

Agriculture & Agric-Food Canada

Heritage (azoxystrobin) for the control of Phytophthora root rot caused by Phytophthora cinnamomi on rhododendron: efficacy and crop tolerance.

Protocol ID: Trial ID: AAFC07-061E-390
Location: Agassiz Study Director: Dr. Shiyu Li
Investigator: Victoria Brookes

General Trial Information

Study Director: Dr. Shiyu Li **Title:** Project Coordinator
Affiliation: Canadian Forest Service, Pest Management Centre
Postal Code: K1A 0C6 **E-mail:** lis@agr.gc.ca
Investigator: Victoria Brookes **Title:** Principal Investigator
Affiliation: Agriculture and Agri-Food Canada
Postal Code: V0M 1A0 **E-mail:** brookesv@agr.gc.ca

Trial Location

City: Agassiz **Trial Status:** ONE-YEAR/FINAL
State/Prov.: BC
Postal Code: V0M 1A0
Country: CAN

Objectives:

To test two rates of azoxystrobin (Heritage) and the standard metalaxyl-M and S-isomer (Subdue MAXX) for the control of Phytophthora cinnamomi on young rhododendron plants.

Conclusions:

There was high disease severity. There did not appear to be a consistent reduction in phytophthora cinnamomi by any of the fungicide treatments.

Crop Description

Variety: Ramapo **Rhododendron**
Planting Date: Jun/13/2007
Planting Method: TRANSPLANTED - HAND

Pest Description

Code: PHYTCN Phytophthora cinnamomi
Common Name: Root Rot in Rhododendron

Site and Design

Plot Width, Unit: 1 M **Site Type:** NURSERY - CONTAINER
Plot Length, Unit: 2 M
Replications: 4 **Study Design:** Non-Randomized

Trial Initiation Comments:

The potting mix was prepared by adding a 10% by weight portion of inoculated vermiculite to the potting mix. This was gently mixed to ensure uniform distribution. Some inoculated potting mix was placed in the bottom of the pot, the rhododendron plug was removed from the tray and placed into the pot. More inoculated potting mix was added to the pot and the mix was gently firmed around the plant. Only the uninoculated check was potted up with regular potting mix. The plants were 20 cm tall at planting.

Comment: Fertilized bi-weekly with 1% solution of 20-20-20

Soil Description

Texture: 50% Bark Mulch, 32.5% Peat, 17.5% Perlite

Application Description

	A	B	C
Application Date:	Jun/13/2007	Jul/09/2007	Jul/24/2007
Time of Day:	2:00PM	2:00PM	12:30PM
Application Method:	DRENCH	SPRAY	SPRAY
Application Timing:	POSTTR	POSTTR	POSTTR
Application Placement:	SURFAC	BROFOL	BROFOL
Applied By:	VRB	VRB	VRB
Air Temperature, Unit:	12.9 C	29 C	16 C
% Relative Humidity:	91	45	100
Dew Presence (Y/N):	N	N	N
Soil Moisture:	ADEQUATE	ADEQUATE	ADEQUATE
% Cloud Cover:	100	0	50

Pest Stage At Each Application

	A	B	C
Pest 1 Code, Disc., Scale:	PHYTCN	PHYTCN	PHYTCN

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Application Equipment

	A	B	C
Appl. Equipment:	Syringe	sprayer	sprayer
Operating Pressure:		25	25
Pressure Unit:		psi	psi
Nozzles/Row:		1	1

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**Heritage (azoxystrobin) for the control of Phytophthora root rot caused by
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Study Director: Dr. Shiyu Li

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Trt No.	Type	Treatment Name	Form Conc	Form Unit	Form Type	Lot Code	Rate Rate	Rate Unit	Other Rate	Other Rate Unit	Growth Stage	Appl Code
1	CHK	Uninoculated control										
2	CHK	inoculated control										
3	FUNG	Heritage	500	G/KG	SC		0.027	G/L				A
	FUNG	Heritage	500	G/KG	SC		0.3	G/L				B
	FUNG	Heritage	500	G/KG	SC		0.3	G/L				C
4	FUNG	Heritage	500	G/KG	SC		0.0135	G/L				A
	FUNG	Heritage	400	G/KG	SC		0.15	G/L				B
	FUNG	Heritage	400	G/KG	SC		0.15	G/L				C
5	FUNG	Subdue Maxx	240	G/L	SC		0.12	ML/L				A
	FUNG	Subdue Maxx	240	G/L	SC		0.12	ML/L				B
	FUNG	Subdue Maxx	240	G/L	SC		0.12	ML/L				C

Additional Treatment Information

Type

CHK = Check or Untreated

FUNG = Fungicide or Bactericide

Form Unit

G/L = Grams Active Ingredient per liter formulated product (same as GA/L)

Form Type

SC = Suspension concentrate (_ flowable concentrate)|A stable suspension of active ingredient(s) in a fluid, which may contain other dissolved active ingredient(s), intended for dilution with water before use.

Rate Unit

G/L = Grams Dry Product per Liter Mix (US=OZ WT/GAL)| 'W'

ML/L = Milliliters Product per Liter Mix (US=FL OZ/GAL)| 'V'

Replications: 4, Design: Non-Randomized, Treatment units: Treated plot size, Dry Form. Unit: %, Treated plot size Width: 1 meters, Treated plot size Length: 2 meters, Application volume: 200 l/ha, Mix size: 2 liters, Format definitions: G-AII7.DEF, G-AII7.FRM

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**Heritage (azoxystrobin) for the control of Phytophthora root rot caused by
Phytophthora cinnamomi on rhododendron: efficacy and crop tolerance.**

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Investigator: Victoria Brookes

Rep Blk

4	4	401	1	402	2	403	3	404	4	405	5
3	3	301	1	302	2	303	3	304	4	305	5
2	2	201	1	202	2	203	3	204	4	205	5
1	1	101	1	102	2	103	3	104	4	105	5

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**Heritage (azoxystrobin) for the control of Phytophthora root rot caused by
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Location: Agassiz

Study Director: Dr. Shiyu Li

Investigator: Victoria Brookes

Schedule for Aug/21/2000 to Aug/21/2003

Date	Trial	Task	Description
	AAFC07-061E-390	None	No Scheduled Tasks

Includes tasks: Treat, Assess, Other

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Heritage (azoxystrobin) for the control of Phytophthora root rot caused by Phytophthora cinnamomi on rhododendron: efficacy and crop tolerance.									
Protocol ID:		Trial ID: AAFC07-061E-390							
Location: Agassiz		Study Director: Dr. Shiyu Li							
		Investigator: Victoria Brookes							
Pest Type		D Disease	D Disease	D Disease	D Disease	D Disease	D Disease	D Disease	D Disease
Pest Code		PHYTCN	PHYTCN	PHYTCN	PHYTCN	PHYTCN	PHYTCN	PHYTCN	PHYTCN
Crop Variety		Ramapo	Ramapo	Ramapo	Ramapo	Ramapo	Ramapo	Ramapo	Ramapo
Description		Incidence	Severity	Incidence	Severity	Incidence	Severity	Incidence	Severity
Part Rated		LEAF C	LEAF C	LEAF C	LEAF C	LEAF C	LEAF C	LEAF C	LEAF C
Rating Date		Jun/18/2007	Jun/18/2007	Jun/29/2007	Jun/29/2007	Jul/25/2007	Jul/25/2007	Aug/15/2007	Aug/15/2007
Rating Data Type		COUDIS	COUDIS	COUDIS	COUDIS	COUDIS	COUDIS	COUDIS	COUDIS
Rating Unit		%	%	%	%	%	%	%	%
Assessed By		VRB	VRB	VRB	VRB	VRB	VRB	VRB	VRB
Days After First/Last Applic.		5	5	16	16	1	1	6	6
Trt-Eval Interval		5 DA-A	5 DA-A	5 DA-A	5 DA-A	5 DA-A	5 DA-A	5 DA-A	5 DA-A
ARM Action Codes		K05	K05	K05	K05	K05	K05	K05	K05
Number of Decimals		1	1	1	1	1	1	1	1
Trt Treatment	Rate								
No. Name	Rate Unit								
1 Uninoculated control		0.0 a	0.0 a	0.0 d	0.0 b	8.3 b	0.5 a	0.0 a	0.0 b
2 inoculated control		0.0 a	0.0 a	33.0 c	6.3 b	66.3 a	18.3 a	24.8 a	24.8 ab
3 Heritage	0.027 G/L	0.0 a	0.0 a	66.3 b	14.0 b	57.8 a	25.0 a	49.5 a	57.8 a
Heritage	0.3 G/L								
Heritage	0.3 G/L								
4 Heritage	0.0135 G/L	0.0 a	0.0 a	91.5 a	56.3 a	49.5 a	21.8 a	41.3 a	33.0 ab
Heritage	0.15 G/L								
Heritage	0.15 G/L								
5 Subdue Maxx	0.12 ML/L	0.0 a	0.0 a	49.5 bc	20.0 b	74.5 a	15.3 a	41.3 a	49.5 a
Subdue Maxx	0.12 ML/L								
Subdue Maxx	0.12 ML/L								
LSD (P=.05)		0.00	0.00	25.22	23.20	29.72	18.10	34.57	32.73
Standard Deviation		0.00	0.00	16.73	15.40	19.72	12.01	22.94	21.72
CV		0.0	0.0	34.83	79.77	38.48	74.39	73.18	65.83
Grand Mean		0.0	0.0	48.05	19.3	51.25	16.15	31.35	33.0
Bartlett's X2		0.0	0.0	0.733	8.799	1.153	11.248	1.781	2.009
P(Bartlett's X2)		.	.	0.693	0.032*	0.886	0.024*	0.619	0.57
Friedman's X2		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
P(Friedman's X2)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	Prob(F)
Total	19	15246.000000			
Treatment	4	8167.500000	2041.875000	4.327	0.0159
Error	15	7078.500000	471.900000		

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Pest Type		D Disease	D Disease	D Disease	D Disease	D Disease
Pest Code		PHYTCN	PHYTCN	PHYTCN	PHYTCN	PHYTCN
Crop Variety		Ramapo	Ramapo	Ramapo	Ramapo	Northern
Description		Height	Width	Height	Width	Alive
Part Rated		LEAF C	LEAF C	LEAF C	LEAF C	LEAF C
Rating Date		Jul/24/2007	Jul/24/2007	Aug/02/2007	Aug/02/2007	Dec/20/2007
Rating Data Type		COUDIS	COUDIS	COUDIS	COUDIS	COUDIS
Rating Unit		CM	CM	CM	CM	NUMBER
Assessed By		VRB	VRB	VRB	VRB	VRB
Days After First/Last Applic.		15	15	24	24	106
Trt-Eval Interval		5 DA-A	5 DA-A	5 DA-A	5 DA-A	5 DA-A
ARM Action Codes		K05	K05	K05	K05	K05
Number of Decimals		1	1	1	1	1
Trt Treatment	Rate					
No. Name	Unit					
1 Uninoculated control		15.4 a	9.0 a	16.5 a	9.5 a	3.0 a
2 inoculated control		15.8 a	11.2 a	16.2 a	9.0 a	2.0 a
3 Heritage	0.027 G/L	13.1 a	8.3 a	12.7 a	7.5 a	1.5 a
Heritage	0.3 G/L					
Heritage	0.3 G/L					
4 Heritage	0.0135 G/L	15.7 a	8.6 a	16.3 a	9.5 a	1.8 a
Heritage	0.15 G/L					
Heritage	0.15 G/L					
5 Subdue Maxx	0.12 ML/L	16.1 a	9.0 a	16.5 a	9.2 a	2.0 a
Subdue Maxx	0.12 ML/L					
Subdue Maxx	0.12 ML/L					
LSD (P=.05)		2.35	2.22	2.66	3.34	1.21
Standard Deviation		1.56	1.47	1.77	2.22	0.81
CV		10.25	15.95	11.29	24.94	39.33
Grand Mean		15.22	9.23	15.64	8.9	2.05
Bartlett's X2		3.857	7.718	4.755	4.037	1.309
P(Bartlett's X2)		0.426	0.102	0.313	0.401	0.727
Friedman's X2		0.0	0.0	0.0	0.0	0.0
P(Friedman's X2)		0.00	0.00	0.00	0.00	0.00

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

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AOV For D Disease PHYTCN Ramapo Height LEAF C Jul/24/2007 COUDIS
CM VRB 15 5 DA-A K05 1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	Prob(F)
Total	19	59.394149			
Treatment	4	22.907986	5.726996	2.354	0.1007
Error	15	36.486164	2.432411		

AOV For D Disease PHYTCN Ramapo Width LEAF C Jul/24/2007 COUDIS
CM VRB 15 5 DA-A K05 1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	Prob(F)
Total	19	53.300200			
Treatment	4	20.772292	5.193073	2.395	0.0966
Error	15	32.527908	2.168527		

AOV For D Disease PHYTCN Ramapo Height LEAF C Aug/02/2007
COUDIS CM VRB 24 5 DA-A K05 1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	Prob(F)
Total	19	90.181678			
Treatment	4	43.397122	10.849280	3.478	0.0336
Error	15	46.784556	3.118970		

AOV For D Disease PHYTCN Ramapo Width LEAF C Aug/02/2007 COUDIS
CM VRB 24 5 DA-A K05 1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	Prob(F)
Total	19	85.022459			
Treatment	4	11.105761	2.776440	0.563	0.6929
Error	15	73.916698	4.927780		

AOV For D Disease PHYTCN Northern Alive LEAF C Dec/20/2007 COUDIS
NUMBER VRB 106 5 DA-A K05 1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	Prob(F)
Total	19	14.950000			
Treatment	4	5.200000	1.300000	2.000	0.1462
Error	15	9.750000	0.650000		

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Location: Agassiz

Study Director: Dr. Shiyu Li

Investigator: Victoria Brookes

Additional Treatment Information

Type

CHK = Check or Untreated

FUNG = Fungicide or Bactericide

Form Type

SC = Suspension concentrate (_ flowable concentrate))A stable suspension of active ingredient(s) in a fluid, which may contain other dissolved active ingredient(s), intended for dilution with water before use.

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**Heritage (azoxystrobin) for the control of Phytophthora root rot caused by
Phytophthora cinnamomi on rhododendron: efficacy and crop tolerance.**

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Location: Agassiz

Study Director: Dr. Shiyu Li

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Pest Type	D Disease	D Disease	D Disease	D Disease	D Disease	D Disease	D Disease
Pest Code	PHYTCN	PHYTCN	PHYTCN	PHYTCN	PHYTCN	PHYTCN	PHYTCN
Crop Variety	Ramapo	Ramapo	Ramapo	Ramapo	Ramapo	Ramapo	Ramapo
Description	Incidence	Severity	Incidence	Severity	Incidence	Severity	Incidence
Part Rated	LEAF C	LEAF C	LEAF C	LEAF C	LEAF C	LEAF C	LEAF C
Rating Date	Jun/18/2007	Jun/18/2007	Jun/29/2007	Jun/29/2007	Jul/25/2007	Jul/25/2007	Aug/15/2007
Rating Data Type	COUDIS	COUDIS	COUDIS	COUDIS	COUDIS	COUDIS	COUDIS
Rating Unit	%	%	%	%	%	%	%
Assessed By	VRB	VRB	VRB	VRB	VRB	VRB	VRB
Days After First/Last Applic.	5	5	16	16	1	1	6
Trt-Eval Interval	5 DA-A	5 DA-A	5 DA-A	5 DA-A	5 DA-A	5 DA-A	5 DA-A
ARM Action Codes	K05	K05	K05	K05	K05	K05	K05
Number of Decimals	1	1	1	1	1	1	1
Trt Treatment	Rate	Rate	Rate	Rate	Rate	Rate	Rate
No. Name	Rate	Unit	Plot				
1 Uninoculated control	101	0.0	0.0	0.0	0.0	0.0	0.0
	201	0.0	0.0	0.0	0.0	0.0	0.0
	301	0.0	0.0	0.0	0.0	0.0	0.0
	401	0.0	0.0	0.0	0.0	33.0	2.0
Mean =	0.0	0.0	0.0	0.0	8.3	0.5	0.0
2 inoculated control	102	0.0	0.0	33.0	16.0	33.0	5.0
	202	0.0	0.0	33.0	3.0	66.0	15.0
	302	0.0	0.0	33.0	3.0	100.0	18.0
	402	0.0	0.0	33.0	3.0	66.0	35.0
Mean =	0.0	0.0	33.0	6.3	66.3	18.3	24.8
3 Heritage	0.027 G/L	103	0.0	0.0	66.0	7.0	66.0
Heritage	0.3 G/L	203	0.0	0.0	66.0	30.0	66.0
Heritage	0.3 G/L	303	0.0	0.0	100.0	16.0	33.0
		403	0.0	0.0	33.0	3.0	66.0
Mean =	0.0	0.0	66.3	14.0	57.8	25.0	49.5
4 Heritage	0.0135 G/L	104	0.0	0.0	100.0	50.0	66.0
Heritage	0.15 G/L	204	0.0	0.0	100.0	65.0	33.0
Heritage	0.15 G/L	304	0.0	0.0	100.0	60.0	66.0
		404	0.0	0.0	66.0	50.0	33.0
Mean =	0.0	0.0	91.5	56.3	49.5	21.8	41.3
5 Subdue Maxx	0.12 ML/L	105	0.0	0.0	33.0	4.0	66.0
Subdue Maxx	0.12 ML/L	205	0.0	0.0	33.0	3.0	66.0
Subdue Maxx	0.12 ML/L	305	0.0	0.0	66.0	66.0	100.0
		405	0.0	0.0	66.0	7.0	66.0
Mean =	0.0	0.0	49.5	20.0	74.5	15.3	41.3

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Pest Type				D Disease	D Disease	D Disease	D Disease	D Disease	D Disease
Pest Code				PHYTCN	PHYTCN	PHYTCN	PHYTCN	PHYTCN	PHYTCN
Crop Variety				Ramapo	Ramapo	Ramapo	Ramapo	Ramapo	Northern
Description				Severity	Height	Width	Height	Width	Alive
Part Rated				LEAF C	LEAF C	LEAF C	LEAF C	LEAF C	LEAF C
Rating Date				Aug/15/2007	Jul/24/2007	Jul/24/2007	Aug/02/2007	Aug/02/2007	Dec/20/2007
Rating Data Type				COUDIS	COUDIS	COUDIS	COUDIS	COUDIS	COUDIS
Rating Unit				%	CM	CM	CM	CM	NUMBER
Assessed By				VRB	VRB	VRB	VRB	VRB	VRB
Days After First/Last Applic.				6	15	15	24	24	106
Trt-Eval Interval				5 DA-A	5 DA-A	5 DA-A	5 DA-A	5 DA-A	5 DA-A
ARM Action Codes				K05	K05	K05	K05	K05	K05
Number of Decimals				1	1	1	1	1	1
Trt Treatment									
No. Name	Rate	Unit	Plot						
1 Uninoculated control			101	0.0	14.8	8.3	16.0	8.8	3.0
			201	0.0	14.0	10.3	15.7	11.8	3.0
			301	0.0	14.7	9.7	15.5	7.2	3.0
			401	0.0	18.2	7.8	19.0	10.0	3.0
			Mean =	0.0	15.4	9.0	16.5	9.5	3.0
2 inoculated control			102	33.0	16.0	9.5	17.2	7.7	1.0
			202	0.0	15.0	13.0	16.3	10.3	1.0
			302	33.0	16.3	11.0	15.2	8.3	3.0
			402	33.0	15.7	11.3	16.0	9.5	3.0
			Mean =	24.8	15.8	11.2	16.2	9.0	2.0
3 Heritage	0.027 G/L		103	33.0	11.8	7.8	12.3	6.0	1.0
Heritage	0.3 G/L		203	66.0	12.7	9.2	14.2	8.8	2.0
Heritage	0.3 G/L		303	66.0	15.0	7.7	12.5	7.0	2.0
			403	66.0	13.0	8.7	11.8	8.0	1.0
			Mean =	57.8	13.1	8.3	12.7	7.5	1.5
4 Heritage	0.0135 G/L		104	33.0	12.7	7.8	17.2	9.8	1.0
Heritage	0.15 G/L		204	0.0	16.3	9.0	17.8	7.2	3.0
Heritage	0.15 G/L		304	66.0	17.0	9.0	18.0	13.5	2.0
			404	33.0	16.7	8.7	12.2	7.3	1.0
			Mean =	33.0	15.7	8.6	16.3	9.5	1.8
5 Subdue Maxx	0.12 ML/L		105	66.0	16.8	11.7	17.3	9.8	2.0
Subdue Maxx	0.12 ML/L		205	0.0	17.7	10.3	18.5	13.2	3.0
Subdue Maxx	0.12 ML/L		305	66.0	16.0	8.0	16.0	6.8	2.0
			405	66.0	14.0	5.8	14.2	6.8	1.0
			Mean =	49.5	16.1	9.0	16.5	9.2	2.0

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Location: Agassiz

Study Director: Dr. Shiyu Li

Investigator: Victoria Brookes

Trial Comments

Just prior to treatment the rhododendrons were planted into a soilless medium that was 10% by weight of inoculum growing on vermiculite.

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Product quantities required for listed treatments and applications across multiple studies:

Amount*	Unit	Treatment Name	Form Conc	Form Type	Lot Code
0.900	ml	Subdue Maxx	240	SC	

O:\All Branches\FFPB Common\PRR & MUP - Pest Mgmt Center\MINOR USE\2007 Projects\2007 Project Folders\AAFC07-060 IR-4 Ranman (cyazofamid) on rhododendron\Trial data\Summerland\Rhodos_heritage AAFC07-061E-390.DAT

* 'Per area' calculations based on spray volume= 200 l/ha, mix size= 2 liters (mix size basis).

* Product amount calculations increased 25 % for overage adjustment.

* 'Per volume' calculations use spray volume= 200 l/ha, mix size= 2 liters.