COPPER	4.0 kg	
NFC +	2.0 kg	5.3AB
DITHANE M-45	2.0 kg	
CHECK		3.3C

* Bacterial Spot Foliar Rating (0-10); 0, no control, foliage severely damaged; 10, complete control.

** Means followed by the same letter not significant (P<0.05, Duncan's multiple range test).

#113

ICAR: 86000421

CROP: Rutabaga cv. Laurentian

PEST: Powdery mildew, *Erysiphe cruciferarum*

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TITLE: POWDERY MILDEW CONTROL IN RUTABAGAS - 1

MATERIALS: BAYLETON 50 WP (triadimeton)
TILT 250 EC (propiconazole)

METHODS: Rutabagas were planted in a clay loam soil May 28 in the Crediton area. Rutabaga seeds were placed 8 cm apart and the plants were later thinned to 16 cm in 0.71 m rows. Treatments were assigned to plots 8 rows wide by 6 m long, replicated 4 times and arranged according to a randomized complete block design. On July 31, the trial was visually assessed for symptoms of powdery mildew. The treatments were applied July 31 with a CO_2 powered bicycle sprayer equipped with 8002 nozzles. Fungicides were sprayed in a 210 L/ha solution at 207 kPa. Treatment 3 received a second TILT application 21 days later. Rutabaga foliage was visually rated on August 21 and September 4, by randomly selecting 10 plants within each plot for powdery mildew symptoms. The top leaf surface, bottom leaf surface, and petiole were rated on a scale of 0 to 100, where 0 indicated a healthy plant and 100 indicated the foliage was completely covered with mycelium. The rutabagas were harvested September 18. The data was analyzed using an analysis of variance and Duncan's multiple range test at the 0.05 significance level.

RESULTS: As presented in the table below.

CONCLUSIONS: On the August 21 rating, 21 days after application, all treatments significally reduced powdery mildew infection compared to the untreated control. On the second assessment date, September 4, only the 2- TILT-application treatment provided season long control of powdery mildew.

TREATMENT	RATE g ai/ha	AUG. 21 (0-100) TOP	BOTTOM	STEM	SEPT. 4 (0-100) TOP	BOTTOM	STEM	MARKETABLE WEIGHT (t/ha)	ROOT DIAMETER (cm)
1. BAYLETON	125	8	6	5	23	24	22	61.6	11.0
2. TILT	100	10	11	4	29	31	24	52.6	10.9
3. TILT;TILT	100;100	10	8	4	2	6	3	62.6	11.5
4. CONTROL		34	43	39	61	79	86	59.4	11.1
LSD (0.05)		13	18	17	23	19	20	11.5	0.5
C.V.		52.9	65.2	78.8	63.5	50.0	63.1	12.2	2.8

#114

ICAR: 86000421

CROP: Rutabaga cv. Laurentian

PEST: Powdery mildew, *Erysiphe cruciferarum*

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TITLE: POWDERY MILDEW CONTROL IN RUTABAGAS - 2

MATERIALS: TILT 250 EC (propiconazole)

METHODS: Rutabagas were planted June 7 in a clay loam soil in the Exeter area. The seeding ratio was 8 cm apart, which were later thinned to 16 cm apart in 0.71 m rows. Treatments were assigned to plots 4 rows wide by 6 m long, replicated 4 times and arranged according to a randomized complete block design. On August 12, the trial was visually assessed for symptoms of powdery mildew. Treatments were applied August. 12 with a CO/2 powered bicycle sprayer equipped with 8002 nozzles. The fungicide treatments were sprayed on rutabagas at 210 L/ha and 207 kPa. Treatment 2 received a second fungicide application 21 days later. Plots were visually rated on September 3 and September 17, by randomly selecting 10 plants per plot and assessing them for powdery mildew symptoms. The top leaf surface, bottom leaf surface, and petiole were rated on a scale of 0 to 100, where 0 indicated no powdery mildew and 100 being completely covered with mycelium. The rutabagas were harvested September 24. The data was analyzed using an analysis of variance and Duncan's multiple range test at the 0.05 significance level.

RESULTS: As presented in the table below.

CONCLUSIONS: TILT provided reduced powdery mildew levels on the rutabaga foliage. The two applications of TILT gave season long control.

TREATMENT	RATE g ai/ha	SEPT. 17 (0-100) TOP	BOTTOM	STEM	MARKETABLE WEIGHT (t/ha)	ROOT DIAMETER (cm)
1. TILT	100	40	58	51	29.2	10.8
2. TILT;TILT	100;100	8	17	21	28.8	11.0
3. CONTROL		55	76	76	28.1	10.6
LSD (0.05)		14	15	16	10.8	1.1
C.V.		24.1	16.7	18.9	21.4	6.0

#115

ICAR: 61002036

CROP: Field Tomatoes, cv. HY-9478

PEST: Early blight, *Alternaria solani* (Ell. & Mart.) L.R. Jones & Grout
Anthracnose, *Colletotrichum coccodes* (Wallr.) S.J. Hughes
Bacterial Speck, *Pseudomonas syringae* pv. *tomato* (Okabe) Young, Dye & Wilkie

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TITLE: TOMATO DISEASE CONTROL USING CHLOROTHALONIL BASED FORMULATIONS

MATERIALS: BRAVO 500, ASC-66518 82.5 DFG, ASC-66825 50WP (chlorothalonil)

METHODS: Tomatoes were transplanted on May 14 in two row plots spaced 1.4m apart. Plots were 8m in length, replicated 4 times in a randomized complete block design. Spray applications were made with a back pack airblast sprayer at 240 L/ha of water. Fungicides were applied either following TOM-CAST on June 20, July 8, 23 and Aug. 18 or applied on a 10- day schedule on June 17, 27, July 7, 17, 27, Aug. 6 and 16. Foliar disease assessments were taken on Aug. 15 and Sept. 3 for Early blight control. Anthracnose and Bacterial Speck counts were taken at harvest on Aug. 28.

RESULTS: As presented in the table below.

CONCLUSIONS: BRAVO 500 and ASC-66518 82.5 DFG provided outstanding control of the foliar blights while ASC-66825 50WP was considerably less effective. Under low anthracnose pressures, all treatments significantly reduced this fruit disease. Somewhat surprising was the reduction of fruits infected with bacterial speck, when using any of the chlorothalonil based formulations.

Treatments	Rate kg AI/ha	Spray Program	Foliar Disease Ratings (0-10)* Aug. 15	Sept. 3	% Anthrac. Aug. 28	% B. Speck Aug.28
BRAVO 500	1.2	TOM-CAST***	8.0AB**	8.0A	2.3BCD	9.8B
BRAVO 500	1.5	TOM-CAST	8.0AB	7.4AB	2.5BC	4.8B
ASC-66518 82.5 DFG	1.5	TOM-CAST	8.0AB	7.9A	1.0CDE	7.0B
ASC-66518 82.5 DFG	2.0	TOM-CAST	8.6A	8.4A	1.3CDE	8.5B
ASC-66825 50WP	0.5	TOM-CAST	7.8AB	5.5CD	2.0BCD	9.0B
ASC-66825 50WP	1.0	TOM-CAST	8.0AB	5.9CD	1.0CDE	9.3B
BRAVO 500	1.2	10 DAY****	8.0AB	8.1A	0.0E	5.0B
BRAVO 500	1.5	10 DAY	8.0AB	8.6A	1.3CDE	8.3B
ASC-66518 82.5 DFG	1.5	10 DAY	8.5A	8.5A	0.0E	7.3B
ASC-66518 82.5 DFG	2.0	10 DAY	8.5A	8.6A	0.5DE	10.0B
ASC-66825 50WP	0.5	10 DAY	5.0C	4.8D	3.8B	9.0B
ASC-66825 50WP	1.0	10 DAY	7.0B	6.4BC	1.5CD	6.3B
Control			4.0C	3.0E	6.8A	16.0A

* Foliar Disease Ratings (0-10) - 0, no control, foliage severely damaged, 10, complete control
** Means followed by the same letter not significant ($P<0.05$, Duncan's multiple range test)
*** TOM-CAST DSV=20
**** 10 DAY INTERVAL

#116

ICAR: 61002036

CROP: Field Tomatoes, cv. HY-9478

PEST: Early blight, *Alternaria solani* (Ell. & Mart.) L.R. Jones & Grout
Anthracnose, *Colletotrichum coccodes* (Wallr.) S.J. Hughes
Bacterial speck, *Pseudomonas syringae* pv. *tomato* (Okabe) Young, Dye & Wilkie

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TITLE: REDUCTION OF PESTICIDES USING BIOLOGICAL CATALYSTS

MATERIALS: CATALYST (citric acid, 9-18-9, Agri-Kelp, Molasses)
BRAVO 500 (chlorothalonil)
DITHANE M-45 (80% mancozeb)
DYRENE 50WP (anilazine)

METHODS: Tomatoes were transplanted on May 14 in two row plots spaced 1.25 m apart. Plots were 8 m in length, replicated 4 times in a randomized complete block design. Spray applications were made with a back pack airblast sprayer at 240 L/ha of water. Fungicides were applied every 12 days. Dates of applications were June 17, 29, July 11 and 23. Foliar disease assessments were taken on Aug. 16 and Sept. 3 for early blight control. Anthracnose and bacterial speck counts were taken at harvest on Aug. 27.

RESULTS: As presented in the table below.

CONCLUSIONS: CASI (Christian Agriculture Stewardship Institute) has recommended that with the addition of their catalyst a grower could reduce the amount of fungicide used by 30-50%. In this trial the CATALYST made no improvements on the foliar disease ratings and would have been considered an additional expense. It is important to note, however, that by reducing any of the three tested fungicides, BRAVO 500, DITHANE M-45 and DYRENE 50WP by 50% there was only a slight decrease in efficacy. Apparently the recommended rates of these fungicides have been established high enough to deal with numerous variabilities when used in commercial field operations. In reference to the CASI claim using the September 3 visual ratings, there was indeed a numerical rating improvement with the addition of the CATALYST but these differences were not statistically significant.

Anthracnose was reduced in all treatments compared to the control but the CATALYST was the least effective. Some materials reduced the percentage of fruit infected with bacterial speck, but the level of control was often inconsistent across similar types of treatments and the degree of control was low. Treatment effects could not be detected in yields.

Treatments	Rate g AI/ha	Early Blight Ratings (0-10)* Aug. 16	Early Blight Ratings (0-10)* Sept. 3	% Anthracnose Aug. 27	% B. Speck Aug. 27
CATALYST***		3.0C**	2.2E	4.3B	15.0AB
BRAVO 500	1.4	9.0A	7.7A	1.5C	13.8ABC
BRAVO 500	0.7	8.5A	7.1ABC	1.3C	7.3C
BRAVO 500 + CATALYST	0.7	8.8A	7.4AB	0.3C	8.8BC
DITHANE M-45	2.6	9.0A	7.0ABC	2.0C	8.8BC
DITHANE M-45	1.3	8.0A	6.0CD	1.0C	12.0ABC
DITHANE M-45 + CATALYST	1.3	7.5AB	6.2BCD	2.3BC	10.3BC
DYRENE 50WP	1.5	8.0A	7.1ABC	1.0C	11.3BC
DYRENE 50WP	0.75	7.8AB	5.7D	1.0C	10.3BC
DYRENE 50WP + CATALYST	0.75	6.3B	6.2BCD	2.5BC	10.0BC
Control		2.5C	2.2E	7.5A	18.3A

* Early Blight Ratings (0-10) - 0, no control, foliage severely damaged, 10, complete control.
** Means followed by the same letter not significant (P<0.05, Duncan's multiple range test).
*** CATALYST - adjust pH to 5.5 using citric acid
- add 11.2 L product/ha 9-18-9
- 0.35 L product/ha Agri-Kelp
- 1.4 L product/ha Molasses

#117

ICAR: 61002036

CROP: Field Tomatoes, cv HY-9478

PEST: Early blight, *Alternaria solani* (Ell. & Mart.) L.R. Jones & Grout; Anthracnose, *Colletotrichum coccodes* (Wallr.) S.J. Highes.

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TITLE: TOMATO DISEASE CONTROL USING DITHANE FORMULATIONS

MATERIALS: DITHANE M-45 80WP, 75DG, (mancozeb)
RHC-387 (surfactant)
ASC-66518 82.5DFG (experimental)

METHODS: Tomatoes were transplanted on May 16 in two row plots spaced 1.4 m apart. Plots were 8 m in length, replicated 4 times in a randomized complete block design. Spray applications were made with a back pack airblast sprayer at 240 L/ha of water. Fungicides were applied on a 10 day schedule; June 18, 28, July 8, 18, 29 and Aug. 7. Foliar disease assessments were made on Aug. 16 and Sept. 3. Anthracnose counts were taken by randomly selecting 100 red fruits per plot on Aug. 30. Harvest was on Aug. 21.

RESULTS: As presented in the table below.

CONCLUSIONS: Based on the Sept.3 rating, ASC-66518 82.5 DFG provided the highest level of foliar disease control. DITHANE 75DG and DITHANE M-45 80WP were equally effective. DITHANE M-45 80WP showed improved control on the earlier Aug. 16 disease rating which was similar to ASC-666518 82.5 DFG. The surfactant RHC-387 did not improve disease control when added to either of the DITHANE formulations. All treatments reduced fruit anthracnose under a light disease situation. Tomato yields were not significantly different.

Treatments	Rate kg AI/ha	Foliar Disease Ratings (0-10)* Aug. 16	Foliar Disease Ratings (0-10)* Sept. 3	% Anthracnose Aug. 30
DITHANE 75DG	2.4	8.0B**	7.2B	0.0B
DITHANE 75DG +	2.4	8.0B	7.2B	0.0B
RHC-387	100.0 ml product			
DITHANE M-45 80WP	2.6	9.3A	7.5B	0.0B
DITHANE M-45 80WP	2.6	9.3A	7.0B	0.0B
RHC-387	100.0 ml product/ha			
ASC-66518 82.5 DFG	1.5	9.0AB	8.0A	0.0B
Control		4.3C	3.0C	6.8A

* Foliar Disease Ratings (0-10); 0, no control, foliage severely damaged; 10, complete control
** Means followed by the same letter not significant ($P<0.05$, Duncan's multiple range test).

#118

Field Tomatoes, cv. HY-9478

PEST: Early blight, *Alternaria solani* (Ell. & Mart.) L.R. Jones & Grout; Anthracnose, *Colletotrichum coccodes* (Wallr.) S.J. Hughes; Bacterial Speck, *Pseudomonas syringae* pv. tomato (Okabe) Young, Dye & Wilkie

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TITLE: TOMATO DISEASE CONTROL USING ANILAZINE

MATERIALS: DYRENE 50WP
DYRENE 480 (anilazine)
BOND
NUFILM P
TRITON
B-1956 (surfactants)
ASC-66518 82.5DFG (experimental)

METHODS: Tomatoes were transplanted on May 15 in two row plots spaced 1.4 m apart. Plots were 8 m in length, replicated 4 times in a randomized complete block design. The trial was repeated in two locations within the research plot area at RCAT, Location 1 and 2. Spray applications were made with a back pack airblast sprayer at 240 L/ha of water. Fungicides were applied every 10 days. Spray program 1 was conducted using DYRENE 50WP at 1.5 kg AI/ha for the first 2 applications followed by 4 applications of ASC-66518 82.5 DFG at 1.5 kg AI/ha. Spray program 2 was conducted alternating DYRENE 50WP and ASC-66518 82.5 DFG at 1.5 kg AI/ha commencing with DYRENE 50WP. Dates of applications were June 18, 28, July 8, 26 and Aug. 4. Foliar disease assessments were taken on Aug. 3, 15 Sept. 3 for early blight control. Anthracnose and bacterial speck counts were taken at harvest on Aug. 21.

RESULTS: As presented in the tables below.

CONCLUSIONS: The flowable DYRENE 480 provided higher numerical foliar disease control ratings than the wettable powder DYRENE 50WP at the equivalent 1.0 kg AI/ha rate and the higher 1.5 kg AI/ha rate, however the differences were not statistically significant. The addition of the surfactants did not improve disease control. ASC-66518 82.5 DFG either alone or in combination with DYRENE 50WP did not improve foliar disease ratings. None of the DYRENE formulations significantly reduced the level of Bacterial Speck found on tomato fruit. The incidence of fruit anthracnose was minor in both locations. Treatment effects were not detected in yield.

LOCATION 1

Treatments	Rate kg AI/ha	Foliar Disease Ratings (0-10)* Aug. 3	Sept. 3	% B. Speck Aug. 29	Yield T/ha
DYRENE 50WP	1.0	7.9A**	6.8BC	23.5AB	36.0ABC
DYRENE 50WP	1.5	8.1A	7.6AB	20.3AB	35.7ABC
DYRENE 480	1.0	8.5A	7.8AB	23.5AB	33.6BC
DYRENE 50WP +	1.0	7.9A	8.0A	24.5A	38.2ABC
BOND	.0625 % v/v				
DYRENE 50WP +	1.0	7.0AB	7.5AB	26.3A	36.5ABC
BOND	0.125 % v/v				
DYRENE 50WP +	1.0	8.6A	7.8AB	25.8A	43.8A
NUFILM P	0.35 L product/ha				
DYRENE 50WP +	1.0	7.1B	6.9ABC	18.8AB	37.9ABC
TRITON B-1956	.0625 % v/v				
PROGRAM 1***		8.3A	6.6BC	16.5AB	35.5ABC
PROGRAM 2***		8.8A	7.4ABC	17.0AB	38.3ABC
ASC-66518 82.5 DFG	1.5	8.1A	7.8AB	13.5B	41.0AB
Control		6.0B	6.2C	21.8AB	34.2BC

* Foliar Disease Ratings (0-10) - 0, no control, foliage severely damaged, 10, complete control.
** Means followed by the same letter not significant (P < 0.05, Duncan's multiple range test).
*** PROGRAM 1: DYRENE 50WP 1.5 kg AI/ha first 2 applications followed by ASC-66518 82.5 DFG 1.5 kg AI/ha.
*** PROGRAM 2: Alternating DYRENE 50WP and ASC-66518 82.5 DFG at 1.5 kg ai/ha.

LOCATION 2.

Treatments	Rate kg AI/ha	Foliar Disease Ratings (0-10)* Aug. 3	Sept. 3	% B. Speck Aug. 29	Yield T/ha
DYRENE 50WP	1.0	8.8A**	6.8B	20.3A	25.2A
DYRENE 50WP	1.5	8.8A	7.3AB	18.8A	24.8A
DYRENE 480	1.0	9.0A	7.8AB	21.0A	27.1A
DYRENE 50WP +	1.0	8.3AB	7.4AB	17.8A	34.4A
BOND	.0625 % v/v				
DYRENE 50WP +	1.0	9.3A	7.5AB	18.8A	31.8A
BOND	0.125 % v/v				
DYRENE 50WP +	1.0	8.8A	7.4AB	20.8A	27.4A
NUFILM P	0.35 L product/ha				
DYRENE 50WP +	1.0	8.3AB	6.9B	20.3A	18.5A
TRITON B-1956	.0625 % v/v				
PROGRAM 1***		8.8A	8.0A	19.3A	34.0A
PROGRAM 2***		8.5AB	8.0A	18.3A	21.4A
ASC-66518 82.5 DFG	1.5	8.8A	7.5AB	19.3A	21.2A
Control		7.3B	4.2C	25.3A	32.1A

* Foliar Disease Ratings (0-10) - 0, no control, foliage severely damaged, 10, complete control.
** Means followed by the same letter not significant (P < 0.05, Duncan's multiple range test).
*** PROGRAM 1: DYRENE 50WP 1.5 kg AI/ha first 2 applications followed by ASC-66518 82.5 DFG 1.5 kg AI/ha.
*** PROGRAM 2: Alternating DYRENE 50WP and ASC-66518 82.5 DFG at 1.5 kg AI/ha.

#119

STUDY DATA BASE: 303-1451-9002

CROP: Potatoes, cv. Norchip

PEST: *Alternaria solani* (Ell. & Martin) Sor.

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TITLE: EFFICACY OF CHEMICAL CONTROL OF POTATO EARLY BLIGHT - 1991

MATERIALS: Chlorothalonil (BRAVO 500, 40 F: 2.2 L/Ha)

METHODS: For each treatment, four replicate plots consisting of five rows (7.5 m in length, spaced 0.9 m apart) were established in a randomized complete block design. All five-row plots were separated by two buffer rows for tractor operations. Whole (35-55 mm), greensprouted, Elite 3 seed tubers were hand-planted 30 cm apart on 27 May and the recommended crop management practices were followed (fertilizer 17-17-17 at 800 Kg/Ha; herbicides- metribuzin 75 DF, 0.73 Kg/Ha; insecticides-endosulfan 400 EC, 1.5 L/Ha and deltamethrin 2.5 EC, 0.25 L/Ha; top desiccant-diquat 20SN, 2.25 L/Ha). Plant emergence counts on the center row of each five-row plot were made on June 29. To the foliage of plants in the two outer rows of each five-row plot, a sporangial suspension (pathogen, cultured on potato dextrose agar) of approx. 5 * 10**3 spores/ml was applied on 8, 14 and 21 August. Foliar disease incidence/severity determinations (0 = none, 1 = slight, 2 = moderate, 3=severe) for plants in the center row of each five-row plot were made throughout August and September. Fungicide applications (tractor-mounted sprayer modified to spray only the center three rows with three hollow-cone nozzles/row, 700 L/Ha volume, 860 KPa) were first made on July 25 and then every 10 days. Top dessicant was applied on September 19 and plots were harvested on 3 October.

RESULTS: All data was subjected to analysis of variance and mean separation tests (see table below). All plots had 100 % emergence. Warm and unusually dry weather was experienced during July and August, 1991.

CONCLUSIONS: Foliar damage due to early blight increased during the latter stages of the growing season and was unusually severe by mid-September. The use of chlorothalonil on a 10 day spray schedule significantly reduced the amount of early blight damage. However, yields were not affected probably as a result of the late season development of the disease.

EFFECTS OF FOLIAR FUNGICIDE TREATMENT ON POTATO EARLY BLIGHT DEVELOPMENT AND TUBER YIELDS - 1991.

	Foliar Disease Incidence (%) (Day/Month)			Yields (T/Ha)	
Treatment	29/8	09/9	16/9	55-85mm	Total
NO FUNGICIDE	0.7a*	1.8a	2.9a	14.5a	35.1a
CHLOROTHALONIL	0.3b	1.5b	2.0b	15.3a	35.8a

* Values in the same column follwed by different letters are significantly different at P=0.05.

#120

STUDY DATA BASE: 303-1451-9002

CROP: Potatoes, cv. Norchip

PEST: *Botrytis cinerea* Pers.

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TITLE: EFFICACY OF CHEMICAL CONTROL OF POTATO GRAY MOLD - 1991

MATERIALS: Chlorothalonil (BRAVO 500, 40 F: 2.2 L/Ha)

METHODS: For each treatment, four replicate plots consisting of five rows (7.5 m in length, spaced 0.9 m apart) were established in a randomized complete block design. All five-row plots were separated by two buffer rows for tractor operations. Whole (35-55 mm), greensprouted, Elite 3 seed tubers were hand-planted 30 cm apart on 27 May and the recommended crop management practices were followed (fertilizer 17-17-17 at 800 Kg/Ha; herbicides- metribuzin 75 DF, 0.73 Kg/Ha; insecticides-endosulfan 400 EC, 1.5 L/Ha and deltamethrin 2.5 EC, 0.25 L/Ha; top desiccant-diquat 20SN, 2.25 L/Ha). Plant emergence counts on the center row of each five-row plot were made on 29 June. Disease incidences were based on natural occurrence and development of the disease; plots were not artificially inoculated with the pathogen. Foliar disease incidence/severity determinations (0=none, 1=slight, 2=moderate, 3=severe) for plants in the center row of each five-row plot were made throughout August and September. Fungicide applications (tractor-mounted sprayer modified to spray only the center three rows with three hollow-cone nozzels/row, 700 L/Ha volume, 860 KPa) were first made on 25 July and then every 10 days. Top desiccant was applied on 19 September and plots were harvested on 3 October.

RESULTS: All data was subjected to analysis of variance and mean separation tests (see table below). All plots had 100% emergence. During July and August, warm and unusually dry weather conditions prevailed.

CONCLUSIONS: During August and September, the amount of foliar damage due to grey mold increased. Use of the fungicide chlorothalonil on a 10 day application schedule significantly reduced the amount of disease on 16 September when it was most severe in the non-treated plots. Yield differences were not found and tuber disorders due to grey mold were not evident at harvest.

EFFECTS OF FOLIAR FUNGICIDE TREATMENT ON POTATO GRAY MOLD DEVELOPMENT - 1991.

Foliar Disease Incidence (%)		(Day/Month)	
TREATMENT	29/8	09/9	16/9
NO FUNGICIDE	0.9a*	1.9a	2.8a
CHLOROTHALONIL	0.7a	1.1a	2.1b

* Values in the same column followed by different letters are significantly different at P=0.05.

#121

STUDY DATA BASE: 303-1451-9002

CROP: Potatoes, cv. Norchip

PEST: *Phytophthora infestans* (Mont.) DeBary

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TITLE: EFFICACY OF CHEMICAL CONTROL OF POTATO LATE BLIGHT - 1991

MATERIALS: Chlorothalonil (BRAVO 500, 40 F: 2.2 L/Ha)

METHODS: For each treatment, four replicate plots consisting of five rows (7.5 m in length, spaced 0.9 m apart) were established in a randomized complete block design. All five-row plots were separated by two buffer rows for tractor operations. Whole (35-55 mm), greensprouted, Elite 3 seed tubers were hand-planted 30 cm apart on 27 May and the recommended crop management practices were followed (fertilizer 17-17-17 at 800 Kg/Ha; herbicides- metribuzin 75 DF, 0.73 Kg/Ha; insecticides-endosulfan 400 EC, 1.5 L/Ha and deltamethrin 2.5 EC, 0.25 L/Ha; top desiccant-diquat 20SN, 2.25 L/Ha). Plant emergence counts on the center row of each five-row plot were made on 22 June. Field plots were not inoculated with the pathogen; disease occurrence was based on the natural late blight presence and spread. Disease determinations (amount of disease foliar tissue as a percent of total plant foliage) of plants in the center row of each five-row plot were made throughout August and September. Fungicide applications (tractor-mounted sprayer modified to spray only the center three rows with three hollow-cone nozzles/row, 700 L/Ha volume, 860 KPa) were first made on 25 July and then every 10 days. Top desiccant was applied on 19 September and plots were harvested on 3 October.

RESULTS: All data was subjected to analysis of variance and mean separation tests (see table below). All plots had 100 % emergence. The warm and unusually dry conditions in July and August coincided with limited occurrence and development of late blight until wet weather in September. Although foliar disease development was rapid and severe in non-treated plots, late blight tuber rot was not evident at harvest.

CONCLUSIONS: Late blight occurrence was minimal until wet weather occurred in September. In plots treated with chlorothalonil, late blight damage was significantly reduced but due to the late season occurrence of the epidemic no significant yield differences were found.

EFFECTS OF FOLIAR FUNGICIDE TREATMENT ON POTATO LATE BLIGHT DEVELOPMENT AND TUBER YIELDS - 1991.

	Foliar Disease Incidence (%) (Day/Month)			Yields(%)	
Treatment	29/8	09/9	16/9	55-85mm	Total
NO FUNGICIDE	0.5a*	30a	96a	100a	100a
CHLOROTHALONIL	0.0a	0b	2b	106a	102a

* Values in the same column followed by different letters are significantly different at P=0.05.

#122

STUDY DATA BASE: 303-1451-9002

CROP: Potatoes, cv. Kennebec

PEST: *Rhizoctonia solani* Khun (AG 3), *Verticillium* spp., *Colletotrichum coccodes* (Wallr.) Hughes

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TITLE: EFFICACY OF CHEMICAL CONTROL OF POTATO DISEASES CAUSED BY SOIL-BORNE FUNGAL PATHOGENS-1991

MATERIALS: Thiophanate-methyl (EASOUT-10 D: 5 gm/kg seed)
ASC-7.5D and ASC-10D (ISK-Biotech Ltd., confidential)

METHODS: Elite 3 seed was used that had received no "fall" fungicide treatment prior to storage. Immediately after cutting and just before planting, the seed was treated with fungicides. Fungicide treatments were applied by shaking in a plastic bag for 3-5 min. the seed and fungicide treatment. As controls, some seed received fungicide treatment. Immediately after treating, the seed was hand-planted in 3.0 m rows with 30 cm in-row and 0.9 m between-row spacings in a randomized complete block design with 4 replicate blocks. Planting was completed on 30 May and recommended crop management practices were followed (fertilizer 17-17-17 at 800 kg/ha; herbicides-metribuzin 75WP, 0.73 kg/ha; fungicides-chlorothalonil 40F, 2.1 l/ha; insecticides-endosulfan 400EC 1.5 l/ha; top desiccant-diquat 20SN, 2.25 l/ha). Plant emergence, vigor, and disease determinations were made throughout the season. Top desiccant was applied on 19 September and plots were harvested on 4 October.

RESULTS: All data was subjected to analysis of variance and mean separation tests (see table below). Warm and unusually dry weather in July and August resulted in a typical water stress induced wilting and reduced plant growth. In addition, Verticillium wilt, stem canker and other disease symptoms were not expressed as usual during July and August. However, by the end of August and in September, when rains and improved plant growth occurred, a variable but severe Verticillium wilt symptom was observed in the plots.

Unfortunately, due to variablility between reps, no significant treatment differences were obtained. At harvest, tuber disease incidences and yields were similar in all plots.

CONCLUSIONS: Although the seed treatment plots had lower plant wilt levels and higher yields than the non-treated seed plots, no significant differences were obtained due to high within-rep variability. However, these results do indicate that seed treatment fungicides are providing some control and should be re-investigated to accurately determine efficacies.

EFFECTS OF PRE-PLANTING FUNGICIDE TUBER TREATMENTS ON POTATO DISEASES CAUSED BY SOIL-BORNE PATHOGENS - 1991.

Treatment	Plant Stand (%) 3 July	Plant Wilt (%) (Day/month) 14/8	22/8	29/8	4/9	Plant Yield (T/Ha) 0-54mm	55-85mm	Total
NON-INOCULATED	97	2	12	30	35	6.5	21.3	27.7
ASC7.5	98	0	7	15	22	7.1	25.6	32.7
ASC10D	98	0	3	22	22	8.9	24.6	33.5
THIOPHANATE-METHYL	98	0	5	17	25	8.1	20.9	28.9

#123

STUDY DATA BASE: 385-1412-8203

CROP: Barley, cv. Galt

PEST: Loose smut, *Ustilago nuda*

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TITLE: EVALUATION OF SEED DRESSINGS FOR LOOSE SMUT CONTROL - 1991

MATERIALS: EL-228 (5% nuarimol)
TF-3770 (5% hexaconazole)
UBI-2100-3 (23% carbathiin)
UBI-2454-1 (5% myclobutanil)
UBI-2565 (.416% cyproconazole)
UBI-2568 (6% triadimenol)
UBI-2584-1 (.833% tebuconazole)

METHODS: Galt barley naturally infected with 10% loose smut was treated in a small batch laboratory treater with the chemicals and rates listed below. The seed was air dried and seeded May 7 into 4 row plots, 5.5 m in length and replicated 4 times in a randomized complete block design. Emergence was counted in 2-1 m lengths from the centre rows. Smut was recorded as the number of smutted heads in the 2 centre rows.

RESULTS: The results are presented in the table below.

CONCLUSIONS: All treatments except UBI-2584-1 reduced emergence, ranging from 1% (UBI-2454-1) to 17% (TF-3770 at the high rate). All treatments significantly reduced loose smut counts. Four treatments controlled loose smut by more than

90%, UBI-2100-3, UBI-2454-1, TF-3770 at the high rate and UBI-2568.

TREATMENT	RATE (gai/kg)	EMERGENCE (No/m)	SMUT (No/2 rows)	%CONTROL
EL-228	0.15	34	7 bcd*	85
TF-3770	0.0125	34	14 bc	71
TF-3770	0.025	30	1 d	98
UBI-2100-3	0.69	33	4 d	91
UBI-2454-1	0.12	36	4 d	92
UBI-2565	0.01	33	16 b	66
UBI-2568	0.15	34	0 d	100
UBI-2584-1	0.02	40	6 cd	87
UNTREATED	--	36	48 a	0

Means in a column followed by the same letter are not significantly different (Duncan's Multiple Range Test p = 0.05).

#124

STUDY DATA BASE: 385-1412-8203

CROP: Barley, cv. Harrington

PEST: Naturally occurring foliar diseases

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TITLE: EVALUATION OF FUNGICIDES FOR FOLIAR DISEASE CONTROL IN HARRINGTON BARLEY - 1991

MATERIALS: BAYLETON (50% triadimenol)
BENLATE (50% benomyl)
DITHANE M-45 (80% mancozeb)
DPX-H6573 (40% fusilazole)
EASOUT (50% thiophanate-methyl)
HWG-1608 3.6 FL (38% ethyltrianol)
HWG-1608 45 DF (45% ethyltrianol)
SAN-619F (10% cyproconazole)
SPORTAK (40% prochloraz)
TILT (25% propiconazole)
XE-779 (25% diniconazole)
Surfactants - AGRAL 90
CANPLUS

METHODS: Harrington barley was seeded into 4 row plots, 5.5 m long with oats seeded between each plot to limit disease spread. The treatments were applied with a back pack carbon dioxide sprayer at the rates below. The trial design was a randomized complete block with 4 replications. The treatments were applied at GS 37-41 with the exception of DITHANE M-45 which had an additional application 10 d later and the late application of Tilt which was sprayed at GS 54. HWG-1608 3.6 FL and HWG-1608 45 DF were applied with the addition of 0.5% AGRAL 90 and XE-779 was applied with 1% CANPLUS. At maturity 20 flag and 20 penultimate leaves were collected at random from each plot and rated for percent leaf area diseased. The entire plot was combined for yield and the seed used to determine 1000 kernel weights.

RESULTS: The results are presented in the table below. Weather conditions were conducive to high natural levels of scald (Rhycosporium secalis).

CONCLUSIONS: All experimental treatments reduced disease levels on both the flag and penultimate leaves and increased yield and 1000 kernel weights. Where leaf disease levels were significantly reduced on both leaves there was a corresponding significant increase in 1000 kernel weights. There was not always a significant yield increase associated with these significant levels of disease control. Those treatments with significant levels of leaf disease control that resulted in significantly higher yields were, in ascending order, late TILT, BAYLETON, SPORTAK at 400 gai/ha, DPX-H6573, SAN-619F at 120 gai/ha, HWG-1608 3.6 FL and early TILT.

TREATMENT	RATE (gai/ha)	% DISEASE FLAG	% DISEASE PENULTIMATE	Kg/ha	1000 KERNEL WT
BAYLETON	125	19	43	4344	41.6
BENLATE	250	38	55	3554	37.4
DITHANE M-45	1800	30	59	4004	40.7
DPX-H6573	160	20	20	4458	41.4
EASOUT	500	38	57	3932	37.4
HWG-1608 - 3.6 FL	125	15	15	4636	40.4
HWG-1608 - 45 DF	125	21	19	3817	41.4
SAN-619F	100	22	32	3853	41.4
SAN-619F	120	17	24	4459	42.4
SPORTAK	350	27	37	3991	39.9
SPORTAK	400	25	28	4423	41.8
TILT - EARLY	125	17	33	4689	41.6
TILT - LATE	125	4	29	4247	41.6
XE-779	120	32	55	3599	38.4
UNTREATED	--	42	62	3441	36.6
LSD.05		11	16	692	2.8

#125

STUDY DATA BASE: 385-1412-8203

CROP: Barley, cv, Abee, Argyle, Bonanza, Ellice, Empress, Galt, Harrington,
Heartland, Jackson, Johnston, Leduc, Samson.

PEST: Naturally occurring foliar diseases.

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TITLE: EFFECT OF TILT ON BARLEY CULTIVARS - 1991

MATERIALS: TILT (25% propiconazole)

METHODS: Twelve barley cultivars were seeded into 4 row plots, 5.5 m long with oats seeded between each plot to limit disease spread. The test was arranged as a 4 rep split plot with cultivars blocked. TILT was applied at GS 37 at a rate of 125 gai/ha. At maturity, 20 flag and 20 penultimate leaves were collected at random from each plot and rated for percent leaf area diseased. The entire plot was combined for yield and the seed used to determine 1000 kernel weights.

RESULTS: The results are presented in the table below. Weather conditions were conducive to high natural levels of scald (Rhycosporium secalis).

CONCLUSIONS: The application of TILT consistently reduced the levels of scald on the flag and penultimate leaves, and increased yields and 1000 kernel weights. The only exception was Johnston where no yield advantage was shown, despite an increased 1000 kernel weight and leaf disease reduction. In general, the cultivars which have higher levels of resistance to scald, Empress, Johnston and Leduc, did not exhibit significant yield or 1000 kernel weight advantages when sprayed with TILT.

		% DISEASE			1000
CULTIVAR	CHEMICAL	FLAG	PENULTIMATE	Kg/ha	KERNEL WT
ABEE	No TILT	47	72	3078	35.2
	TILT	12	10	4010	40.5
ARGYLE	No TILT	42	69	3181	29.0
	TILT	10	24	3955	31.6
BONANZA	No TILT	27	50	2724	30.2
	TILT	12	21	3178	31.2
ELLICE	No TILT	53	82	1903	29.4
	TILT	29	39	2719	35.8
EMPRESS	No TILT	5	18	3343	33.7
	TILT	2	4	3770	34.8
GALT	No TILT	24	46	2211	26.9
	TILT	5	9	2280	31.4
HARRINGTON	No TILT	64	91	2356	28.9
	TILT	24	19	2974	35.4
HEARTLAND	No TILT	37	51	1698	27.5
	TILT	8	7	2650	30.8
JACKSON	No TILT	60	75	2453	31.8
	TILT	23	33	2830	37.0
JOHNSTON	No TILT	2	6	3372	32.7
	TILT	1	2	3235	34.2
LEDUC	No TILT	2	9	3652	35.0
	TILT	1	2	3879	36.4
SAMSON	No TILT	52	63	2723	26.4
	TILT	19	27	3609	29.8
LSD.05		10	11	485	1.9

#126

STUDY DATA BASE: 303-1412-8907

CROP: Barley cv. Albany

PEST: Natural occurring pathogens

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TITLE: EFFECTS OF FUNGICIDE SEED TREATMENTS ON YIELD IN BARLEY, 1991

MATERIALS: VITAFLO 280 (carbathiin 167 g/L, thiram 148 g/L)
UBI-2584-1 (Raxil, tebuconazole 8.33 g/L)
UBI-2611 (Raxil, tebuconazole 8 g/L, thiram 200 g/L)
UBI-2383-2 (triadiminol 317 g/L)

TF-3770 (hexaconazole, 12 g/L)

METHODS: Albany barley was treated in a small plot seed treater with the above materials at the rates listed in the table below. The seed was planted May 14, 1991 at a seeding rate of 300 viable seeds per m2. Each plot was 10 rows wide by 5.0 m long with 17.8 cm between each row. Treatments were replicated in a complete randomized block design. At Zadok's Growth Stage 12, emergence counts were taken on 2 m of row per plot. Yield, hectolitre weights and thousand kernel weights were determined from the harvest of the centre seven rows of each plot, using a small plot combine.

RESULTS: There was insufficient disease present in any plot to warrant seedling blight or early season disease assessment. Seed treatment effects on yield are presented in the table below.

CONCLUSIONS: There were no significant differences in any of the treatments on yield or thousand kernel weights. Weather for the season was drier than normal, particularly during the mid-part of the growing season. As a result, disease incidence and severity were very low, thus impacting on potentialfungicide benefits on yield from early season disease control.

Treatment	Rate (g ai/ha)	Yield (kg/ha)	Hectolitre Weight (kg)	1000 Kernel Weight (g)
Untreated control	0	3937	67.5	46.6
Vitaflo 280	1.03	3694	66.8	47.0
UBI-2584-1	0.02	3774	67.6	45.3
UBI-2584-1	0.04	3871	67.5	46.3
UBI-2584-1	0.08	3867	67.5	45.9
UBI-2611	0.52	4126	67.7	45.7
UBI-2611	1.04	3615	67.8	46.9
UBI-2383-2	0.1	3832	67.5	47.7
UBI-2383-2	0.15	3856	67.9	47.3
Vitaflo 280	0.55	3882	66.9	45.3
TF-3770	0.01	3710	67.2	46.1
TF-3770	0.02	3925	67.2	46.6
		NS	NS	NS

NS - not significant at P =0.05

#127

STUDY DATA BASE: 303-1412-8907

CROP: Barley cv. Birka

PEST: Net Blotch, *Pyrenophora teres*

NAME AND AGENCY:
MARTIN, R.A. and CHEVERIE, F.G.
Agriculture Canada, Research Station, Charlottetown
Prince Edward Island C1A 7M8
Tel. (902) 566-6851, Fax (902) 566-6821

TITLE: INFLUENCE OF TIMED SPRAYS OF SAN-619F ON NET BLOTCH EXPRESSION AND YIELD OF BARLEY, 1990

MATERIALS: TILT (propiconazole 250 EC)
SAN-619F (cyproconazole 100 g/L)

METHODS: Barley plots, cv. Birka, were established on 05-28-90, at a seeding rate of 300 viable seeds per m2. Each plot was 10 rows wide by 6.0 m long with 17.8 cm between each row. Timed foliar fungicide treatments were replicated four times in a complete randomized block design. A herbicide spray was applied on 06-26-90 using a Refine and Hoegrass tank mix at a produce rate of 22 g/ha and 2.5 L/ha, respectively. At Zadok's Growth Stages (ZGS) 37, 39, and 45, foliar fungicide treatments were applied at the rates listed in the table below using a CO2 backpack sprayer. At ZGS 83, net blotch was assessed as the 2nd and 3rd leaves from the head on 10 randomly selected tillers per plot. Disease assessment was conducted using the Horsfall Barratt Rating System. Yield and thousand kernel weights were determined from the data based on the harvest of 7 rows from each plot using a Hege small plot combine.

RESULTS: Results of the timed foliar fungicide treatments on net blotch expression and on yield of barley are presented in the table below. The herbicide tank mix of Refine and Hoegrass resulted in severe foliage damage to the barley plots within 1 day of application. New foliage did not appear to be affected by the herbicides at later stages of crop development.

CONCLUSIONS: The SAN-619F 100 g/ha treatment at ZGS 45 was significantly better than the other treatments in disease control. Yields were variable, and no correlations between disease control and yield benefit occurred.

Treatment	Rate (g ai/ha)	Zadoks Growth Stage of Application	Net Blotch (%) 2nd Leaf	Net Blotch (%) 3rd Leaf	Yield (kg/ha)	Thousand Kernel Weight (g)
Untreated	0	-	46.9	76.1	2674	35.25
Tilt	125	37	43.6	76.1	3091	37.85
Tilt	125	39	38.6	61.4	3366	38.60
Tilt	125	45	34.0	65.5	3007	38.55
SAN-619F	80	37	40.2	70.7	3412	38.25
SAN-619F	80	39	42.7	67.8	3121	37.65
SAN-619F	80	45	33.3	60.7	3118	37.80
SAN-619F	100	37	49.8	74.6	3229	37.35
SAN-619F	100	39	38.5	64.4	3356	38.90
SAN-619F	100	45	16.3	38.0	29.3	38.50
SEM*			4.67	5.12	NS	0.580
LSD (0.05)**			13.6	14.9		1.7

* SEM = Standard Error of Mean
** LSD = Value at a 0.05 level of probability
NS = Not significant at P = 0.05

#128

STUDY DATA BASE: 303-1412-8907

CROP: Barley cv. Rodeo

PEST: Net Blotch, *Pyrenophora teres*

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TITLE: INFLUENCE OF FOLIAR FUNGICIDES ON YIELD OF BARLEY, 1991

MATERIALS: TILT (propiconazole 250 EC)
BAYLETON 50WP (triadimefon 50WP)
BAYLETON 50DF (triadimefon 50DF)

HWG-1608 (tebuconazole 1.2 EC)
ELITE 45DF (tebuconazole 450 g/L)
Surfactants: RENEX 36, COMPANION, AGRAL 90, and ENHANCE

METHODS: Barley plots, cv. Rodeo, were established 05-10-91 at a seeding rate of 300 viable seeds per m2. Each plot was 10 rows wide by 4.0 m long with 17.8 cm between each row. Foliar fungicide treatments were replicated in a complete randomized block design. At Zadok's Growth Stage 49, treatments were applied at the rates listed in the table below, using a CO_2 backpack sprayer. Disease severity at application was less than 2% on any leaf. Yield, thousand kernel weights and hectolitre weights were determined from the harvest of the centre seven rows of each plot, using a small plot combine.

RESULTS: Results of the effects of the foliar fungicide treatments on yield of barley are listed in the table below.

CONCLUSIONS: There were no significant differences in any of the treatments on yield, hectolitre weights or thousand kernel weights. Weather for the season was drier than normal during the mid-part of the production season. This led to a low incidence and severity in foliar diseases until very near maturity when foliar disease has less of a yield impact.

Treatment	Rate (g ai/ha)	Yield (kg/ha)	Hectoliter Weight (kg/ha)	Thousand Kernel Weight (g)
Untreated control	0	3070	63.52	46.20
Tilt	125	2746	63.12	47.10
Bayleton 50WP	125	2734	63.06	46.70
Bayleton 50DF	125	2835	63.09	46.80
HWG-1608 1.2EC	125	2776	63.65	46.90
Elite 45DF	125	2953	63.24	47.20
Elite 45DF+Renex 36	125+0.25 v/v	3121	63.58	46.80
Elite 45DF+Companion	125+0.25 v/v	2672	63.80	47.30
Elite 45DF+Agral 90	125+0.10 v/v	3180	63.24	46.00
Elite 45DF+Enhance	125+0.5 L/ha	2722	63.84	47.40
		NS	NS	NS

NS - not significant at P = 0.05

#129

STUDY DATA BASE: 303-1412-8907

CROP: Barley cv. Albany

PEST: Net Blotch, *Pyrenophora teres*

NAME AND AGENCY:
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TITLE: EVALUATION OF SANDOZ SEED TREATMENTS ON DISEASE CONTROL AND YIELD POTENTIAL IN BARLEY, 1990

MATERIALS: VITAFLO (carbathiin 167 g/L, thiram 148 g/L)
SAN-619F SL (cyproconazole 4 g/L)
SAN-619 SC (cyproconazole 4 g/L)
UBI-2568 (triadimenol 60 g/L)

METHODS: Barley seed, cv. Albany, was treated with the above materials at the rates indicated in the table below. Barley plots were established on 25-05-90, at a seeding rate of 300 viable seeds per m2. Each plot was 10 rows wide by 3.5 m long with 17.8 cm between each row. Treatments were replicated four times in a randomized block design. At Zadoks Growth Stage (ZGS) 15, emergence counts were taken on 2 m of row per plot. The herbicide Refine was applied on 23-06-90 at a product rate of 22 g/ha. Seedling blight and foliar net blotch were assessed at ZGS 30 on 20 whole plants per plot, using a 0-4 scale where 0 indicated disease free and 4 was severely diseased.

Seedling blight was based on discoloration of the subcrown internode. Yield and thousand kernel weights were determined by the harvest of 7 rows of each plot using a small plot combine.

RESULTS: Results are listed in the table below.

CONCLUSIONS: There were no significant differences from any of the measured parameters except for emergence which was variable in the treatments. This may have been due to low disease pressure during the growing season and a severe infestation of barnyard grass in the plot area.

Treatment	Rate (g ai/kg seed)	Emergence (m/2)	Seedling Blight (0-4)	Net Blotch (0-4)	Yield (kg/ha)	Thousand Kernel Weight (g)
Untreated	0	128	1.75	0.5	3142	40.8
Vitaflo 280	1.03	153	1.50	0.0	2994	40.2
SAN-619F SL	0.01	124	1.75	0.25	3264	38.5
SAN-619F SL	0.015	137	1.50	0.5	3056	39.7
SAN-619F SC	0.01	104	1.50	0.0	2871	40.4
SAN-619F SC	0.015	130	1.50	0.25	2840	39.0
UBI-2568	0.15	135	2.00	0.25	2868	39.2
SEM*		7.7				
LSD (0.05)**		23	NS	NS	NS	NS

* SEM = Standard Error of Mean
** LSD = Value at a 0.05 level of probability
NS = Not significant at P = 0.05

#130

CROP: Barley cv. Harrington

PEST: Net blotch, *Pyrenophora teres*
Spot blotch, *Cochliobolus sativus*

NAME AND AGENCY:
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TITLE: EVALUATION OF PROPICONAZOLE APPLICATION TIMING FOR THE CONTROL OF FOLIAR DISEASES IN BARLEY

MATERIALS: TILT 250 EC (propiconazole)

METHODS: Harrington barley was planted on May 16, 1991 at a rate of 90 kg/ha in 15 cm rows. The previous crop was winter wheat. 44 kg/ha N and 22 kg/ha P2O5 were banded at seeding. Diclofop methyl at 0.75 kg/ha and bromoxynil at 0.28 kg/ha were applied on May 27 for the control of grassy and broadleaf weeds. The experimental design was a randomized complete block with 4 replicates. Plots were 2 x 7.5 m with a 2 m untreated buffer between plots. The fungicide was applied at 3 crop growth stages: June 27 at Zadoks 37, July 3 at Zadoks 49, and July 11 at Zakoks 59. Application was made with a compressed air bicycle sprayer on June 27, and a comp. air backpack sprayer on July 3 and 11. Both sprayers delivered 200 L/ha at 275 kPa with 80015 nozzles. Plots were rated for disease severity using a 0-9 scale where 0 is disease free and 9 is > 50% leaf area infected. The trial was harvested August 13 and kernal weight determined from the harvested sample. The data was analyzed using Duncans MRT at the 0.05 significance level.

RESULTS: As presented in the table below.

CONCLUSIONS: All fungicide application timings reduced disease levels and increased yields and kernal weight. The best timings were Zadoks 37 and 49, as these had lower levels of disease and resulted in grain yields significantly higher than the untreated check.

Treatment	Rate kg/ha	Growth Stage	0-9 Disease Rating July 23	Yield kg/ha	Kernel Wgt g/1000
Untreated Check	-	-	6.6a*	3633b	36.2b
Propiconazole	0.125	37	5.1b	4186a	41.3a
Propiconazole	0.125	49	5.1b	4044a	39.4ab
Propiconazole	0.125	59	5.5b	3864ab	39.5ab

* Means followed by the same letter do not differ significantly (Duncan's multiple range test, P = 0.05).

#131

STUDY DATA BASE: 375-1431-7631

CROP: Meadow Bromegrass, *Bromus riparius* cv. Regar

PEST: Head smut, *Ustilago bullata* Berk.

NAME AND AGENCY:
TURNBULL, G.D. and GOSSEN, B.D.
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TITLE: EVALUATION OF FUNGICIDAL SEED TREATMENTS FOR CONTROL OF HEAD SMUT ON MEADOW BROMEGRASS

MATERIALS: UBI-2155 (carbathiin 26.7% + thiram 38.8%)
THIRAM 50 WP (thiram)
CAPTAN (captan, 7.5%)
TILT 250 EC (propiconazole)
TF-3770 (hexaconazole 12.5 g/l)

METHODS: Naturally infested meadow bromegrass seed was dusted with 3.6 g spores/kg seed. The treatments were applied to 25 g batches in 500 ml Ehrlenmeyer flasks, except for three levels of UBI-2155 treated by Gro-Tech. The trial was seeded on 08 June, 1990 at Saskatoon, and on 12 June, 1990 at Melfort. Plots consisted of single 6 m rows with 0.3 m between rows, in a 6- replicate randomized complete block. Emergence was counted at Melfort on 07 August, 1990. Smutted plants were counted and an estimate of row fullness was made at Saskatoon on 10 June, 1991, and at Melfort on 17 June, 1991.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: All seed treatments significantly reduced disease. Emergence was improved by application of Tilt, and of UBI-2155 at 2.45, 4.90, and 12.25 g/kg seed. At Saskatoon, thiram, captan, and UBI-2155 applied at the lowest rate improved row fullness, while at Melfort, only UBI-2155 applied at 9.8 g/kg seed showed any improvement over the inoculated check. (This study was supported in part by the Saskatchewan Agriculture Development Fund and by the Canadian Seed Growers Association).

Treatment	Rate g ai/kg	MELFORT Emergence	% Row Fullness	Smutted Plants/Row
UBI-2155	2.45	38.3 AB	78.3 AB	0.2 B
UBI-2155	4.90	41.7 AB	71.7 AB	0 B
UBI-2155*	4.90	22.7 BC	52.5 AB	0 B
UBI-2155	7.35	33.3 ABC	62.5 AB	0 B
UBI-2155*	7.35	37.5 ABC	74.2 AB	0 B
UBI-2155	9.80	54.3 A	83.3 A	0.2 B
UBI-2155*	9.80	34.2 ABC	61.7 AB	0 B
UBI-2155	12.25	22.8 BC	67.5 AB	0 B
TILT 250 EC	0.15	38.8 AB	73.3 AB	0 B
TF-3770	0.025	25.7 BC	55.8 AB	0 B
THIRAM 50 WP	2.7	28.3 BC	65.8 AB	0.9 B
CAPTAN	2.6	26.5 BC	65.8 AB	0.2 B
Uninoculated Check		34.3 ABC	60.8 AB	8.7 A
Inoculated Check		14.3 C	45.0 B	7.0 A

Treatment	Rate g ai/kg	SASKATOON % Row Fullness	Smutted Plants/Row
UBI-2155	2.45	69.2 ABC	0 C
UBI-2155	4.90	61.2 BCD	0 C
UBI-2155*	4.90	60.0 CD	0.3 C
UBI-2155	7.35	65.2 ABCD	0 C
UBI-2155*	7.35	62.5 BCD	0 C
UBI-2155	9.80	63.3 BCD	0 C
UBI-2155*	9.80	59.2 CD	0 C
UBI-2155	12.25	66.7 ABCD	0 C
TILT 250 EC	0.15	68.3 ABCD	0 C
TF-3770	0.025	64.2 ABCD	0 C
THIRAM 50 WP	2.7	73.3 AB	0 C
CAPTAN	2.6	75.0 A	0 C
Uninoculated Check		65.0 ABCD	4.0 B
Inoculated Check		56.7 D	5.5 A

* Gro-Tech treated Means followed by the same letter do not differ significantly according to Duncan's Multiple Range Test.

#132

STUDY DATA BASE NUMBER: 375-1411-8719

CROP: Spring wheat, cultivar Leader

PEST: Common root rot, *Cochliobolus sativus*

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TITLE: EFFECT OF SEED TREATMENT FUNGICIDES ON EMERGENCE, COMMON ROOT ROT AND YIELD OF LEADER SPRING WHEAT, 1991

MATERIALS: EXP 80240A
AGROX FLOWABLE (maneb 300 g/L)
TF-3770 (hexaconazole 12.5 g/L)
TF-3785 (hexaconazole 10.0 g/L)
TF-3787 (hexaconazole 12.5 g/L)
UBI-2100-2 (carbathiin 230 g/L)
UBI-2584-1 (tebuconazole 8.33 g/L)
UBI-2568 (triadimenol 60g/L)

METHODS: The test was done at Saskatoon, Saskatchewan in 1991. Naturally occurring inoculum of C. sativus was relied upon for infection. Seed was treated in 1000 ml glass jars. Chemical treatments were dispersed over the glass surface, then 275g of seed was added and shaken. To ensure uniform coverage of the seed, the first treated lot of seed was discarded and a second lot was packaged for seeding. A randomized complete block design with six replicates made up the test. Each plot was 4 rows; each row was 6 m long. Rows were 23 cm apart with 350 seeds planted in each row. Seeding and fertilizing (40 kg/ha with 11-55-0) took place May 23; emergence was recorded June 11 on 2 m of one of the center rows; harvesting (3 rows x 5 m long) was done on September 5 with yield recorded as grams per plot. Common root rot was recorded at the soft dough stage on August 21 by rating 50 plants, randomly selected from one row. Common root rot was determined by counting the number of plants with lesions covering greater than 50% of the subcrown internode. Percent common root rot was calculated by multiplying the field score by two.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Five treatments had significantly (P=0.01) lower disease ratings than the control: TF-3787, TF-3770, UBI-2568, TF-3785 and UBI-2584-1. Yield was not affected by any of the treatments. Treatment with TF-3770, UBI-2568, and TF-3787 thickened subcrown internodes and these treatments, as well as TF-3785, increased the number of subcrown internode tillers. Treatments with EXP 80240A significantly reduced the emergence relative to the control.

PRODUCT	RATE (g a.i./kg seed)	EMERGENCE (plants/2m)	COMMON ROOT ROT (%)	YIELD (g/subplot)
Check	---	75a*	53a*	1109a*
EXP 80240A-1	0.30	47b	53a	1032a
EXP 80240A-2	0.40	46b	60a	1000a
TF-3767	0.45	89a	54a	1119a
TF-3770	0.02	84a	7c	1043a
TF-3785	0.02	82a	15c	1127a
TF-3787	0.02	89a	7c	1106a
UBI-2100-2	0.55	86a	53a	1141a
UBI-2568	0.30	81a	10c	1091a
UBI-2584-1	0.02	76a	32b	1066a

* Values in the same column which are not followed by the same letter are significantly different at the 1% level of probability according to Duncan's Multiple Range Test.

#133

STUDY DATA BASE: CA30-91-P800

CROP: Spring Wheat cv. Manitou X

PEST: Loose smut, *Ustilago tritici*

NAME AND AGENCY: DYKSTRA, C.E. and SMITH, D.B.
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TITLE: EVALUATION OF HEXACONAZOLE AS A SEED TREATMENT FUNGICIDE IN CEREALS

MATERIALS: TF-3770 (hexaconazole; 12.5 g/L)
TF-3787 (hexaconazole; 10 g/L)
TF-3785 (hexaconazole; 10 g/L)
VITAFLO 280 (carbathin; 167 g/L, thiram; 148 g/L)
AGROX FL (maneb;300 g/L)

METHODS: Naturally infected seed was separated into 100 g lots, and treated on April 23, 1991 using a mini-rotostat seed treater. The treatments were sown at a rate of 200 seeds/4m row on April 25, 1991 at Millgrove, Ontario using a precision cone seeder. Each plot consisted of one 4 m row, and were replicated 4 times in a complete randomized block design. The number of plants per plot were counted at approximately 50% emergence and 100% emergence to determine any treatment affects. Later in the season, total head counts of the plots were recorded along with the number of loose smutted heads to determine the level of infection and subsequent control with the treatments.

RESULTS: As presented in the table below.

CONCLUSIONS: The treatments did not significantly affect plant emergence compared to the check. All treatments significantly reduced the number of smut infected heads compared to the check. All rates of TF-3787 and TF-3785 at 0.015 and 0.025 g ai/kg seed provided loose smut control equivalent to the lead TF-3770 formulation of hexaconazole.

TREATMENT	RATE (g a.i./kg seed)	EMERGENCE 100 % 21/05	TOTAL HEAD COUNT 10/07	INFECTED HEADS 10/07
1 UNTREATED	---	125.5 ab	205.8 a	15.8 a
2 TF-3770 12.5 FS	0.015	133.3 a	197.3 ab	1.0 d
3 TF-3770 12.5 FS	0.02	120.3 ab	186.0 ab	0.5 d
4 TF-3770 12.5 FS	0.025	107.3 b	199.0 ab	0.0 d
5 TF-3787 10 FS	0.015	122.0 ab	214.8 a	1.3 d
6 TF-3787 10 FS	0.02	131.5 a	203.3 a	0.5 d
7 TF-3787 10 FS	0.025	117.0 ab	185.3 ab	0.0 d
8 TF-3785 10 FS	0.015	127.8 ab	191.0 ab	0.8 d
9 TF-3785 10 FS	0.02	127.8 ab	189.5 ab	5.3 c
10 TF-3785 10 FS	0.025	115.8 ab	169.5 b	2.5 cd
11 VITAFLO 280 LS	0.55/0.49	137.8 a	198.5 ab	1.3 d
12 AGROX FL	0.54	132.3 a	194.5 ab	11.5 b
LSD(0.05) =	20.6	27.5	2.8	
Standard Dev. =		14.25	19.05	1.93
CV =		11.42	9.79	57.56

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05)

#134

STUDY DATA BASE: CA30-91-P801

CROP: Spring Wheat cv. Manitou X

PEST: Loose smut, *Ustilago tritici*

NAME AND AGENCY: DYKSTRA, C.E. and SMITH, D.B.
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TITLE: EVALUATION OF HEXACONAZOLE AS A SEED TREATMENT FUNGICIDE IN CEREALS

MATERIALS: TF-3770 (hexaconazole; 12.5 g/L)
TF-3787 (hexaconazole; 10 g/L)
TF-3785 (hexaconazole; 10 g/L)
VITAFLO 280 (carbathin; 167 g/L, thiram; 148 g/L)
AGROX FL (maneb; 300 g/L)

METHODS: Naturally infected seed was separated into 100 g lots, and treated on April 23, 1991 using a mini-rotostat seed treater. The treatments were sown at a rate of 200 seeds/4m row on May 7, 1991 at Copetown, Ontario using a precision cone seeder. Each plot consisted of one 4 m row, replicated 4 times in a complete randomized block design. The number of plants per plot were counted for at approximately 50% emergence and 100% emergence to determine any treatment affects. Later in the season, total head counts of the plots were recorded along with the number of smutted heads to determine the level of infection and subsequent control with the treatments.

RESULTS: As presented in the table below.

CONCLUSIONS: The TF-3787 formulation at 0.025 g a.i./kg seed significantly reduced the 100% emergence rating compared to the check. This reduction was not significant between the other treatments applied. All treatments significantly reduced the number of smut infected heads compared to the check with the exception of AGROX FL which had a significantly higher number of smut infected heads compared to the check. The low head count of all plots may be attributed to a heavy infestation of crabgrass and drought conditions at this trial site later in the season.

TREATMENT	RATE (g a.i./kg seed)	EMERGENCE RATING 50 % (No of plants/plot) 14/05	EMERGENCE RATING 100 % (No of plants/plot) 18/05	INFECTED HEADS No/plot 08/07	TOTAL HEAD COUNT No/plot 08/07
1 UNTREATED	---	109.5 a	137.3 a	5.0 b	69.3 b
2 TF-3770 12.5 FS	0.015	83.0 bc	131.5 a-d	0.0 c	69.5 b
3 TF-3770 12.5 FS	0.02	72.0 cd	129.3 a-d	0.0 c	81.8 b
4 TF-3770 12.5 FS	0.025	73.0 cd	128.0 a-d	0.0 c	78.5 b
5 TF-3787 10 FS	0.015	79.0 cd	138.8 ab	0.0 c	89.8 ab
6 TF-3787 10 FS	0.02	78.0 cd	124.3 a-d	0.3 c	74.5 b
7 TF-3787 10 FS	0.025	56.0 d	112.5 d	0.0 c	86.0 ab
8 TF-3785 10 FS	0.015	66.5 cd	119.8 bcd	0.3 c	80.3 b
9 TF-3785 10 FS	0.02	89.5 abc	130.8 a-d	0.3 c	84.0 b
10 TF-3785 10 FS	0.025	78.3 cd	118.3 cd	0.0 c	81.0 b
11 VITAFLO 280 LS	0.55/0.49	87.5 abc	130.0 a-d	0.5 c	83.3 b
12 AGROX FL	0.54	103.8 ab	141.3 a	9.8 a	111.3 a
LSD (.05) =		21.5	16.7	2.0	25.1
Standard Dev. =		14.88	11.59	1.39	17.39
CV =		18.30	9.02	104.04	21.10

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05)

#135

ICAR/IRAC: 89110061

CROP: Spring wheat, cv. Manitou/Tobari 66//Kitt

PEST: Loose smut, *Ustilago tritici*

NAME AND AGENCY:
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TITLE: EFFECTS OF FUNGICIDE SEED TREATMENTS ON LOOSE SMUT OF SPRING WHEAT

MATERIALS: TF-3770 (12.5 g/l hexaconazole)
TF-3787 (10 g/l hexaconazole)
VITAFLO 280 (carbathiin plus thiram)

METHODS: Naturally infected wheat seed was treated using a mini-rotostat treater at doses indicated in the table. The wheat was sown on 3 May, 1991 in single 1.5 m rows at the Arkell Research Station, near Guelph. The rows were spaced 2 m apart and the seeding rate was approximately 100 seeds/row. Each treatment was replicated six times in a randomized complete block design. Ammonium nitrate (34-0-0) was applied immediately after sowing at approximately 150 kg/ha. The previous crop in the plot area was spring wheat grown in 1990. Loose smut was assessed on 2 July, 1990 (wheat GS 59-61*) by counting the number of smutted and healthy spikes in each treatment row. The incidence data were transformed to arcsin values for analysis; untransformed means are reported in the table.

RESULTS: The loose smut data are reported in the table.

CONCLUSIONS: All of the seed treatments significantly reduced incidence of loose smut compared to the untreated check. TF-3770 and TF-3787 suppressed smut completely.

* Growth stage on scale of Zadoks, Chang and Konzak.

Fungicide Formulation	Dose (g AI/kg seed)	Incidence of loose smut (%)
Untreated check	-	6.7a*
VITAFLO 280	0.550	0.1 b
TF-3770	0.020	0.0 b
TF-3787	0.020	0.0 b

* Numbers in a column followed by the same letter are not significantly different according to the Waller-Duncan Bayesian K-ratio t-test.

#136

CROP: Spring Wheat, Manitou/Tobari 66//Kitt

PEST: Loose Smut, *Ustilago tritici*

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TITLE: CHEMICAL CONTROL OF LOOSE SMUT ON SPRING WHEAT

MATERIALS: TF-3770, TF-3787, VITAFLO 280 (Carbathiin)

METHODS: Naturally infected wheat seed was treated using a Mini-Rotostat seed treater on April 23, 1991. The treated seed was planted in Branchton on a well worked sandy loam soil using a push seeder on May 2, 1991. A total of 200 seed was planted in each treatment row which was 4 m in length. The experimental design consisted of a randomized complete block design with four replicates. Three treatments and a non-treated control were included in each block. Both emergence counts (total number of plants emerged out of 200) and vigour ratings (10-best, 0-worst) were taken on May 16, 1991. The total number of smutted heads out of 200 was counted and a percentage calculated on June 26, 1991.

RESULTS: As presented in the table below.

CONCLUSIONS: TF-3770 at 0.02, TF-3787 at 0.02 and VITAFLO 280 at 0.55 g a.i./kg seed all provided excellent control of loose smut. There were no significant differences between treatments for the emergence counts and vigour ratings.

Treatment May 02	Rate (g ai/kg seed)	Vigour Ratings May 16	Emergence Counts May 16	Percent Loose Smut June 26
Check	-	9.8 A*	153.3 A	8.20 A
TF-3770	0.02	9.3 A	148.0 A	0.00 B
TF-3787	0.02	9.3 A	152.3 A	0.00 B
VITAFLO 280	0.55	10.0 A	160.5 A	0.25 B

* Values within a column followed by the same letter are not significantly different at the P=.05 level. (Duncan's multiple range test).

#137

STUDY DATA BASE NUMBER: 375-1411-8719

CROP: Spring wheat, cv. Katepwa, Fielder

PEST: Naturally occurring foliar diseases

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TITLE: EFFECT OF FOLIAR FUNGICIDE TREATMENTS ON FOLIAR DISEASE AND YIELD OF IRRIGATED SPRING WHEAT, 1991

MATERIALS: BASF: POLYRAM DF (metiram 80% WP)
Ciba Geigy: TILT (propiconazole 250g/L)
Rohm and Haas: DITHANE DG (mancozeb 75% WP)

METHODS: The test was performed at the Irrigation Development Centre, Outlook, Saskatchewan. In the spring 100 kg/ha of 34-0-0 was broadcast. During the growing season, water was applied when tensiometer readings measured -0.5 bar. A split-plot design was used with cultivars as main plots and treatments as subplots. There were four replicates. Each subplot was made up of eight rows. Rows contained 350 seeds, were 6 m long and 23 cm apart. Four rows of barley were planted between subplots. Seeding and fertilizing (50 kg/ha of 11-55-0) took place May 17. Fungicide treatments were sprayed using a hand-held, CO2 pressurized, 4 nozzle boom sprayer (nozzle size 0.01) that delivered 225 L/ha at 240 kPa. The foliage of 8 rows was sprayed for each treatment. Control subplots were sprayed with water. Spray rates are indicated in the table below. Spraying took place July 3 (G.S.41-45, booting) and July 9 (G.S. 45-59, booting to completion of inflorescence emergence). Ten penultimate leaves were collected July 30 (G.S. 75-79, medium to late milk stage) from randomly selected plants in the center two rows of each subplot and were stored at 5oC until actual percent disease coverage was rated. Leaves from the control subplots were pressed and dried. They were scanned to determine the presence of obligate pathogens. Dried leaf pieces (4-6 cm) containing lesions werewashed for 1 hour, surface disinfected for 1 minute in 0.6% sodium hypochlorite, rinsed three times with sterile distilled water and then put on water agar (1.8%) containing 100mg/L streptomycin sulfate and 50 mg/L vancomycin hydrochloride. Plates were incubated under a mixture of blacklight, blacklightblue and cool white fluorescent lights for 12 hours alternating with 12 hours dark at 20oC. Sporulation was observed after about one week. Harvesting of 5 rows x 5m long occurred September 3 with yield recorded as grams per subplot.

RESULTS: Results are summarized in the table below. Cultivars were significantly (P=0.01) different for yield with Fielder averaging 3309 g/subplot and Katepwa 2513. However, the cultivar x treatment interaction was not significant for disease but it was significant (P=0.05) for yield because of the low yield in Fielder for Dithane relative to the other treatments. In the table, data for cultivars was combined. In Katepwa, 75% of the leaf disease was caused by Septoria nodorum, 10% by S. avenae f.sp. triticea, and 15% by Pyrenophora tritici-repentis (tan spot). The major cause of leaf disease in Fielder was S. nodorum at 70% while S. avenae f.sp. triticea caused 10%, and P. tritici-repentis 20%.

CONCLUSIONS: All treatments showed a significant (P=0.01) reduction in percent foliar disease over the control. Yield was also significantly (P=0.01) improved in all of the treatments with an average yield increase of 9% over the control. (This study was supported by the Irrigation Based Economic Development Fund, and the assistance of personnel at the Saskatchewan Irrigation Development Centre is

gratefully acknowledged.)

TREATMENT	RATE g a.i./ha	SPRAY SCHEDULE July 3	July 9	FOLIAR DISEASE (%)	YIELD (g/subplot)
Control	---	spray	spray	2 a*	2714 b*
TILT-1 spray	125	---	spray	3 b	2948 a
TILT-2 sprays	125	spray	spray	2 b	2992 a
DITHANE DG	1800	spray	spray	4 b	2916 a
POLYRAM DF	1800	spray	spray	3 b	2985 a

* Values in the same column which are not followed by the same letter are significantly different at the 1% level of probability according to Duncan's Multiple Range Test.

#138

STUDY DATA BASE NUMBER: 375-1411-8719

CROP: Spring wheat, cv. Katepwa, Fielder

PEST: Naturally occurring foliar diseases.

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TITLE: EFFECT OF APPLICATION TIMING OF TILT ON FOLIAR DISEASE AND YIELD OF IRRIGATED SPRING WHEAT, 1991

MATERIALS: Ciba Geigy: TILT (propiconazole 250g/L).

METHODS: The test was performed at the Irrigation Development Centre, Outlook, Saskatchewan. In the spring 100 kg/ha of 34-0-0 fertilizer was broadcast. During the growing season, water was applied when tensiometer readings measured -0.5 bar. A split-plot design with four replicates was used with cultivars as main plots and treatments as subplots. Each subplot was made up of eight rows. Four rows of barley were planted between subplots. Seeding and fertilizing (50 kg/ha of 11-55-0) took place May 17. Treatments were sprayed using a hand-held, CO/2 pressurized, 4 nozzle boom sprayer (nozzle size 0.01) that delivered 225 L/ha at 240 kPa. The foliage of 8 rows was sprayed for each treatment. Tilt was applied to subplots at a rate of 125 g a.i./ha. Growth stages and spray dates are listed in the table below. The control subplots were sprayed with water once during the growing season and untreated subplots were not sprayed. Ten penultimate leaves were collected July 30 (G.S. 75-79, medium to late milk) from randomly selected plants in the center two rows of each subplot and were stored at 5 degrees C until actual percent disease coverage was rated. Leaves from the control subplots were pressed and dried, then scanned to determine the presence of obligate pathogens. Dried leaf pieces containing lesions were prepared and plated on water agar containing antibiotics. Plates were incubated for about a week and sporulation was observed. Harvesting of 5 rows x 5 m long occurred September 3 with yield recorded as grams per subplot.

RESULTS: Results are summarized in the table below. Cultivars differed significantly (P=0.05) for percent disease levels (Katepwa 8%, Fielder 5%), and had significantly (p=0.01) different yields (Katepwa 2429 g/subplot, Fielder 3219). However, the cultivar by treatment interaction was not significant so the data for cultivars was combined in the table. In Katepwa, 95% of the leaf disease was caused by Septoria nodorum and 5% by Pyrenophora tritici-repentis (tan spot) while in Fielder, S. nodorum caused 90% and P. tritici-repentis 10%.

CONCLUSIONS: Foliar disease was significantly (P=0.01) reduced from the control for two spray dates: Tilt-4 and Tilt-5. Growth stages for these spray dates ranged from booting (G.S. 41) to completion of inflorescence emergence (G.S. 59). Yield was significantly (P=0.05) different from the control with Tilt-4 and Tilt-7 having 12% and 11% higher yields, respectively, than the control. (This study was supported by the Irrigation Based Economic Development Fund, and the assistance of personnel at the Saskatchewan Irrigation Development Centre is gratefully acknowledged.)

TREATMENT	SPRAY DATE	GROWTH STAGE	FOLIAR DISEASE (%)	YIELD (g/subplot)
Untreated	----	----	9 a**	2630 b**
Control	July 9	G.S. 45-59* Booting to completed emergence of inflorecence	8 ab	2691 b
TILT-1	June 10	G.S. 20-22 Tillering	7 ab	2828ab
TILT-2	June 17	G.S. 23-25 Tillering	8 ab	2762ab
TILT-3	June 25	G.S. 31-32 Stem elongation	6 a	2786ab
TILT-4	July 3	G.S. 41-45 Booting	3 c	3021a
TILT-5	July 9	G.S. 45-59 Booting to completed emergence of inflorescence	3 c	2811ab
TILT-6	July 16	G.S. 69 Anthesis complete	6 a	2898ab
TILT-7	July 23	G.S. 71-76 Early to medium milk	6 a	2981a

* G.S. according to Tottman, D.R. and Broad, H. 1987. Ann. appl.Biol. 110:441-454.

** Values in the same column which are not followed by the same letter are significantly different at the 5% level of probability according to Duncan's Multiple Range Test.

#139

STUDY DATA BASE: 303-1120-8805

CROP: Spring wheat cv. Katepwa, Spring oats cv. Tibor

PEST: Naturally occurring seedling blights.

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TITLE: EVALUATION OF FUNGICIDE SEED TREATMENTS FOR SPRING WHEAT AND OATS - 1991

MATERIALS: BAYTAN (triadimenol, 317 g/L)
VITAFLO-280 (carbathiin 167 g/L + thiram, 148 g/L)
TF-3770 (hexaconazole, 2.5 g/L)

METHODS: Pedigreed seed was treated with the materials at rates listed in the table using a small batch rotary laboratory seed treater. Plots were seeded on 17 May 1991 at a seeding rate of 400 and 300 viable seeds/m2 for wheat and oats, respectively. Plots were established in a complete randomized block with each plot 2 x 5 m. Emergence was determined at Zadoks (ZGS) 10. Leaf disease severity was determined on a 1-9 scale at ZGS 72. Yield performance was determined on a harvest of the centre 6 rows of each plot using a Hege 125 small plot combine.

RESULTS: Foliar disease lesioning was less severe than usual and not significantly influenced by treatment in severity on each crop and thus not reported. This lack of disease was attributed to warm dry weather in June and July.

CONCLUSIONS: VITAFLO-280 and TF-3770, demonstrate at the low rate, improved emergence of Katepwa wheat while only VITAFLO-280 demonstrated an improvement in 1000-K weights. Wheat yields were not influenced by the materials under evaluation. Oats did not respond to any of the treatments evaluated.

		Katepwa wheat			Tibor oats		
	Rate	Emergence	1000-K	Yield	Emergence	1000-K	Yield
Treatment	g ai/kg seed	#/m2	g	kg/ha	#/m2	g	kg/ha
Check	---	300	35.26	2424	245	34.46	2793
BAYTAN	0.15	373	35.02	2500	278	34.13	2917
VITAFLO-280	1.03	345	37.20	2726	229	33.83	2386
TF-3770	0.01	355	35.31	2481	279	33.98	2411
TF-3770	0.02	296	36.10	2551	271	34.09	2188
TF-3770	0.04	357	35.98	2397	---	---	---
LSD (P=0.5)		50.1	1.242	NS	NS	NS	NS

#140

CROP: Wheat, cv. Katepwa

PEST: Tan spot, *Pyrenophora tritici-repentis*
Septoria, *Septoria nodorum*

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TITLE: EVALUATION OF FUNGICIDES FOR CONTROL OF FOLIAR LEAF DISEASES OF WHEAT, 1990

MATERIALS: RH-4767 0.5 EC
DITHANE DF (mancozeb) 75% DF
DITHANE M-45 (mancozeb) 80% WP
COMPANION (octylphenoxypolyethoxyethanol n-butanol)
TILT (propiconazole) 250 EC

METHODS: Treatments were made to plots 2.5 m X 8.0 m with a hand-held C02 sprayer at a pressure of 310 kPa delivering 200 L/ha. Plots were replicated 4 times in a randomized block design. Initial treatments were applied at Zadoks 47, July 7, and subsequent applications (treatments 6 and 8) were made at Zadoks 59, on July 16. Disease levels were assessed on July 27 and yields were taken on August 31. Percent leaf area lesioned and yields were analysed using an analysis of variance and Duncan's multiple range test at the 0.05 significance level. Location: Kane, Manitoba.

RESULTS: As summarized in the table below.

CONCLUSIONS: All applications made to the crop reduced the progression of leaf disease. Yields were all equal to those of the untreated check.

TREATMENT	APPLICATION RATE kg ai/ha	APPLICATION GROWTH STAGE Zadoks	% LEAF AREA LESIONED	YIELD g/sq m
RH-7592/COMPANION	0.60/0.12% v/v	47	17.8 cd*	319.5 ab
RH-7592/COMPANION	0.09/0.12% v/v	47	19.8 c	331.5 ab
RH-7592/DITHANE DF/ COMPANION	0.06/1.69 0.12% v/v	47	14.0 cd	327.3 ab
RH-7592/DITHANE DF/ COMPANION	0.09/1.69 0.12% V/V	47	13.5 d	307.3 b
DITHANE DF/COMPANION	1.69/0.12% v/v	59	18.8 cd	313.3 ab
DITHANE DF/COMPANION	1.69/0.12% v/v	47 & 59	15.3 cd	346.3 a
TILT EC	0.125	47	18.8 cd	329.3 ab
DITHANE M-45	1.80	47 & 59	32.0 b	320.3 ab
UNTREATED CHECK	0.00	--	44.5 a	310.3 ab

* Means followed by the same letter are not significantly different (P<0.05, Duncan's multiple range test.

#141

CROP: Wheat, cv. Katepwa

PEST: Tan spot, *Pyrenophora tritici-repentis*
Septoria, *Septoria nodorum*

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TITLE: APPLICATIONS OF DITHANE DF COMPARED TO DITHANE M-45 FOR CONTROL OF FOLIAR LEAF DISEASES

MATERIALS: DITHANE DF (mancozeb) 75% DF
DITHANE M-45 (mancozeb) 80% WP

METHODS: Treatments were made to plots 2.5 m X 8.0 m with a hand-held C02 sprayer at a pressure of 310 kPa delivering 200 L/ha. Plots were replicated 4 times in a randomized block design. Initial treatments were applied at Zadoks 50, July 8 and any secondary applications were made at Zadoks 59, July 16. Disease levels were assessed on July 10 (trace to 3% leaf area lesioned) and July 19 with yields taken on August 30. Percent leaf area lesioned and yields were analysed using an analysis of variance and Duncan's multiple range test at the 0.05 significance level.

RESULTS: As presented in the table below.

CONCLUSIONS: Dithane DF controlled leaf disease as well as the standard Dithane M-45 treatment. Leaf diseases were significantly less severe than the untreated check in treatments where two applications were made versus one. Seed weights of two treatments were significantly higher than the untreated check. However this was not reflected in a significant increase in grain yield when compared to the check.

TREATMENT	APPLICATION RATE kg ai/ha	ZADOKS	% LEAF AREA LESIONED	YIELD g/sq m	SEED (g) 1000kwt
DITHANE M-45	1.80	50	10.5 ab*	217.2 a	31.8 ab
DITHANE DF	1.69	50	11.2 ab	219.3 a	32.5 ab
DITHANE M-45	1.80	50 & 59	5.9 b	215.6 a	33.4 a
DITHANE DF	1.69	50 & 59	6.4 b	205.4 a	33.2 a
UNTREATED CHECK	0.00	---	13.8 a	194.4 a	30.9 b

* Means followed by the same letter are not significantly different (P<0.05, Duncan's multiple range test).

#142

CROP: Wheat cv. Katepwa

PEST: Tan spot, *Pyrenophora tritici-repentis*
Septoria avenae blotch, *Septoria avenae* f.sp. *triticea*
Leaf rust, *Puccinia recondita*

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TITLE: EVALUATION OF TERBUCONAZOLE FOR FOLIAR DISEASE CONTROL IN SPRING WHEAT

MATERIALS: BAY-HWG-1608 45 DF (terbuconazole)
BAY-HWG-1608 3.6 FL (terbuconazole)
TILT 250 EC (propiconazole)

METHODS: Katepwa spring wheat was planted on May 13, 1991 at a rate of 94 kg/ha in 15 cm rows. The previous crop was winter wheat. 44 kg/ha N and 22 kg/ha P2O5 were banded at seeding. Diclofop methyl at 0.75 kg/ha and bromoxynil at 0.28 kg/ha were applied on May 27 for the control of grassy and broadleaf weeds. The experimental design was a randomized complete block, with 4 replicates. Plots were 2 x 7.5 m with a 2 m untreated buffer between plots. Fungicides were applied on June 27 at 10:30 am with a compressed air bicycle sprayer delivering 200 L/ha at 275 kPa with 80015 flat fan nozzles. The wheat was at Zadoks 39-49 at the time of application. Plots were rated for disease levels using a 0-9 scale where 0 is disease free and 9 is > 50 % leaf area infected. The trial was harvested on August 19. Kernal weight was determined from the harvested yield samples. The data was analyzed using Duncan's multiple range test at the 0.05 significance level.

RESULTS: As presented in the table below.

CONCLUSIONS: All fungicide treatments reduced levels of leaf rust and tan spot/septoria. Treated plots had grain yields significantly higher than the untreated check. Kernal weights were higher in treated plots, but differences were not always significant.

Treatment	Rate kg/ha	0-9 Disease rating July 23 Leaf rust	Tan spot/Sept.	Yield kg/ha	Kernel Wgt g/1000
Untreated check	-	4.9a*	6.5a	2342b	28.7b
BAY-1608 45 DF	0.125	4.5b	4.5b	2627a	30.7a
BAY-1608 3.6 FL	0.125	4.5b	4.5b	2715a	29.9ab
TILT 250 EC	0.125	4.5b	4.5b	2617a	29.5ab

* Means followed by the same letter do not differ significantly (Duncans multiple range test, P = 0.05).

#143

STUDY DATA BASE: 303-1120-8805

CROP: Winter wheat, cv. Borden and Monopol

PEST: Septoria leaf blotch, *Septoria nodorum*
Powdery mildew, *Erysiphe graminis* f.sp. *tritici*

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TITLE: EFFICACY OF FOLIAR FUNGICIDES FOR CONTROL OF WINTER WHEAT DISEASES - 1991

MATERIALS: FOLICUR 144EC and 45DF (tebuconazole)
BAYLETON 50WP AND 50DF (triadimefon)
RENEX 36
TRITON XR
AGRAL 90

METHODS: Winter wheat cultivars were planted in separate blocks on 4 September 1990 and fertilized with 60 kg N/ha as ammonium nitrate at snow melt in April 1991 and subdivided into plots 2 x 6 m, separated by an equal sized guard plot and established in a complete randomized block design with 4 replicates. Plots received a further treatment of 40 kg N/ha at Zadoks (ZGS) 32. All fungicide treatments were applied at ZGS 45 which corresponded with the appearance of powdery mildew lesions. Sprays were applied with a tractor driven direct injection sprayer delivering 280 L/ha water at 267 kPa pressure. Diseases were evaluated for severity on a 1-9 scale at ZGS 70 for powdery mildew and ZGS 75 for septoria leaf blotch. Yields were determined by harvesting the centre 6 rows of each plot using a Hege 125 plot combine.

RESULTS: Winter survival was excellent. Disease severity was less in 1991 than in previous years due to warm dry weather during June and July. See table below for data.

CONCLUSIONS: The control of septoria leaf blotch with BAYLETON was atypical compared with earlier results. Analysis of Borden yields indicated a high coefficient of variability (30%) attributed to wheat midge damage (Sitodiplosis mosellana) and yield data are thus not reported. All treatments reduced powdery mildew on Monopol with BAYLETON 50DF having greater efficacy than FOLICUR treatments. BAYLETON 50DF was more effective than BAYLETON 50WP for the control of powdery mildew lesioning. Yields of Monopol did not illustrate a significant increase with treatment at P=0.05; however, application of FOLICUR 144EC alone and BAYLETON, 50DF and 50WP, showed a yield increase of 11% which was significant at a P=0.06 level.

Treatment	Rate (g ai/ha)	Borden Septoria (1-9)1	Mildew (1-9)*	Monopol 1000-K (g)	Yield (kg/ha)
Check	---	6.3	7.8	45.15	3785
FOLICUR 144EC	125	4.8	6.0	46.01	4205
FOLICUR 45DF	125	4.3	5.5	46.65	3808
FOLICUR 45DF+RENEX 36	125+0.25v/v	4.0	5.3	47.67	3865
FOLICUR 45DF+TRITON XR	125+0.25v/v	4.3	--**	---	---
FOLICUR 45DF+AGRAL 90	125+0.10v/v	4.3	---	---	---
BAYLETON 50WP	125	3.0	4.5	47.58	4236
BAYLETON 50DF	125	2.3	3.5	46.05	4268
LSD (0.05)		0.51	0.87	NS	NS

* 1- 9: 1 - no disease, 9 - severe disease.
** Not tested.

#144

STUDY DATA BASE: 87000180

CROP: Choke cherry, *Prunus virginiana* L.

PEST: Choke cherry leaf spot, *Coccomyces lutescens* Higgins

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TITLE: FUNGICIDES FOR PREVENTION OF CHOKE CHERRY LEAF SPOT

MATERIALS: BENLATE 50WP
CAPTAN 50WP (benomyl + captan)
BENLATE 50WP (benomyl)
CAPTAN 50WP (captan)
RONILAN 50F (vinclozolin)
CYPREX 67WP (dodine)

METHODS: Fungicides were tested for prevention of choke cherry leaf spot on first year choke cherry seedlings. The trial was conducted at the Shelterbelt Centre on 12 beds of fall sown choke cherry. Each bed was 110 m by 1.25 m with 4 rows of seedlings. Three treatment plots, each 10 m were set up within each bed. Five fungicide treatments and a check treatment were replicated 6 times in a RCB design. Treatments were applied starting on May 27, 1991 and repeated every 3 weeks throughout the growing season. Treatments were applied with a high pressure sprayer delivering 565 L/ha through 8004 nozzles operating at 415 kPa. On July 6 and October 9, 1991 visual plant ratings were recorded. leaf spot was rated as follows: 1 = no leaf spot present, 2 = a few spots noticeable, 3 = numerous spots apparent, some leaf curling, 4 = excessive leaf curling, some defoliation, 5 = severe defoliation. On August 9, 30 cm sub-samples were taken from each row within each treatment plot. The number, length and weight of seedlings was recorded from each sub-sample. ANOVA was conducted with means separated by the

Student-Newman-Keuls test.

RESULTS: Results are summarized in the Table below.

CONCLUSIONS: Visual leaf spot ratings indicated that CYPREX, BENLATE and BENLATE/CAPTAN significantly reduced disease ratings. CYPREX and BENLATE produced significantly taller and heavier seedlings. BENLATE also prevented powdery mildew, whereas the CYPREX did not. Alternate applications of BENLATE and CYPREX are recommended.

Treatment	Rate Kg ai/Ha	Leaf spot rating July 6	Leaf spot rating Oct 9	Number Sdlg/m	Height (cm)	Sdlg DW(g)
BENLATE + CAPTAN	0.55 2.25	2.7b*	2.0c	76.4a	8.8b	0.58b
BENLATE	0.45	2.2c	2.0c	71.4ab	11.0a	0.89a
CAPTAN	1.81	4.7a	3.0c	74.0ab	8.1bc	0.13c
RONILAN	0.71	5.0a	4.7a	66.4ab	7.6bc	0.13c
CYPREX	0.59	2.0c	1.7c	73.9ab	11.1a	0.84a
CHECK	-	5.0a	5.0a	59.0b	7.0c	0.12c

* Means followed by the same letter are not significantly different at the 5% level according to Student-Newman-Keuls test.

#145

CROP: Chrysanthemums, cvr Winter Carnival.

PEST: Fusarium wilt, *Fusarium oxysporum* Schlecht.

TITLE: SOIL-APPLIED FUNGICIDES FOR THE CONTROL OF FUSARIUM WILT IN POTTED CHRYSANTHEMUMS

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MATERIALS: ARREST 75W (carbathiin 20%, oxycarboxin 5%, thiram 50%)
ANCHOR (carbathiin 66.7 g/L, thiram 66.7 g/L)
BENLATE 50WP (benomyl 50%)
ROVRAL 50W (iprodione 50%)
SUBDUE 2G
ASOUT 70WP (thiophanate-methyl 70%)

METHODS: Colonies of F. oxysporum were cultured on Petri dishes containing acidified potato dextrose agar. When the Petri dish was completely colonized, the contents of 20 plates were combined with 1 L of sterilized, distilled water in a waring blender. The mixture was blended until a smooth slurry was formed. The potting medium was inoculated at the equivalent of 100 ml of slurry per pot before potting, by mixing the slurry evenly into the lots of medium. Fungicides were mixed evenly into the potting medium before potting in lots of soil. A 25 ml slurry was made for each fungicide by adding water. Lots of medium were spread out evenly on clean polyethylene and treated with the fungicides using a hand sprayer. The medium was inoculated after being treated with fungicides. Five rooted cuttings were planted per 15cm standard pot on January 29 in a 1:1:1 peat, perlite and vermiculite mix (BX mix, McRichie). Five pots (replicates) were planted for each treatment, and these were arranged in a completely randomized design. Pots were irrigated using a Chapin tube system. Pots were continuously fed at 350 ppm N with 20-20-20 fertilizer containing micronutrients. Plants received 2 weeks of long days and then moved to a 10 hr day and 14 hr night lighting schedule. The plants were pinched on 14 February, and disbudded on 27 March. The number of leaves with visible disease symptoms were counted on 7 April. The mean, total number of leaves per pot are recorded in the table below. The mean fresh per-pot-weight was also recorded at the same time. Flower buds were beginning to open at the time of assessment.

RESULTS: Results are summarized in the Table below.

CONCLUSIONS: While none of the soil treatments provided acceptable control of Fusarium wilt, BENLATE provided some suppression. There was no indication of phytotoxicity with BENLATE applications. ARREST and ANCHOR were phytotoxic, particularly at the higher rates.

TREATMENT	APPLICATION RATE (ml/g product per pot)	MEAN NO. INFECTED LEAVES PER POT	MEAN FRESH WEIGHT GRAMS PER POT
1 ARREST 75W	0.035	40.7 abc*	277.2 bcde
2 ARREST 75W	0.07	34.5 abcd	285.0 bcd
3 ARREST 75W	0.14	33.6 abcd	235.8 efg
4 BENLATE 50WP	0.01	32.5 abcd	258.0 defg
5 BENLATE 50WP	0.02	21.3 d	280.1 bcde
6 BENLATE 50WP	0.04	27.3 bcd	301.8 bcd
7 ANCHOR	0.025	38.6 abc	271.7 cdef
8 ANCHOR	0.05	33.9 abcd	231.5 fg
9 ANCHOR	0.1	37.4 abcd	227.2 g
10 BENLATE 50WP plus ANCHOR	0.02 0.05	26.3 cd	270.0 cdefg
11 ROVRAL 50W	0.02	48.7 a	292.0 bcd
12 ROVRAL 50W	0.04	39.2 abc	268.2 cdefg
13 ROVRAL 50W	0.08	44.6 a	276.7 bcde
14 SUBDUE 2G	0.2	45.1 a	285.0 bcd
15 EASOUT 70WP	0.16	44.1 ab	317.8 b
16 Inoculated control		45.2 a	311.0 bc
17 Non-inoculated control		41.2 abc	371.6 a

* Values followed by the same letter are not significantly different at the 5% level (Duncan's multiple range test)

#146

STUDY DATA BASE:

CROP: Gerbera (Gerbera jamesonii)

PEST: *Phytophthora cryptogea* Pethy. & Laff.

NAME AND AGENCY:
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TITLE: RESIDUAL PROTECTIVE EFFECT OF FUNGICIDAL DRENCHES ON PHYTOPHTHORA ROOT ROT OF GERBERA, 1983

MATERIALS: RIDOMIL 5 WP (Metalaxyl) 0.05 and 0.1 g ai/L
CHEVRON RE 20615 (ofurace, VAMIN 50WP) 0.5 and 1.0 g ai/L

METHODS: Plants grown from crown-root divisions were 9 months old when transferred into 21-cm pots containing approx. 5500 ml of peat:sawdust (1:1) mix supplemented with dolomite and hydrated lime, superphosphate and fritted trace elements. For each treatment six replicate pots were randomized on two greenhouse benches. A liquid fertilizer was applied on a regular basis. Suspensions of the fungicides in water were continuously agitated on a magnetic stirrer and single-300 ml aliquot was drenched onto each of pot of gerbera.

After 7 or 21 days the treated pots were infested with Phytophthora cryptogea grown on a vermiculite-vegetable juice medium. Either 500 ml or 1000 ml of the fungus-permeated vermiculite was suspended in 3 L of water, and this slurry was continuously agitated on a magnetic stirrer. Aliquots of 500 ml of these two densities of fungal slurry were mixed into the surface layer of growing medium around each plant, resulting in a 1.5% of 3% dosage rate of inoculum (v/v).

RESULTS: See table below.

CONCLUSIONS: Of the 24 check untreated plants, 22 died within less than 50 days. The dosage rate of inoculum had little effect on their average length of survival. A single drench of RIDOMIL at 0.1 g ai/L or CHEVRON RE 20615 at 1 g ai/L provided sufficient residual fungitoxicity to protect most gerberas, for the experimental period of 64 or 78 days, from Phytophthora cryptogea introduced up to at least 3 weeks after treatment. A drench of RIDOMIL at only 0.05 g was only slightly less effective, but the lower rate of CHEVRON RE 20615 at 0.5 g provided acceptable residual protection only against the 1.5% dosage rate of inoculum when introduced 7 days, but not 21 days, after the fungicide application.

RESIDUAL PROTECTIVE EFFECT OF FUNGICIDAL DRENCHES ON DISEASE IN POTTED GERBERA IN A SOILLESS MIX SUBSEQUENTLY INFESTED WITH PHYTOPHTHORA CRYPTOGEA

FUNGICIDE	RATE (g ai/L)	NO. DEAD PLANTS/AV. NO. DAYS DEAD PLANTS SURVIVED No. days after drenching to infestation of potted plants: 7*		21*	
		Percent dosage rate of inoculum per pot (v/v)			
		1.5	3	1.5	3
RIDOMIL	0.05	1/68	1/35	0	1/57
	0.1	0	02**	0	0
CHEVRON RE 20615	0.5	0	3/63	2/56	11/56
	1.0	0	2/67	01	0
CHECK	--	6/49	6/42	6/36	6/36

* Max. no. days in experiment after infestation of the pots was 78 and 64 for the 7- and 21-day periods, respectively.

** Superscript numeral refers to the number of living plants with a sub-lethal infection and that survived the max. no. days.

#147

CROP: Lawson cypress, cv. Allumii *Chamaecyparis lawsoniana*

PEST: *Phytophthora cinnamomi* Rands

NAME AND AGENCY:

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TITLE: RESIDUAL PROTECTIVE EFFECT OF FUNGICIDAL DRENCHES OF PHYTOPHTHORA ROOT ROT OF LAWSON CYPRESS, 1982

MATERIALS: RIDOMIL 5 WP (Metalaxyl) 0.05 and 0.1 g ai/L
CHEVRON RE 20615 0.5 and 1.0 g ai/L (available only as a component of Caltan flowable: containing folpet (450 g/L) CHEVRON RE 20615 (60 g/L))

METHODS: Plants grown from rooted cuttings were 16 months old when transferred into 21-cm pots containing approx. 5500 mL of peat:sawdust (1:1) mix supplemented with dolomite and hydrated lime, superphosphate and fritted trace elements. For each treatment six replicate pots were randomized on two greenhouse benches. A liquid fertilizer was applied on a regular basis. Suspensions of the fungicides in water were continuously agitated on a magnetic stirrer and a single 300 mL aliquot was drenched onto each pot of Lawson cypress. After 7 or 21 days the treated pots were infested with Phytophthora cinnamomi grown on a vermiculite-vegetable juice medium. Either 500 mL or 1000 mL of the fungus-permeated vermiculite were suspended in 3 L of water, and this slurry was continuously agitated on a magnetic stirrer. Aliquots of 500 mL of these two densities of fungal slurry were mixed into the surface layer of the growing medium around each plant, resulting in a 1.5% or 3% dosage rate of inoculum (v/v).

RESULTS: See table below.

CONCLUSIONS: Of the 24 check untreated plants, 21 died within less than 90 days, while their average length of survival was 2 to 3 weeks longer at the 1.5% than at the 3% dosage level of inoculum. A single drench of RIDOMIL at 0.1 g ai/L or CHEVRON RE 20615 at 1 g ai/L provided sufficient residual fungitoxicity to protect most Lawson cypress, for the experimental period of 158 or 172 days, from Phytophthora cinnamomi introduced up to at least 3 weeks after treatment. A drench of RIDOMIL or CHEVRON RE 20615 at the lower rates of 0.05 g and 0.5 g, respectively failed to provide acceptable residual protection against the higher level of inoculum introduced 3 weeks after treatment. Seven Lawson cypress drenched with RIDOMIL (four at the lower rate) and nine treated with CHEVRON RE 20615 (eight at the lower rate) survived apparently healthy, but were found to have a sub-lethal infection at the end of the experiment.

RESIDUAL PROTECTIVE EFFECT OF FUNGICIDAL DRENCHES ON DISEASE IN POTTED LAWSON CYPRESS IN A SOILLESS MIX SUBSEQUENTLY INFESTED WITH PHYTOPHTHORA CINNAMOMI

FUNGICIDE	RATE (g ai/L)	NO. DEAD PLANTS/AV. NO. DAYS DEAD PLANTS SURVIVED No. days after drenching to infestation of potted plants 7*		21*	
		Percent dosage rate of inoculum per pot (v/v) 1.5	3	1.5	3
RIDOMIL	0.05	1/148	21/101**	12/146	31/114
	0.1	01	1/123	01	01
CHEVRON RE 20615	0.5	03	12/139	12/125	31/134
	1.0	0	0	01	0
Check	--	51/69	6/55	6/84	6/64

* Max. no. days in experiment after infestation of the pots was 172 and 158 for the 7- and 21-day periods, respectively.
** Superscript numeral refers to the number of living plants with a sub-lethal infection and that survived the max. no. days.

#148

STUDY DATA BASE: 306-1461-9019

CROP: Apple cv. Red Delicious

PEST: European red mite, *Panonychus ulmi*

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TITLE: PERSISTENCE OF APOLLO IN APPLE ORCHARD CANOPY

MATERIALS: APOLLO (clofentezine)

METHODS: Single tree plots of 20 year old Red Delicious apple trees on MM.106 rootstocks were replicated 4 times using a randomized complete block design. Trees were sprayed to runoff using a truck mounted handgun sprayer calibrated to deliver 3800 L/ha at 2800 kPa. APOLLO was applied at the rate of 300 L/ha on June 12 (calyx) or July 24, 1990 (second cover). Samples consisting of 25 fruit bud clusters for calyx spray trees or 50 leaves for second cover spray trees were collected from the outer and inner canopy at intervals following spray. Samples were analyzed for clofentezine residues (method of analysis available on request).

RESULTS: Residue data are presented in the table below.

CONCLUSION: Clofentezine residues in apple foliage persisted at measurable levels throughout the sampling period. Residues declined more rapidly following APOLLO application on June 12 than on July 24, perhaps due to growth dilution effects.

Table 1. Mean residue of clofentezine in apple foliage at intervals following APOLLO spray.

Treatment	Rate (ml/ha)	Residue in apple foliage (mg/kg fresh weight) Days after application 0	1	2	4	8	16	32	64
APOLLO*	27	12.8	-	7.65	-	5.22	3.06	-	1.14
APOLLO**	27	6.63	-	6.83	-	3.17	3.48	-	2.60
APOLLO***	27	11.0	9.53	11.6	11.5	9.97	6.56	4.37	1.68
APOLLO****	27	12.6	9.04	8.84	9.30	9.12	6.32	5.93	3.09

* applied June 24, samples from outer canopy.
** applied June 24, samples from inner canopy.
*** applied July 24, samples from outer canopy.
**** applied July 24, samples from inner canopy.

#149

ICAR: 84100761

CROP: Carrots var. Cellopak

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TITLE: PESTICIDE RESIDUE IN CARROTS AS A RESULT OF FOLIAR TREATMENT

MATERIALS: CYMBUSH/(R) 250 EC (cypermethrin)

METHODS: The tests were done at the Holland Marsh on muck soil. Carrots were planted with a Stan-Hay precision seeder in a bed of three, double rows, 15 m long. The treatments were applied at a rate of 500 L/ha with a tractor-mounted sprayer. Cypermethrin was applied three times at weekly intervals at the rate of 0.07 kg active/ha. The crop was sampled at various intervals by pulling about 14 carrots, topping and sending the roots for analysis. Samples were analyzed for residue (method of analysis available on request).

RESULTS: As presented in the table below.

CONCLUSION: For control of carrot rust fly the recommended post-harvest interval for cypermethrin is 35 days. This pre-harvest interval appears unreasonably long since no residue was detected in harvested roots immediately after application or at anytime during the subsequent 14 days.

Residue of cypermethrin in carrots when the insecticide was applied twice at weekly intervals.*

Days after 2nd application	Residue in carrots (mg/kg) cypermethrin
0	ND**
1	ND
3	ND
7	ND
10	ND
14	ND

* Treated September 9 and 16, 1991.
** ND = not detected; level of detection 0.01 mg/kg.

#150

ICAR: 84100761

CROP: Cauliflower var. Andes

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TITLE: FUNGICIDE RESIDUE IN COLE CROPS

MATERIALS: ROVRAL/(R) 50 WP (iprodione)

METHODS: Cauliflower were transplanted in four-row plots, 15 m long, replicated four times. The treatment was applied at the rate of 800 L of liquid/ha with a tractor-mounted sprayer. ROVRAL was applied three times at weekly intervals at the rate of 0.75 kg active/ha. The crop was treated prior to harvest and sampled at various intervals during harvest maturity. Samples were analyzed for residue (methods of analysis available on request).

RESULTS: As presented in the table below.

CONCLUSIONS: Initial residue of iprodione in cauliflower was 4.15 mg/kg and decreased to 1.04 mg/kg by day 15. Low levels of iprodione metabolites wree also observed. Residues were higher than in previous studies because the cauliflower was not wrapped during application. Residue of iprodione in cauliflower when the fungicide was applied three times at weekly intervals prior to harvest.*

Days after 3rd application	Residue in cauliflower (mg/kg)
1	4.15a**
3	4.55a
7	1.80b
10	1.70b
15	1.04b

* Treated September 4, 9 and 16, 1991.
** Means followed by the same letter are not significantly different (P>0.05) according to Duncan's Multiple Range Test.

#151

ICAR: 84100761

CROP: Romaine lettuce cv. Parris Island

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TITLE: FUNGICIDE RESIDUES IN EARLY AND LATE SEASON LETTUCE FOLLOWING APPLICATION OF MANEB

MATERIALS: MANEB 80 WP

METHODS: In June, July and August Romaine lettuce was transplanted on muck soil. Each plot consisted of 16 rows of 8 m (July and August) or 8 rows of 15 m (June). The treatments were applied at the rate of 400 L/ha at 500 kPa with a tractor-mounted sprayer. Maneb was applied at weekly intervals at the rate of 1.8 kg active/ha. The crop was treated prior to harvest and sampled at various intervals when the crop was mature. In October with the slow growth of the lettuce the crop was sampled when the heads were smaller (15 cm) than commercial heads. Each treatment was replicated four times. Samples were analyzed for residue (methods of analyses available on request).

RESULT: As presented in the table below.

CONCLUSIONS: In July and August when warm temperatures prevailed and lettuce were mature at harvest, residue of maneb (zineb equivalent EBDC) was lower than in October when temperatures were low and the lettuce was smaller at harvest. In each of the three tests the residue of maneb was below the permitted maximum residue level (7 mg/kg) by the recommended pre-harvest interval of 10 days.

Residue of maneb (zineb equivalent EBDC) in lettuce when the fungicide was applied at weekly intervals.

Residue in lettuce (mg/kg).*

Days after application	July**	August**	October**
0	14.8a***	8.4ab	23.0a
1	13.0a	10.1a	23.8a
2,3	12.0ab	5.8b	9.3b
7	4.9bc	2.2c	7.0b
9,10	2.9c	0.91c	4.5b
14	1.6c	1.1c	3.5b
21	0.58c	1.7c	3.4b

* Zineb eq EBDC.
** Treated July 2, 8 (July); July 22, 29 and August 6 (August); September 3, 9, 16, 23 and October 1 (October).
*** Means followed by the same letter are not significantly different (P=0.05) according to Duncan's Multiple Range Test.

#152

ICAR: 84100761

CROP: Romaine lettuce cv. Parris Island

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TITLE: FUNGICIDE RESIDUE IN ROMAINE LETTUCE

MATERIALS: MANEB 80 WP

METHODS: Romaine lettuce was transplanted on muck soil. Each plot consisted of 16 rows of 8 m. The treatments were applied at the rate of 400 L/ha at 300 kPa or 500 kPa with a tractor-mounted sprayer. Maneb was applied five times at weekly intervals at the rate of 0.9, 1.8 or 3.6 kg active/ha. Because of the slow growth of the lettuce the crop was sampled when the heads were smaller (15 cm) than commercial heads. Each treatment was replicated four times. Samples were analyzed for residue (methods of analyses available on request).

RESULT: As presented in the table below.

CONCLUSIONS: Residues of maneb (zineb eq EBDC) after application of the recommended rate (1.8 kg ai/ha) and 1/2 recommended rate (0.9 kg ai/ha) were below the permitted maximum residue level of 7 mg/kg by the recommended pre-harvest interval of 10 days. When twice the recommended rate of maneb (3.6 kg ai/ha) and the lower pressure of application (300 kPa) was used residues were above the permitted maximum residue level by the recommended pre-harvest interval of 10 days and did not decline below 7 mg/kg until 21 days.

Residue of maneb in lettuce when the fungicide was applied five times at weekly intervals at different pressures and rate.*

Days after 5th application	Residue in lettuce (mg/kg)**			
	500 kPa 1.8 kg ai/ha	300 kPa 1.8 kg ai/ha	500 kPa 0.9 kg ai/ha	500 kPa 3.6kg ai/ha
0	23.0a***	34.3b	7.9a	46.5a
1	23.8a	50.3a	8.6a	27.8b
3	9.3b	20.3c	4.4b	14.5c
7	7.0b	16.0cd	2.9cb	12.5cd
9	4.5b	11.1cd	2.5cb	7.7cd
14	3.5b	10.8cd	2.6cb	9.4cd
21	3.4b	6.8d	1.7c	4.8d

* Treated September 3, 9, 16, 23 and October 1.
** Zineb eq EBDC.
*** Means followed by the same letter are not significantly different (P=0.05) according to Duncan's Multiple Range Test.

#153

STUDY DATA BASE: 348-1461-4802

CROP: Apple

PEST: Dogwood borer, *Synanthedon scitula* Harris

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TITLE: EVALUATION OF PHEROMONE LURES FOR MONITORING DOGWOOD BORER ON APPLE

MATERIALS: Clearwing borer lures (CWB L103, Scentry Inc., Buckeye, Arizona, USA 85326-0090), peach tree borer (GPTB, Trece Inc. Salinas, California, USA 93915), and dogwood borer (DWB L119 and DWB, Z, Z -3, 13-octadecadienyl acetate, Scentry Inc., 3 different batch lots).

METHODS: Commercially prepared lures for monitoring dogwood borer were evaluated in commercial blocks of apple trees in the Beaver Valley (BV), Collingwood (CW) and Vittoria (Vitt) areas and research orchards at the Smithfield Experimental Farm (SEF). Trees were of several cultivars on semidwarf or dwarf sized rootstocks and were known to be infested with dogwood borer. Monitoring was conducted in 1989 and 1990 using Pherocon II or Multi-pher (Vitt site only) traps. Two or four traps per orchard were hung in the lower part of the tree, approximately 0.5 m to 1.4 m above ground level, depending on the orchard, from mid-June until late August. Traps were checked twice weekly, and pheromone lures were replaced after six weeks in the orchard. The data were analyzed using a randomized complete block design and Duncan's multiple range test at the 0.05 significance level.

RESULTS: Traps baited with DWB lures caught moths from 4 to 42 days earlier compared to traps baited with GPTB or CWB lures, depending on the orchard. Traps baited with DWB lures caught S. scitula later in the year than traps baited with the other lures. No lures were specific for S. scitula. Other clearwing moths were caught in all traps. Data for S. scitula catches are shown in the tables below. In 3 of the 4 orchards monitored the traps baited with DWB L119 lures caught significantly (P=0.05) more S. scitula compared to traps with the GPTB lure (Table 1). The DWB lures were also more effective in trapping S. scitula in the SEF orchard in 1990 compared to the GPTB lures (Table 2). Traps baited with the DWB lure or the DWB L119 lure (1990) were more effective than the CWB L103 lure in attracting S. scitula. Differences in performance of the DWB lures and differences from year to year indicate the need for careful quality control to ensure uniformity between batches of lures.

CONCLUSIONS: The DWB L119 lure is useful for determining first moth flight, peak periods of flight activity and length of flight period which may be used to time control sprays.

TABLE 1. Mean number of dogwood borer moths per trap, 1989.

	Orchard			
	SEF	BV	CW	Vitt
Dates	10/07-27/07	29/06-14/08	04/07-08/08	26/06-21/08
Lure				
DWB L119	0.4a*	2.2 a	1.5 a	3.8 a
GPTB	0.1a	0.8 b	0.05 b	0.0 b
Std. error	0.2	0.5	0.2	0.7

* Means followed by the same letter within each column are not significantly different ($P<0.05$, Duncan's Multiple Range Test). Two traps for each lure in each orchard.

TABLE 2. Mean number of dogwood borer moths per trap at SEF.

Dates	1989 04/07-17/08	1990 03/07-14/08
Lure		
DWB	23.0 a*	5.0 b
DWB L119	6.0 b	11.3 a
CWb L103	0.8 b	0.3 c
Std. error	3.7	0.3

* Means followed by the same letter within each column are not significantly different ($P<0.05$, Duncan's Multiple Range Test). Four traps for each lure in each orchard.

PESTICIDE AND CHEMICAL DEFINITIONS

PESTICIDE	ALTERNATIVE DESIGNATION(S)
1,3-dichloropropene	TELONE; TELONE II-B
A-815	triflumizole
A0201	imazalil
ABAMECTIN	avermectin b1; AVID
ABG-6149	B. thuringiensis Berliner
ABG-6162	thuringiensin
ABG-6198	B. thuringiensis Berliner
ABG-6228	thuringiensin
ABG-6263	DITERA, delta-endotoxin of B.t.
ABG-6271	delta-endotxin of B.t.; DITERA
ABG-6275	B. thuringiensis tenebrionis
AC 290,230	unknown
AC 290,678	unknown
AC 301,467	terbufos; COUNTER
AC 303,630	confidential
AC 801,352	unknown
ACECAP	acephate
acephate	ORTHENE; ORTHO-12-420; TF-3553; TF-3670; ACECAP
ACR-3453A	unknown
ACR-3675	pyrifenox
ACR-3815	mancozeb + pyrifenox
acrinathrin	RU-38702
ACTIDIONE TGF	cycloheximide
ACTIDIONE-THIRAM	cycloheximide + thiram
AFUGAN	pyrazophos
AGSURF	surfactant
AGRAL 90	nonylphenolethylene oxide
AGRIKELP	unknown
AGRI-MYCIN 17	streptomycin
AGRI-STREP	streptomycin
AGRIMYCIN 17	streptomycin
AGRISTREP	streptomycin
AGROSOL	captan + thiabendazole; AGROSOL FLOWABLE
AGROSOL POUR-ON	thiram + thiabendazole; AGROSOL T
AGROX	maneb
AGROX 16	mancozeb
AGROX B-3	B-3
AGROX C	ethylmercuric chloride + phenylmercuric acetate
AGROX DL PLUS	captan + diazinon + lindane
AGROX D-L-M	diazinon + lindane + metalaxyl
AGROX DB	maneb
AGROX DUST	maneb
AGROX FLOWABLE	maneb
AGROX NM	maneb
AGROX SEED PIECE DUST	mancozeb
AGROX-12	mancozeb
AGROX-16	mancozeb
AGSCO DB GREEN	lindane + maneb
AGSCO DB RED	lindane + maneb
AH-87600	cypermethrin + diazinon
aldicarb	TEMIK
aldoxycarb	STANDAK; UBI-2496
ALIETTE	fosetyl-al
ALIETTE EXTRA	fosetyl-al + captan + thiabendazole
allidochlor	RANDOX
alphamethrin	cypermethrin-alpha; FASTAC
ALSYSTIN	triflumuron
aluminum phosphide	GASTOXIN; hydrogen phosphide; phosphine; PHOSTOXIN

AMAZE	isofenphos
AMAZE SEED TREATER	carbendazim + isofenphos + thiram
AMBUSH	permethrin
AMIBEN	chloramben
amitraz	BAAM; MITAC
ammonium sulphamate	AMMATE; AMMONIUM SULFAMATE; AMS
ANCHOR	carbathiin + thiram; UBI-2359-1; UBI-2359-2
anilazine	DYRENE
ANVIL	hexaconazole
APM	azinphos-methyl
APOLLO	clofentezine
APRON	metalaxyl
APRON 35	metalaxyl
APRON 350	captan + metalaxyl
APRON 70	captan + metalaxyl
APRON-T	metalaxyl + thiabendazole
AQUA	parathion
ARRESIN	monolinuron
ARREST	carbathiin + oxycarboxin + thiram
ASC-66518	unknown
ASC-66792	unknown
ASC-66825	unknown
Ascophyllum nodosum extract	MICRO-MIST; KELP EXTRACT
ASSIST OIL	dormant oil
ASIMINA TRILOBA BARK EXTRACT	Paw Paw bark extract
ASIMICIN	Paw Paw bark extract
ATROBAN	permethrin
ATROBAN DELICE POUR-ON	permethrin
AVADEX	diallate
AVADEX BW	triallate
avermectin b1	ABAMECTIN; AVID; MK-936
AVID	avermectin b1; ABAMECTIN
AXIS OIL	emulsifiable spray oil
AXIS SPRAY OIL	emulsifiable spray oil
AZADIRACHTA INDICA EXTRACT	NEEM
azadirachtin	NEEM; MARGOSAN-O
azinphos-methyl	APM; GUTHION
AZTEC	cyfluthrin + MAT-7484
B-3	captan + diazinon + lindane; AGROX B-3; CHIPMAN B-3
B. thuringiensis Berliner	ABG-6149; ABG-6198A; EG-2371
B. thuringiensis israelensis	VECTOBAC
B. thuringiensis Kurstaki	B. thuringiensis Berliner Kurstaki; Bacillus thuringiensis Kurstaki; BACTOSPEINE; BACTOSPEINE-A; DIPEL; FUTURA; MYX 2284; MYX 7275; CELLCAP; CUTLASS; MVP BIOINSECTICIDE; FOIL; JAVELIN; THURICIDE-HPC
B. thuringiensis san diego	M-ONE; M-ONE MYD; MYX 1806; MYX 9852
B. thuringiensis tenebrionis	SAN-418; TRIDENT; ABG-6263; ABG-6275
BAAM	amitraz
BACILLUS THURINGIENSIS KURSTAKI	B. thuringiensis Kurstaki; CGA-237218
BACTOSPEINE	B. thuringiensis Kurstaki
BACTOSPEINE-A	B. thuringiensis Kurstaki
BANNER	propiconazole
BANTROL	ioxynil
BANVEC	dicamba
BANISECT	chlorpyrifos
BAS-152	dimethoate
BAS-263	cloethocarb
BAS-276	benzamorf
BAS-389	furmecyclox
BAS-436	BCI-100F; confidential
BAS-9028	fenproprathrin; DANITOL

BAS-9102	benfuracarb; ONCOL
BASAMID	dazomet
BASAGRAN	bentazon
BASF-166801	BASF-LAB-166801; LAB-166801
BASUDIN	diazinon
BAY-FCR-1272	cyfluthrin
BAY-HWG-1608	ethyltrianol; FOLICUR; HWG-1608; tebuconazole; ELITE
BAY-KWG-0519	triadimenol
BAY-MAT-7484	phosetbupirim
BAY-NTN-19701	MONCEREN; NTN-19701
BAY-NTN-33893	NTN-33893; imidacloprid
BAY-SIR-8514	triflumuron
BAY-SLJ-0312	flubenzimine; CROPOTEX
BAYCOR	bitertanol
BAYLETON	triadimefon
BAYOFLY	cyfluthrin
BAYTAN	triadimenol
BAYTAN UNIVERSAL	fuberidazole + imazalil + triadimenol
BAYTHROID	cyfluthrin
BAS-436	confidential
BEE SCENT	Bee pheromones
BELMARK	fenvalerate
benalaxyl	GALBEN; TF-3651; TF-3772; TF-3773
bendiocarb	FICAM; TRUMPET
BENESAN	lindane
benfuracarb	ONCOL; BAS-9102
BENLATE	benomyl
benodanil	CALIRUS
BENOLIN R	benomyl + lindane + thiram
BENOLIN R FS	carbendazim + lindane + thiram
benomyl	BENLATE
bentazon	BASAGRAN
benzamorf	BAS-276
BERET	fenpiclonil; CGA-142705
BETA-EXOTOXINE DE B.T.	thuringiensin
BHC	lindane
bifenthrin	BRIGADE; CAPTURE; FMC-54800; TALSTAR
BILOXAZOL	bitertanol
BIOFILM	surfactant
BIRLANE	chlorfenvinphos
bitertanol	BAYCOR; BILOXAZOL
BLADEX	cyanazine
BLOTIC	propetamphos
bordeaux mixture	calcium hydroxide + copper sulphate
BOTRAN	dichloran
BOVAID	fenvalerate
BOVITECT	permethrin
BRAVO	chlorothalonil
BRAVO 500	chlorothalonil
BRAVO 720	chlorothalonil
BRAVO 90DG	chlorothalonil
BRAVO S	chlorothalonil + sulphur
BRAVOSAN	chlorothalonil + oxadixyl
BRIGADE	bifenthrin
brodifacoum	VOLID
bromoxynil	PARDNER
BROOT	trimethacarb
BUCTRIL M	bromoxynil + MCPA
bupirimate	NIMROD
BUSAN 30	TCMTB
BUTACIDE	piperonyl butoxide
C-I-L LAWN FOOD AND INSECT CONTROL	chlorpyrifos
C-I-L LAWN FUNGICIDE	chlorothalonil
CAG-1009	benomyl + thiram

CAG-1013	benomyl + thiram
CALIRUS	benodanil
CALIXIN	tridemorph
CAN-O-JET	unknown
CANOCOTE COMMERCIAL COAT	methyl cellulose
CANOCOTE MICROPELLET	methyl cellulose
CANPLUS 411	unknown oil
captafol	DIFOLATAN
captan	ORTHOCIDE
CAPTURE	bifenthrin
carbaryl	SEVIN; SEVIN XLR; SEVIN XLR PLUS; UCSF-27; UCSF-40
carbathiin	UBI-1373; UBI-2092; UBI-2100; UBI-2100-2; UBI-2106; UBI-2151; UBI-2406; UBI-2408; UBI-2436-1; UBI-2492; VITAFLO 250; VITAVAX; VITAVAX 2100; VITAVAX 75W;
carbendazim	DELSENE; DPX-965; MBC
carbofuran	FURADAN; FURADAN 350; FURADAN CR-10; UBI-2501
CARPOVIRUSINE	granulosis virus
CARZOL	formetanate
CASCADE	WL-115110; flufenoxuron
CC-16238	diniconazole
CC-16239	diniconazole
CC-16348	diniconazole
CC-16359	diniconazole
CC-16378	diniconazole
CC-16394	diniconazole
CC-16461	diniconazole
CC-16462	diniconazole
CC-16464	diniconazole
CC-16481	diniconazole
CC-16488	diniconazole
CC-16864	diniconazole
CC-16866	diniconazole
CC-16867	diniconazole
CC-16860	diniconazole
CC-16896	diniconazole
CC-16882	diniconazole
CD-351	mineral oil-adjuvant
CD-352	mineral oil-adjuvant
CD-353	mineral oil-adjuvant
CELLCAP	MCAP; M-CAP; MYX 7275; MVP BIOINSECTICIDE
CERONE	ethephon
CGA-453	confidential
CGA-12223	isazofos; MIRAL
CGA-64250	propiconazole
CGA-64251	etaconazole
CGA-72662	cyromazine
CGA-73102	furathiocarb
CGA-142705	fenpiclonil; BERET
CGA-169374	difenoconazole; DRAGAN; DIVIDEND
CGA-184699	unkown
CGA-237218	Bacillus thuringiensis kurstaki
CGF-4280	NNF-136
CHARGE	cyhalothrin-lambda; lambda-cyhalothrin
CHITINE	adjuvant
chinomethionat	MORESTAN
CHIPMAN B-3	B-3
CHITOSAN	a chitin derivative
chloramben	AMIBEN
chlorbromuron	CHLOROBROMURON; MALORAN
chlordane	ASPON; BELT; CHLORDAN
clorethoxyfos	FORTRESS; DPX-42989
chlorfenvinphos	BIRLANE
CHLORINE BLEACH	sodium hypochlorite

chlormequat	CYCOCEL; CYCOCEL EXTRA
chloroneb	TERSAN SP
chlorophacinone	ROZOL
chlorothalonil	BRAVO; BRAVO 500; BRAVO 720; BRAVO 90DG; C-I-L LAWN FUNGICIDE; DACONIL; DACONIL 2787; TF-9021
chlorpyrifos	C-I-L LAWN FOOD AND INSECT CONTROL; LORSBAN; BANISECT
chlorsulfuron	GLEAN
CITCOP	COPPER SALTS OF ROSIN AND FATTY ACIDS
CITOWETT	CITOWETT PLUS
CITOWETT PLUS	CITOWETT
cloethocarb	BAS-263; LANCE; UBI-2559; UBI-2562
clofentezine	APOLLO; NC-21314
CO-6054	METOMECLAN; TF-3693
CODLEMONE	Codling moth pheromones
CODLING MOTH GRANULOSIS VIRUS	granulosis virus
Codling moth pheromones	CODLEMONE
COPAC	copper
copper	COPAC
copper oxychloride	MICROCOP-50; NIAGARA FIXED COPPER
copper salts of rosin and fatty acids	TENN-COP; CITCOP
COPPER SPRAY	tribasic copper sulphate
copper sulphate	COPPER SULFATE
CORBEL	fenpropimorph
CORN OIL	adjuvant
COUNTER	terbufos
CPGV	CODLING MOTH GRANULOSIS VIRUS
cresol	M-CRESOL; META-CRESOL
CUBE	rotenone
CULTAR	paclobutrazol
CUTLASS	Bacillus thuringiensis
cupric hydroxide	COPPER HYDROXIDE; KOCIDE; KOCIDE 101
cyanazine	BLADEX
cycloheximide	ACTIDIONE TGF
CYCOCEL	chlormequat
CYCOCEL EXTRA	chlormequat
cyfluthrin	BAY-FCR-1272; BAYOFLY; BAYTHROID
CYGON	dimethoate
CYGUARD	phorate + terbufos
cyhalothrin	GRENADE; PP-563
cyhalothrin-lambda	CHARGE; ICIA-0321; KARATE; PP-321
cyhexatin	PLICTRAN
CYMBUSH	cypermethrin
cypermethrin	CYMBUSH; DEMON; RIPCORD; STOCKAID
cypermethrin-alpha	ALPHAMETHRIN; FASTAC; WL-85871
CYPREX	dodine
cyromazine	CGA-72662; LARVADEX; TRIGARD
cyproconazole	SAN 619; UBI-2565; UBI-2575
CYTHION	malathion
D-D	1,2-dichloropropane + 1,3-dichloropropene
DACONIL	chlorothalonil
DACONIL 2787	chlorothalonil
DANITOL	fenpropathrin; BAS 9082
DASANIT	fensulfothion
dazomet	BASAMID
DECIS	deltamethrin
DELSENE	carbendazim
delta-exotoxin of B.t.	B.t. delta-exotoxine; EG-2158
delta-endotoxin of B.t.	ABG-6263; ABG-6271; DITERA; M-ONE PLUS
deltamethrin	DECIS
demeton	SYSTOX
DEMON	cypermethrin
DERITOX	rotenone
DERRIS	rotenone

DEVRINOL	napropamide
DEXON	fenaminosulf
DI-BETA	thuringiensin
DI-SYSTON	disulfoton
diallate	AVADEX
diatomaceous earth	DIATOMACEOUS SILICA
diazinon	BASUDIN; DIAZOL; TF-5304; UBI-2291
DIAZOL	diazinon
DIBROM	naled
dichlone	PHYGON
dichloran	BOTRAN
dichlorvos	VAPO
diclofop-methyl	HOE-GRASS; HOELON
dicofol	KELTHANE
dienochlor	PENTAC AQUAFLOW
difenoconazole	CGA-169374; DIVIDEND; DRAGAN
diflubenzuron	DIMILIN
DIFOLATAN	captafol
diiodomethyl-para-tolyl sulphone	GUS-2000; GUS-4002
DIKAR	dinocap + mancozeb
dimethoate	BAS-152-47; CYGON; FMC; FMC-267; HOPPER-STOPPER
DIMILIN	diflubenzuron
diniconazole	CC-16238B; CC-16239; CC-16239A; CC-16348; CC-16359; CC-16378; CC-16394; CC-16461; CC-16462; CC-16464; CC-16481; CC-16488; SPOTLESS; XE-779; XE-779L
dinitro	dinoseb
dinocap	KARATHANE
dinoseb	DOW POTATO TOPKILLER; dinitro
DIPEL	B. thuringiensis Kurstaki
DIPEL LDM	B. thuringiensis Kurstaki
diphacinone	RAMIK BRUN
diphenamid	ENIDE
diphenylamine	DPA
disulfoton	DI-SYSTON
DITERA	ABG-6263; ABG 6271; delta-endotoxin of B.t.
DITHANE DF	mancozeb
DITHANE DG	mancozeb
DITHANE F-45	mancozeb
DITHANE M-45	mancozeb
DITHANE M45	mancozeb
DIVIDEND	difenoconazole; DRAGAN; CGA-169374
dodemorph	MELTATOX
dodine	CYPREX; EQUAL
DOW POTATO TOPKILLER	dinoseb
DOWCO 163	nitrapyrin
DOWCO 429X	DOWCO 429
DOWCO 429	DOWCO-429X; XRD-429
DOW 444	unknown
DOWCO-473	hexafluron; XRD 473
DOWICIDE A	sodium 2-phenylphenoxide
DPA	diphenylamine
DPX-4424	procymidone
DPX-965	carbendazim
DPX-H6573	flusilazole
DPX-Y5893	hexythiazox
DRAGAN	DIVIDEND; difenoconazole; CGA-169374
DRIE-DIE NO. 67	silica aerogel
DS-64220	chlorothalonil + copper
DS-64221	chlorothalonil + copper
DYFONATE	fonofos
DYLOX	trichlorfon
DYRENE	anilazine
EASOUT	thiophanate-methyl

EASOUT POTATO SEED PIECE TREATMENT	diazinon + thiophanate-methyl
ECTIBAN	permethrin
EF-453	chlorpyrifos + cypermethrin
EFOSITE-AL	fosetyl-al; ALIETTE
EG-2158	delta-exotoxin of B.t.
EG-2371	B. thuringiensis Berliner
EL-11-1C-223	nuarimol
EL-222	fenarimol
EL-228	nuarimol
EL-228/FN-5116	nuarimol
EL-228/IIIC-223-2	nuarimol
EL-5261	ethalfluralin + trifluralin
EL-FN-5116	nuarimol
EL-FN-7011	nuarimol
ELITE	tebuconazole
EMBARK	mefluidide
emulsifiable spray oil	AXIS OIL; AXIS SPRAY OIL; SUNSPRAY
endosulfan	THIODAN
ENIDE	diphenamid
ENTICE	feeding stimulant
EPIC	furmecyclox
EPTC	S-ethyl dipropylthiocarbamate
EQUAL	dodine
esfenvalerate	HALMARK
ET-611	cypermethrin + diazinon
ET-696	cypermethrin + diazinon
etaconazole	CGA-64251; VANGARD
ethalfluralin	EL-161; SONALAN
ethephon	CERONE
ethion	DIETHION; NIALATE
ethirimol	MILGO E; MILSTEM
ethyltrianol	BAY-HWG-1608; tebuconazole; ELITE; FOLICUR; FOLICOTE
etridiazole	TRUBAN
EVISECT	thiocyclam-hydrogenoxalate
EXP 02022	fosetyl-Al + copper oxychloride
EXP 02164	iprodione
EXP 06003	thiodicarb
EXP-2164B	iprodione
EXP-6003A	thiodicarb
EXP-6043A	unknown
EXP-60145A	confidential
EXP 80287A	unknown
EXP 80290A	unknown
EXP 80362A	unknown
EXP 80363A	unknown
EXP 80364A	unknown
EXP 80365A	unknown
EXP 80366A	unknown
EXP 80367A	unknown
F020	Paw Paw bark extract
famphur	WARBEX
FASTAC	cypermethrin-alpha; alphacypermethrin
FCR-4545	unknown
fenaminosulf	DEXON; LESAN
fenamiphos	NEMACUR; NEMACUR 3
fenarimol	EL-222
fenbutatin oxide	TORQUE; VENDEX
fenethanil	RH-7592
fenitrothion	SUMITHION
fenoxycarb	INSEGAR; RO-13-5223
fenpiclonil	BERET; CGA-142705
fenpropathrin	DANITOL; WL-41706; BAS 9082; S-3206
fenpropimorph	CORBEL; M&B-83; MISTRAL
fensulfothion	DASANIT

fenvalerate	BELMARK; BOVAID
ferbam	FERMATE
FERTILIZER	fertilizers
fertilizers	FERTILIZER
FICAM	bendiocarb
fluazifop-butyl	FUSILADE
fluazinam	IKF-1216; B-1216
flucythrinate	GUARDIAN
flufenoxuron	CASCADE; WL 115110
flusilazole	DPX-H6573; NUSTAR
flutolanil	NNF-136
flutriafol	ICIA-0450; MINTECH; PP-450; TF-3673; TF-3674; TF-3675; TF-3739; TF-3752; TF-3753; TF-3765; TF-3775
fluvalinate	MAVRIK
FMC	dimethoate
FMC-267	dimethoate
FMC-54800	bifenthrin
FN-5116	nuarimol
FOIL	B. thuringiensis Kurstaki
FOLICOTE	tebuconazole
FOLICUR	tebuconazole; BAY-HWG-1608
folpet	PHALTAN
fonofos	DYFONATE; DYFONATE ST
FORCE	tefluthrin
formaldehyde	FORMALIN
FORMALIN	formaldehyde
formetanate	CARZOL
FORTRESS	chlorethoxyfos; DPX-42989
fosetyl-al	ALIETTE; EFOSITE-AL
FR-1069	iprodione + lindane; FR-1069/1
FR-1218/1	fenpropimorph + iprodione
FRANIXQUERRA	sodium dioctyl sulfosuccinate
FRIGATE	mineral oil-insecticide
FUNGAFLOR	imazalil
FUNGAZIL	imazalil
FUNGINEX	triforine
FURADAN	carbofuran
FURADAN 350	carbofuran
FURADAN CR-10	carbofuran
FURADAN SEED TREATER	carbendazim + carbofuran + thiram; FURADAN F1 SEED TREATER; FURADAN ST
FURADAN ST	FURADAN SEED TREATER
furathiocarb	CGA-73102; PROMET
FURAVAX	methfuroxam
furmecyclox	BAS-389; BAS-38905; EPIC
FUSILADE	fluazifop-butyl
FUTURA	B. thuringiensis Kurstaki
FUTURA XLV	B. thuringiensis Kurstaki
G-696	UBI-2421; UBI-2563; metsulfovax
GALBEN	benalaxyl
GALLEX	2,4-xylenol + cresol
GAMMASAN	lindane
GAMMASAN PLUS	benomyl + captan + lindane
GARDO	lindane
GLEAN	chlorsulfuron
granulosis virus	CARPOVIRUSINE; CODLING MOTH GRANULOSIS VIRUS; CPGV; UCB-87
GUARDIAN	flucythrinate
guazatine	PANOCTINE
GUS-2000	diiodomethyl-para-tolylsulphone
GUS-2420	imazalil
GUS-371	oxadixyl
GUS-4002	diiodomethyl-para-tolylsulphone

GUS-4013	metalaxyl
GUS-4043	triadimenol
GUS-4551	oxadixyl
GUS-4700	thiophanate-methyl
GUS-80502	thiodicarb
GUTHION	azinphos-methyl
GX SOAP	soap
HALMARK	esfenvalerate
hexaconazole	ANVIL; ICIA-0523; JF-9480; PP-523; TF-3770; TF-9480
hexafluron	XRD-473; DOWCO-473
hexythiazox	DPX-Y5893; SAVEY
HILLESHOG COMMERCIAL COAT	methyl cellulose
HILLESHOG MICROPELLET	methyl cellulose
HOE-498	unknown
HOE-000522	teflubenzuron
HOE-GRASS	diclofop-methyl
HOELON	diclofop-methyl
HOPPER-STOPPER	dimethoate
HWG-1608	BAY-HWG-1608
hydramethylnon	MAXFORCE
hymexazol	TACHIGAREN
ICIA-0321	cyhalothrin-lambda
ICIA-0450	flutriafol
ICIA-0523	hexaconazole
ICIA-0993	tefluthrin
INCITE	piperonyl butoxide
imazalil	A0201; FUNGAFLOR; FUNGAZIL; GUS-2420; TF-3733; UBI-2420
imidacloprid	BAY-NTN-33893; NTN-33893
IMIDAN	phosmet
INSECTAWAY	diatomaceous earth + feeding attractants
INSECOLO	silicon dioxide
INSECTO	diatomaceous earth + honey + sugars
INSEGAR	RO-13-5223; fenoxycarb
iprodione	ROVRAL; ROVRAL FLO; ROVRAL GREEN EXP 02164; EXP-2164B
ioxynil	BANTROL
ISK 66895L	experimental B.t.
isazophos	CGA-12223; MIRAL; TRIUMPH
isofenphos	AMAZE; OFTANOL; TF-9031
ivermectin	IVOMEC
IVOMEC	ivermectin
JAVELIN	B. thuringiensis Kurstaki
JF-9480	hexaconazole
KARATE	cyhalothrin-lambda; lambda-cyhalothrin; PP-321
KARATHANE	dinocap
kasugamycin	KASUMIN
KELTHANE	dicofol
KEMIRA-9051/3a	carbathiin + carbendazim + imazalil
KILMOR	dimethylamine salts of 2,4-D + dicamba + mecoprop
KOCIDE 101	copper + cupric hydroxide
KORNTROL OIL	mineral-oil adjuvant
KUMULUS S	sulphur
KWG-0519	triadimenol
LAB-166801	BASF-LAB-166801

lambda-cyhalothrin	CHARGE; PP-321
LANCE	cloethocarb
LANNATE	methomyl
LARVADEX	cyromazine
LARVIN	thiodicarb
LENTAGRAN	pyridate
LESAN	fenaminosulf
LIMIT	[(acetylamino)methyl]chlor(diethyl-phenyl)acetamide
lindane	BENESAN; BHC; GAMMASAN; GARDO; STOCKPEST
LIQUIDUSTER	permethrin
LORSBAN	chlorpyrifos
LORSBAN 20	captan + chlorpyrifos
M&B FLOWABLE SULPHUR	sulphur
M&B MICRO-NIASUL	sulphur
M&B-83	fenpropimorph
M-CAP	MCAP; CELLCAP; B. thuringiensis Kurstaki
MCAP	CELLCAP; B. thuringiensis Kurstaki; M-CAP
M-ONE	B. thuringiensis san diego
M-ONE MYD	B. thuringiensis san diego
M-ONE PLUS	delta-endotoxin of B.t.
MAINTAIN	maleic hydrazide
malathion	CYTHION
maleic hydrazide	MAINTAIN; ROYAL
MALORAN	chlorbromuron
mancozeb	AGROX 16; AGROX SEED PIECE DUST; AGROX-12; AGROX-16; DITHANE DF; DITHANE DG; DITHANE F-45; DITHANE M-45; DITHANE M45; MANZATE 200; TF-3664; TF-3664 SEED PIECE TREATMENT; TF-3692; TF-3710; TUBERSEAL
maneb	AGROX; AGROX DB; AGROX DUST; AGROX FLOWABLE; AGROX NM; MANZATE; TF-3591; TF-3767
MANZATE	maneb
MANZATE 200	mancozeb
MARGOSAN-O	azadirachtin
MAVRIK	fluvalinate
MAXFORCE	hydramethylnon
MBC	carbendazim
mefluidide	EMBARK
MELTATOX	dodemorph
mepronil	SDS-45037
MERCURIC BICHLORIDE	mercuric chloride
mercuric chloride	MERCURIC BICHLORIDE
MERGAMMA DB	ethylmercuric chloride + lindane + phenyl mercuric acetate
MERGAMMA NM	lindane + maneb
MERSIL	mercuric chloride + mercurous chloride
MERTECT	thiabendazole
MESUROL	methiocarb
metalaxyl	APRON; APRON 35; APRON-FL; GUS-4013; RIDOMIL; SUBDUE; TF-3740; UBI-2379; UBI-2461
metam-sodium	VAPAM
METASYSTOX-R	oxydemeton-methyl
methamidophos	MONITOR
methfuroxam	FURAVAX
methidathion	SUPRACIDE
methiocarb	MESUROL
methomyl	LANNATE
methoxychlor	MARLATE; METHOXY-DDT
methyl bromide	METH-O-GAS
methyl cellulose	CANOCOTE COMMERCIAL COAT; CANOCOTE MICROPELLET; HILLESHOG COMMERCIAL COAT; HILLESHOG MICROPELLET

metiram	POLYRAM
METOMECLAN	CO-6054
metsulfovax	G-696; UBI-2421; UBI-2563
metribuzin	SENCOR; SENCOR 500
mevinphos	PHOSDRIN
mexacarbate	UCZF-14; UCZF-15; ZECTRAN
MICRO-MIST	KELP EXTRACT; Ascophyllum nodosum extract
MICRO-NIASUL	sulphur
MICROCOP-50	copper oxychloride
MICROSCOPIC SULPHUR	sulphur
MICROTHIOL SPECIAL	sulphur
MILCAP	captafol + ethirimol
MINERAL OIL	mineral oil-adjuvant
mineral oil-adjuvant	CD-351; CD-352; CD-353; CD-353A; MINERAL OIL; KORNTROL OIL
mineral oil-insecticide	FRIGATE; OIL CONCENTRATE
MINTECH	flutriafol
MINTOX	methoxychlor + potassium oleate
MIRAL	CGA-12223; isazophos
MISTRAL	fenpropimorph
MITAC	amitraz
MK-936	avermectin b1
molybdenum	MOLY
MONCEREN	BAY-NTN-19701; pencycuron
MONCUT	NNF-136
MONITOR	methamidophos
monolinuron	ARRESIN
MORESTAN	chinomethionat
myclobutanil	NOVA; RH-3866; S-3206; SYSTHANE; UBI-2454; UBI-2454-1; UBI-2454-2; UBI-2497; UBI-2561;
MVP BIOINSECTICIDE	CELLCAP; M-CAP; MCAP; MYX 7275; B. thuringiensis Kurstaki
MYX-1806	B. thuringiensis san diego; SPUD-CAP
MYX-2284	B. thuringiensis Kurstaki
MYX-7275	MVP BIOINSECTICIDE; B. thuringiensis Kurstaki
MYX-9858	B. thuringiensis san diego
naled	DIBROM
napropamide	DEVRINOL
NC-21314	clofentezine
NEEM	azadirachtin; AZADIRACHTA INDICA EXTRACT; AZADIRACHTIN SOLUTION 1; AZADIRACHTIN SOLUTION 2; NEEM SOLUTION 1; NEEM SOLUTION 2; NEEMIX; SAFERS NEEM INSECTICIDE; SNI OIL
NEEMIX	NEEM
NEMACUR	fenamiphos
NEMACUR 3	fenamiphos
NIAGARA FIXED COPPER	copper oxychloride
NIMROD	bupirimate
NIP	TOK;nitrofen
nitrofen	NIP;TOK;TRIZILIN
nitrapyrin	DOWCO 163; 2-chloro-6(trichloromethyl) -pyridine
NNF-136	CGF-4280; flutolanil; MONCUT
NO-DAMP	oxine benzoate
nonylphenolethylene oxide	AGRAL 90
NOVA	myclobutanil
NTN-19701	BAY-NTN-19701
NTN-33893	BAY-NTN-33893; imidacloprid
NU-FILM	adjuvant
nuarimol	EL-11-1C-223; EL-228; EL-228/FN-5116; EL-228/IIIC-223-2; EL-FN-5116; EL-FN-7011; FN-5116; TF-3582; TF-3610;

	TF-3611; TF-3644; TF-3645; TF-3646; TF-3672; TRIMIDOL
nurelle	chlorpyrifos + cypermethrin
NUSTAR	flusilazole
OFTANOL	isofenphos
ofurace	RE-20615; VAMIN
OIL CONCENTRATE	mineral oil-insecticide
OKANAGAN DORMANT OIL	okanagan oil
OMITE	propargite
ONCOL	benfuracarb; BAS-9102
ORBIT	propiconazole
ORTHENE	acephate
ORTHO-12-420	acephate
ORTHOCIDE	captan
OSECO REGENT	VITAVAX RS
oxadixyl	GUS-371; GUS-4551; SAN-371
oxamyl	VYDATE
oxine benzoate	NO-DAMP
oxycarboxin	PLANTVAX
oxydemeton-methyl	METASYSTOX-R; METASYSTOX R2
oxyfenthiin	P-368; UBI-P368
P-368	oxyfenthiin
paclobutrazol	PP-333; CULTAR
PANOCTINE	guazatine
PANOCTINE PLUS	guazatine + imazalil
parathion	AQUA
PARDNER	bromoxynil
Paw Paw bark extract	ASIMINA TRILOBA BARK EXTRACT; ASIMICIN; F020
PCNB	quintozene
penconazole	TOPAS
pencycuron	MONCEREN
PENTAC AQUAFLOW	dienochlor
PERECOT	mixed copper oxides
PERMECTRIN	permethrin
permethrin	AMBUSH; ATROBAN; ATROBAN DELICE POUR-ON; BOVITECT; ECTIBAN; PERMECTRIN; POUNCE; SANBAR; LIQUIDUSTER
petroleum oil	SUNSPRAY OIL; VOLCK DORMANT OIL; VOLCK OIL
PFIZER	lindane
PHALTAN	folpet
phenylmercuric acetate	ERAD; PMA; PMAS; SCOTTS F96; SCOTTS S804
PHEROCON 1CP	attractant
phorate	THIMET
phosalone	ZOLONE
PHOSDRIN	mevinphos
phosetbupirim	BAY-MAT-7484
phosmet	IMIDAN
PHYGON	dichlone
PHYTOSOL	trichlonate
piperonyl butoxide	BUTACIDE; INCITE
pirimicarb	PIRIMOR
PIRIMOR	pirimicarb
PLANTVAX	oxycarboxin
PLICTRAN	cyhexatin
POAST	sethoxydim
polybutene-5	THRIPSTICK II
POLYRAM	metiram
potassium oleate	SAFERS INSECTICIDAL SOAP; SAFERS SOAP
POTASSIUM SULFATE	potassium sulphate
potassium sulphate	POTASSIUM SULFATE
POUNCE	permethrin
PP-321	cyhalothrin-lambda; lambda-cyhalothrin; KARATE

PP-333	paclobutrazol
PP-450	flutriafol
PP-523	hexaconazole
PP-993	tefluthrin
PREMIERE	thiabendazole + thiram
PREVICUR-N	propamocarb
PRO GRO SYSTEMIC SEED PROTECTANT	carbathiin + thiram; PRO GRO
prochloraz	SPORTAK
PROCURE	triflumizole
procymidone	DPX-4424
PROMET	furathiocarb
propamocarb	PREVICUR-N
propanil	STAMPEDE
propargite	OMITE
propazine	MILO-PRO; PRIMATOL
propetamphos	BLOTIC
propiconazole	BANNER; CGA-64250; TILT; ORBIT
propoxur	BAYGON; CRAWLTOX; UNDEN
PROTURF FFII	quintozene
PROTURF FUNGICIDE VII	triadimefon
pyrazophos	AFUGAN
pyridate	LENTAGRAN
pyrifenox	ACR-3675; RO-15-1297
pyroxyfur	TF-3724
quintozene	PCNB; PROTURF FFII; SCOTTS FF II; SCOTTS FFII; SCOTTS LAWN DISEASE PREVENTER; TERRACHLOR; TERRACLOR
RAMIK BRUN	diphacinone
RANDOX	allidochlor
RAPCOL	furathiocarb + metalaxyl + thiram
RAPCOL TZ	furathiocarb + metalaxyl + thiabendazole
RENEX	surfacants
RAXIL	tebuconazole;ELITE
RE-20615	ofurace;VAMIN
RH-3866	myclobutanil; SYSTHANE
RH-5781	unknown
RH-5849	t-butyl-benzoylhydrazide
RH-7592	phenyl[chlorophenethyl][triazole]pro-panenitrile; fenethanil
RHC-387	surfactant
RIDOMIL	metalaxyl
RIDOMIL MZ	mancozeb + metalaxyl
RIGO CROP OIL	dormant oil
RIPCORD	cypermethrin
RIZOLEX	tolclofos-methyl
RO-13-5223	fenoxycarb; INSEGAR
RO-15-1297	pyrifenox
RONILAN	vinclozolin
ROTACIDE	rotenone
rotenone	CUBE; DERRIS; DERITOX; ROTACIDE
ROVRAL	iprodione
ROVRAL FLO	iprodione
ROVRAL GREEN	iprodione
ROVRAL PLUS	iprodione + lindane
ROVRAL ST	iprodione + lindane
ROYAL	maleic hydrazide
ROZOL	chlorophacinone
RU-38702	acrinathrin
S-3206	fenpropathrin
S-3349	tolclofos-methyl
S-71639	confidential
SAFERS ID	diazinon + potassium oleate
SAFERS INSECTICIDAL SOAP	potassium oleate

SAFERS NATURAL GARDEN FUNGICIDE CONC.	SAFERS NGF
SAFERS NEEM INSECTICIDE	NEEM
SAFERS SOAP	potassium oleate
SAN-155	thiocyclam-hydrogenoxalate
SAN-371	oxadixyl
SAN-418	B. thuringiensis tenebrionis
SAN-518	mancozeb + oxadixyl
SAN-553	copper + folpet + oxadixyl
SAN-619	cyproconazole; UBI-2565; UBI-2575
SAN-658	captan + cyproconazole
SAN-683	mancozeb + cyproconazole
SANBAR	permethrin
SAP-404	potassium oleate + pyrethrins
SAVEY	hexythiazox
SCOOT	thiram
SCOTTS FF II	quintozene
SCOTTS FFII	quintozene
SCOTTS FUNGICIDE VII	triadimefon
SCOTTS LAWN DISEASE PREVENTER	quintozene
SD-208304	confidential
SDS-45037	mepronil
SDS-66811	unknown
SENCOR	metribuzin
SENCOR 500	metribuzin
sethoxydim	POAST
SEVIN	carbaryl
SEVIN XLR	carbaryl
SEVIN XLR PLUS	carbaryl
SHELLSHOCK	refined diatomaceous earth
SHIN-ETSU ROPE	codling moth pheromone
SHOK	piperonyl butoxide + natural pyrethroids
silica aerogel	DRIE-DIE NO. 67
SN-72129	thianitril
SNI OIL	NEEM
sodium 2-phenylphenoxide	DOWICIDE A
SOLACOL	validamycin a
SPORTAK	prochloraz
SPOTLESS	diniconazole
SPUD-CAP	MYX 1806; B.T. san diego
STAMPEDE	propanil
STANDAK	aldoxycarb
STOCKAID	cypermethrin
STOCKPEST	lindane
streptomycin	AGRI-MYCIN 17; AGRI-STREP; AGRIMYCIN 17; AGRISTREP
SUBDUE	metalaxyl
sulphur	KUMULUS S; M&B FLOWABLE SULPHUR; M&B MICRO-NIASUL; MICRO-NIASUL; MICROSCOPIC SULPHUR; WETTABLE SULPHUR
SUMITHION	fenitrothion
SUNSPRAY OIL	emulsifiable spray oil
superior oil	TF-5081
SUPRACIDE	methidathion
SYS-TEM	dimethoate
SYSTEM	dimethoate
SYSTHANE	myclobutanil; RH-3866
SYSTOX	demeton
TACHIGAREN	hymexazol
talc	MAGNESIUM SILICATE
TALSTAR	bifenthrin
TBZ	thiabendazole
TCMTB	BUSAN 30
tebuconazole	ethyltrianol; ELITE; FOLICUR; FOLICOTE; UBI-2584; RAXIL
teflubenzuron	HOE-000522; HOE-00522; abamectin

tefluthrin	FORCE; ICIA-0993; PP-993; TF-3648; TF-3661; TF-3695; TF-3722; TF-3754; TF-3755; TF-5291
TELONE	1,3-dichloropropene
TELONE II-B	1,3-dichloropropene
TEMIK	aldicarb
TENN-COP	copper salts of rosin and fatty acids
terbuconazole	tebuconazole;ELITE
terbufos	COUNTER; AC 301,467
TERRACLOR	quintozene
TERSAN SP	chloroneb
TF-3479	triadimenol
TF-3479B	triadimenol
TF-3480	triadimenol
TF-3481	triadimenol
TF-3482	lindane + triadimenol
TF-3483	lindane + triadimenol
TF-3486	captan + chlorpyrifos
TF-3488	captan + chlorpyrifos
TF-3492	chlorpyrifos + maneb
TF-3508	carbendazim + lindane + thiram
TF-3509	captan + triadimenol
TF-3533	lindane + thiram
TF-3552	captan + isofenphos
TF-3553	acephate
TF-3560	maneb + thiabendazole
TF-3561	maneb + thiabendazole
TF-3566	captan + thiabendazole
TF-3582	nuarimol
TF-3585	lindane + nuarimol
TF-3586	lindane + nuarimol
TF-3591	maneb
TF-3592	benalaxyl + captan + molybdenum
TF-3603	isofenphos + maneb
TF-3607	lindane + thiabendazole + thiram
TF-3610	nuarimol
TF-3611	nuarimol
TF-3620	captan + thiabendazole
TF-3621	benalaxyl + captan + molybdenum
TF-3632	benomyl + captan + lindane
TF-3643	captan + isofenphos
TF-3644	nuarimol
TF-3645	nuarimol
TF-3646	nuarimol
TF-3647	benalaxyl + diazinon + lindane
TF-3648	tefluthrin
TF-3651	benalaxyl
TF-3656	imazalil + triadimenol
TF-3658	maneb + triadimenol
TF-3659	maneb + triadimenol
TF-3660	maneb + triadimenol
TF-3661	tefluthrin
TF-3664	mancozeb
TF-3670	acephate
TF-3672	nuarimol
TF-3673	flutriafol
TF-3674	flutriafol
TF-3675	flutriafol
TF-3678	lindane + maneb
TF-3682	bendiocarb + captan
TF-3686	benalaxyl + molybdenum
TF-3689	imazalil + triadimenol
TF-3690	imazalil + triadimenol
TF-3691	mancozeb + triadimenol
TF-3692	mancozeb
TF-3693	CO-6054
TF-3694	imazalil + mancozeb

TF-3695	tefluthrin
TF-3696	isofenphos + mancozeb
TF-3697	isofenphos + mancozeb
TF-3698	lindane + mancozeb
TF-3699	lindane + mancozeb
TF-3700	captan + CO-6054 + lindane
TF-3701	captan + carbendazim + isofenphos
TF-3702	captan + imazalil + lindane
TF-3703	captan + imazalil + lindane
TF-3704	captan + isofenphos
TF-3705	imazalil + mancozeb
TF-3710	mancozeb
TF-3719	flutriafol + lindane
TF-3720	flutriafol + lindane
TF-3721	chlorpyrifos + mancozeb + tefluthrin
TF-3722	tefluthrin
TF-3723	benalaxyl + imazalil
TF-3724	pyroxyfur
TF-3725	pyroxyfur + thiram
TF-3726	pyroxyfur + thiram + thiabendazole
TF-3727	flutriafol + isofenphos
TF-3728	flutriafol + isofenphos
TF-3729	triadimenol + isofenphos
TF-3730	triadimenol + isofenphos
TF-3731	imazalil + mancozeb
TF-3733	imazalil
TF-3738	triadimenol
TF-3739	flutriafol
TF-3740	metalaxyl
TF-3741	metalaxyl + thiram
TF-3742	metalaxyl + thiabendazole + thiram
TF-3752	flutriafol
TF-3753	flutriafol
TF-3754	tefluthrin
TF-3755	tefluthrin
TF-3759	flutriafol + lindane
TF-3760	flutriafol + lindane
TF-3765	flutriafol
TF-3767	maneb
TF-3769	lindane + maneb
TF-3770	hexaconazole
TF-3772	benalaxyl
TF-3773	benalaxyl
TF-3775	flutriafol
TF-3787	unknown
TF-5291	tefluthrin
TF-5304	diazinon
TF-9021	chlorothalonil
TF-9031	isofenphos
TF-9480	hexaconazole
thiabendazole	MERTECT; TBZ; UBI-2395; UBI-2395-1; UBI-2531
THIMET	phorate
thiocyclam-hydrogenoxalate	EVISECT; SAN-155
THIODAN	endosulfan
thiodicarb	GUS-80502; LARVIN; EXP-6003A
thionazin	ZINOPHOS
thiophanate-methyl	EASOUT; GUS-4700
thiram	SCOOT; TMTD
THIS flowable copper sulphur	copper + sulphur
THRIPSTICK II	polybutene-5
THURICIDE-HPC	B. thuringiensis Kurstaki
thuringiensin	ABG-6162A; ABG-6228; BETA-EXOTOXINE DE B.T.; DI-BETA
TILT	propiconazole
TILT MZ	mancozeb + propiconazole; TILT-MANCOZEB FORMULATED MIXTURE

TMTD	thiram
tolclofos-methyl	RIZOLEX; S-3349
TOPAS	penconazole
TOPAS MZ	mancozeb + penconazole
TOPAS/MANZATE	maneb + penconazole
TORQUE	fenbutatin oxide
TREFLAN	trifluralin
triadimefon	BAYLETON; PROTURF FUNGICIDE VII; SCOTTS FUNGICIDE VII
triadimenol	BAY-KWG-0519; BAYTAN; GUS-4043; KWG-0519; TF-3479; TF-3479B; TF-3480; TF-3481; TF-3738; UBI-2383; UBI-2383-1; UBI-2541; UBI-2568
triallate	AVADEX BW
tribasic copper sulphate	COPPER SPRAY
trichlorfon	DYLOX
trichloronate	PHYTOSOL
tridemorph	CALIXIN
TRIDENT	B. thuringiensis tenebrionis
triflumizole	A-815; PROCURE; UBI-1716; UBI-2342; UBI-2391; UBI-A-815; UBI-A815
triflumuron	ALSYSTIN; BAY-SIR-8514
trifluralin	TREFLAN
triforine	FUNGINEX
TRIGARD	cyromazine
trimethacarb	BROOT; UC27-BF-32
TRIMIDOL	nuarimol
TRITON B-1956	unknown
TRIUMPH	isazophos
TROUNCE	potassium salts of fatty acids + pyrethrins
TRUBAN	etridiazole
TRUMPET	bendiocarb
TUBERSEAL	mancozeb

UBI-1196	VITAVAX 200
UBI-1373	carbathiin
UBI-1556	carbathiin + thiabendazole
UBI-1592	carbathiin + imazalil + thiabendazole
UBI-1664	carbathiin + maneb; UBI-1664-R
UBI-1716	triflumizole
UBI-1759	UBI-A-920; UBI-A92; UBI-A920
UBI-2051	carbathiin + thiram; VITAFLO 280
UBI-2092	carbathiin
UBI-2100	carbathiin
UBI-2100-2	carbathiin
UBI-2106	carbathiin
UBI-2106-1	carbathiin + lindane
UBI-2151	carbathiin
UBI-2155	carbathiin + thiram
UBI-2215	thiram
UBI-2235	carbathiin + thiram
UBI-2291	diazinon
UBI-2342	triflumizole
UBI-2344	carbathiin + lindane + thiram
UBI-2359	carbathiin + thiram
UBI-2359-1	ANCHOR
UBI-2359-2	ANCHOR
UBI-2365	carbathiin + thiram
UBI-2369	VITAVAX rs
UBI-2369-1	VITAVAX rs
UBI-2374	carbathiin + imazalil
UBI-2375	carbathiin + triflumizole
UBI-2376	carbathiin + thiram + UBI-1759
UBI-2377	carbathiin + thiram + UBI-1759
UBI-2379	metalaxyl
UBI-2382	carbathiin + oxycarboxin + oxadixyl

UBI-2383	triadimenol
UBI-2383-1	triadimenol
UBI-2384	unknown
UBI-2389	carbathiin + isofenphos
UBI-2390	carbathiin + thiram
UBI-2390-1	carbathiin + thiram
UBI-2390-2	carbathiin + thiram
UBI-2391	triflumizole
UBI-2392	carbathiin + triflumizole
UBI-2393	carbathiin + thiabendazole; UBI-2393-1; UBI-2393-2
UBI-2394	carbathiin + imazalil + thiabendazole; UBI-2394-1; UBI-2394-2
UBI-2395	thiabendazole
UBI-2395-1	thiabendazole
UBI-2398	carbathiin + triflumizole
UBI-2401	carbathiin + imazalil; UBI-2401-1
UBI-2402	carbathiin + lindane + thiabendazole; UBI-2402-1
UBI-2403	carbathiin + imazalil + lindane
UBI-2404	carbathiin + imazalil
UBI-2405	carbathiin + lindane
UBI-2406	carbathiin
UBI-2408	carbathiin
UBI-2409	carbathiin + lindane + metalaxyl + thiophanate-methyl
UBI-2410	carbathiin + lindane
UBI-2413	carbathiin + isofenphos + thiram; UBI-2413-1
UBI-2414	carbathiin + isofenphos + thiram
UBI-2415	carbathiin + thiodicarb + thiram
UBI-2416	carbathiin + thiophanate-methyl
UBI-2417	carbathiin + lindane + metalaxyl; UBI-2417-1
UBI-2420	imazalil
UBI-2421	G-696; metsulfovax
UBI-2422	carbathiin + lindane + thiram; UBI-2422-1
UBI-2424	carbathiin + imazalil; UBI-2424-1
UBI-2435	carbathiin + thiram; UBI-2435-1
UBI-2436-1	carbathiin
UBI-2446	carbathiin + imazalil
UBI-2450	metalaxyl + thiabendazole
UBI-2451	carbathiin + metalaxyl + thiabendazole
UBI-2454	myclobutanil; UBI-2454-1; UBI-2454-2
UBI-2455	myclobutanil + thiabendazole
UBI-2458	carbathiin + metalaxyl + thiabendazole
UBI-2461	metalaxyl
UBI-2464	metalaxyl + thiabendazole
UBI-2465	thiram + triadimenol
UBI-2466	thiram + triadimenol
UBI-2467	carbathiin + thiram
UBI-2468	carbathiin + metalaxyl
UBI-2469	carbathiin + oxadixyl
UBI-2471	carbathiin + imazalil + lindane
UBI-2472	carbathiin + lindane + metalaxyl
UBI-2473	carbathiin + lindane + oxadixyl
UBI-2475	carbathiin + thiabendazole
UBI-2476	metalaxyl + thiabendazole
UBI-2477	carbathiin + metalaxyl + thiabendazole
UBI-2492	carbathiin
UBI-2496	aldoxycarb
UBI-2497	myclobutanil
UBI-2498-1	carbathiin + thiabendazole
UBI-2509-1	metalaxyl + thiram
UBI-2501	carbofuran
UBI-2511	carbathiin + cloethocarb + thiram; UBI-2511-1
UBI-2513	carbathiin + carbofuran + thiram
UBI-2521	carbathiin + thiabendazole

UBI-2521-1	carbathiin + thiabendazole
UBI-2522	carbathiin + metalaxyl
UBI-2529	carbathiin + cloethocarb
UBI-2530	carbathiin + isofenphos
UBI-2531	thiabendazole
UBI-2541	triadimenol
UBI-2550	metsulfovax + lindane + thiram
UBI-2554	carbathiin + cloethocarb + thiram
UBI-2554-1	carbathiin + cloethocarb + thiram
UBI-2555	carbathiin + cloethocarb + thiram
UBI-2557	carbathiin + cloethocarb + thiram
UBI-2559	cloethocarb
UBI-2561	myclobutanil
UBI-2562	cloethocarb
UBI-2563	metsulfovax
UBI-2564	carbathiin + metsulfovax
UBI-2565	cyproconazole
UBI-2568	triadimenol
UBI-2573	metsulfovax + thiram
UBI-2575	cyproconazole
UBI-2584	tebuconazole
UBI-2599-1	unknown
UBI-2611	unknown
UBI-A815	triflumizole
UBI-P368	oxyfenthiin
UC27-BF-32	trimethacarb
UCB-87	GRANULOSIS VIRUS
UCSF-27	carbaryl
UCSF-40	carbaryl
UCZF-14	mexacarbate
UCZF-15	mexacarbate
UNITRAPS	attractant

validamycin a	SOLACOL
VAMIN	RE 20615; ofurace
VANGARD	etaconazole
VAPAM	metam-sodium
VAPO	dichlorvos
VECTOBAC	B. thuringiensis israelensis
VENDEX	fenbutatin oxide
vinclozolin	RONILAN
VITAFLO 250	carbathiin
VITAFLO 280	carbathiin + thiram; UBI-2051
VITAFLO DB	carbathiin + thiram
VITAFLO DUAL PURPOSE	carbathiin + lindane + thiram
VITAFLO-MANEB	carbathiin + maneb
VITAFLO-THIRAM	carbathiin + thiram
VITAVAX	carbathiin
VITAVAX 200	carbathiin + thiram; UBI-1196
VITAVAX 2100	carbathiin
VITAVAX 75W	carbathiin
VITAVAX DUAL POWDER	carbathiin + lindane + thiram
VITAVAX DUAL SOLUTION	carbathiin + lindane
VITAVAX P	VITAVAX POWDER
VITAVAX POWDER	carbathiin + thiram; VITAVAX P
VITAVAX RS	carbathiin + lindane + thiram; OSECO REGENT; UBI-2369; UBI-2369-1
VITAVAX SINGLE SOLUTION	carbathiin
VITAVAX SOLUTION	carbathiin
VOLCK OIL	petroleum oil
VOLCK DORMANT OIL	dormant oil
VOLCK SUPREME OIL	dormant oil
VOLID	brodifacoum
VORLEX	1,3-dichloropropene + methyl isothiocyanate
VYDATE	oxamyl

WARBEX	famphur
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