

Determination of rates and evaluation of efficacy of oxathiapiprolin for management of downy mildew in 13 trials over four years

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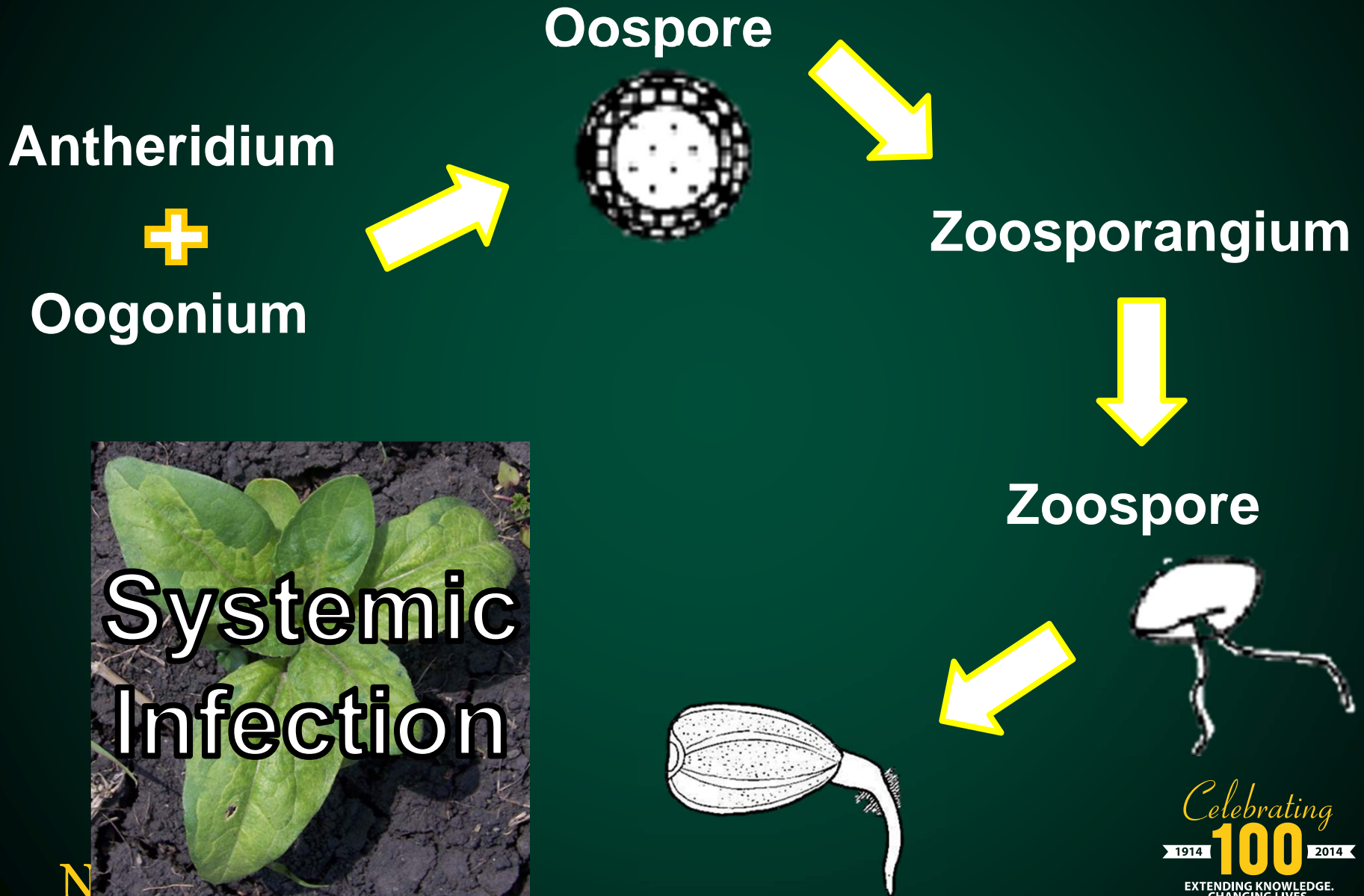
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Plasmopara halstedii Lifecycle



N

Celebrating
1914 **100** 2014
EXTENDING KNOWLEDGE.
CHANGING LIVES.

Gulya et al. 1997

Symptoms



Significant Stand Losses



Downy Mildew Management

- Limited genetic resistance
- Rotation is not effective/practical
- Fungicide seed treatments
 - Metalaxyl and mefenoxam (FRAC 4) had efficacy until resistant *P. halstedii* isolates were found in the late 1990s
 - Azoxystrobin (FRAC 11) available for suppression of downy mildew
 - High risk for resistance development

Objective

Evaluate oxathiapiprolin for the management of downy mildew

1. Efficacy
2. Rate determination

Oxathiapiprolin

- Discovered and developed by DuPont
- New Mode of Action
 - Oomycete specific
- New option for disease management in:
 - Sunflowers (downy mildew)
 - Soybeans
 - Specialty crops

Materials and Methods

- 2011-2014
 - 13 location x years
- Randomized Complete Block Design (RCBD)
 - Oil sunflower seeds – single row plots
- 3-4 disease incidence evaluations
 - analyzed using SAS v9.3
- No yield data collected

Inoculum Production

High inoculum concentrations
~ 2.3×10^6 zoosporangia ml⁻¹ per linear foot



Saturated soil



2011

Treatment	Rate µg ai/target	Fargo	Thompson
		Incidence (%)	
inoculated, NTC	-----		
oxathiapiprolin	0.45		
oxathiapiprolin	1.8		
oxathiapiprolin	7.25		
oxathiapiprolin	29.0		
oxathiapiprolin	116.0		
mefenoxam (Apron XL)	29.0		
azoxystrobin (Dynasty)	50.0		
fenamidone (Idol)	188.9		
LSD $P=0.05$			
P-value			
CV			

250µg of Cruiser applied per target for every treatment

analyzed using SAS v.9.3

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2011

Treatment	Rate µg ai/target	Fargo	Thompson
		Incidence (%)	
inoculated, NTC	-----	55.2 ab	36.8 a
oxathiapiprolin	0.45	38.5 bc	30.9 ab
oxathiapiprolin	1.8	15.9 cd	11.8 c
oxathiapiprolin	7.25	8.0 d	2.5 cd
oxathiapiprolin	29.0	1.3 d	0.8 d
oxathiapiprolin	116.0	3.5 d	0.9 d
mefenoxam (Apron XL)	29.0	48.7 b	38.2 a
azoxystrobin (Dynasty)	50.0	41.6 b	25.4 b
fenamidone (Idol)	188.9	11.5 d	22.8 b
LSD _{P=0.05}		22.83	9.68
P-value		P<0.0001	P<0.0001
CV		53.37	39.43

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2011 Fargo Trial - rate responses

NTC



NDS 55% Inc.

Low rate of ox.
(0.45 μg ai/target)



39% Inc.

High rate of ox.
(116.0 μg ai/target)



4% Inc.

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D 2014
WLEDGE.
IVES.

Photos: Friskop

2011

Treatment	Rate µg ai/target	Fargo	Thompson
		Incidence (%)	
inoculated, NTC	-----	55.2 ab	36.8 a
oxathiapiprolin	0.45	38.5 bc	30.9 ab
oxathiapiprolin	1.8	15.9 cd	11.8 e
oxathiapiprolin	7.25	8.0 d	2.5 cd
oxathiapiprolin	29.0	1.3 d	0.8 d
oxathiapiprolin	116.0	3.5 d	0.9 d
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P-value		P<0.0001	P<0.0001
CV		53.37	39.43

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2012

ID	Treatment	Rate µg ai/target	Thompson	Carrington
			Incidence (%)	
1	inoculated, NTC	-----	62.9 a	11.8 a
2	oxathiapiprolin	4.69	18.7 d	5.3 bc
3	oxathiapiprolin	9.37	12.8 de	2.7 bc
4	oxathiapiprolin	18.75	19.9 d	2.8 bc
5	oxathiapiprolin	37.5	8.4 ef	1.0 bc
6	oxathiapiprolin fludioxonil (Maxim) mefenoxam (Apron XL)	9.37 2.5 29.0	7.2 ef	1.4 bc
7	azoxystrobin (Dynasty) fludioxonil (Maxim) mefenoxam (Apron XL)	100.0 2.5 29.0	40.1 b	6.5 ab
8	fenamidone (Idol)	5.8 fl oz/cwt	31.1 c	2.5 bc
LSD $P=0.05$			8.15	5.56
P-value			$P<0.0001$	$P<0.0059$
CV			24.94	102.06

250µg of Cruiser applied per target for every treatment

analyzed using SAS v.9.3

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ID	Treatment	Rate µg ai/target	Thompson	Carrington
			Incidence (%)	
1	inoculated, NTC	-----	62.9 a	11.8 a
2	oxathiapiprolin	4.69	18.7 d	5.3 bc
3	oxathiapiprolin	9.37	12.8 de	2.7 bc
4	oxathiapiprolin	18.75	19.9 d	2.8 bc
5	oxathiapiprolin	37.5	8.4 ef	1.0 bc
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7	azoxystrobin (Dynasty) fludioxonil (Maxim) mefenoxam (Apron XL)	100.0 2.5 29.0	40.1 b	6.5 ab
8	fenamidone (Idol)	5.8 fl oz/cwt	31.1 c	2.5 bc
LSD $P=0.05$			8.15	5.56
P-value			$P<0.0001$	$P<0.0059$
CV			24.94	102.06

250µg of Cruiser applied per target for every treatment

analyzed using SAS v.9.3

2013

ID	Treatment	Rate µg ai/target	Fargo R1	Fargo R2	Thompson	Carrington
			Incidence (%)			
1	inoculated, NTC	-----	87.6 a	41.2 a	52.3 a	65.0 a
3	oxathiapiprolin	9.37	2.0 c	0.0 c	3.5 c	3.1 c
4	oxathiapiprolin	18.75	0.4 c	1.1 c	3.5 c	2.2 c
5	oxathiapiprolin	37.5	0.8 c	0.0 c	1.1 c	0.0 c
6	oxathiapiprolin	9.37	1.2 c	0.0 c	2.6 c	0.5 c
	fludioxonil (Maxim)	2.5				
	mefenoxam (Apron XL)	29.0				
7	azoxystrobin (Dynasty) fludioxonil (Maxim) mefenoxam (Apron XL)	100.0 2.5 29.0	51.4 b	27.8 b	27.5 b	18.7 b
8	fenamidone (Idol)	5.8 fl oz/cwt	3.1 c	6.1 c	3.3 c	0.7 c
LSD _{P=0.05}			16.69	11.13	10.31	6.72
P-value			P<0.0001	P<0.0001	P<0.0001	P<0.0001
CV			54.45	80.15	69.40	30.25

250µg of Cruiser applied per target for every treatment

analyzed using SAS v.9.3

2013

ID	Treatment	Rate µg ai/target	Fargo R1	Fargo R2	Thompson	Carrington
			Incidence (%)			
1	inoculated, NTC	-----	87.6 a	41.2 a	52.3 a	65.0 a
3	oxathiapiprolin	9.37	2.0 c	0.0 c	3.5 c	3.1 c
4	oxathiapiprolin	18.75	0.4 c	1.1 c	3.5 c	2.2 c
5	oxathiapiprolin	37.5	0.8 c	0.0 c	1.1 c	0.0 c
6	oxathiapiprolin	9.37	1.2 c	0.0 c	2.6 c	0.5 c
6	fludioxonil (Maxim)	2.5	1.2 c	0.0 c	2.6 c	0.5 c
6	mefenoxam (Apron XL)	29.0	1.2 c	0.0 c	2.6 c	0.5 c
7	azoxystrobin (Dynasty) fludioxonil (Maxim) mefenoxam (Apron XL)	100.0 2.5 29.0	51.4 b	27.8 b	27.5 b	18.7 b
8	fenamidone (Idol)	5.8 fl oz/cwt	3.1 c	6.1 c	3.3 c	0.7 c
LSD _{P=0.05}			16.69	11.13	10.31	6.72
P-value			P<0.0001	P<0.0001	P<0.0001	P<0.0001
CV			54.45	80.15	69.40	30.25

250µg of Cruiser applied per target for every treatment

analyzed using SAS v.9.3

2014

ID	Treatment	Rate μg ai/target	Fargo	Carrington
			Incidence (%)	
1	Inoculated, NTC	-----	49.8 a	90.3 a
3	oxathiapiprolin	9.37	1.9 c	21.6 c
4	oxathiapiprolin	18.75	1.4 c	17.8 c
7	azoxystrobin (Dynasty) fludioxonil (Maxim) mefenoxam (Apron XL)	100.0 2.5 29.0	22.1 b	62.9 b
	LSD _{p=0.05}		9.80	8.13
	P-value		P<0.0001	P<0.0001
	CV		43.34	14.01

250μg of Cruiser applied per target for every treatment

analyzed using SAS v.9.3

Fargo Trial
July 31, 2014
Late Vegetative Stage



Conclusions

- The rate range of oxathiapiprolin was narrowed
- 9.37-18.75 $\mu\text{g ai/target}$ rates significantly reduced downy mildew incidence
- Results indicate that oxathiapiprolin could provide another management option for downy mildew

A large field of sunflowers under a blue sky with light clouds. The sunflowers are in full bloom, with bright yellow petals and dark brown centers. The field extends to the horizon, creating a sense of depth. The sky is a clear, pale blue with some wispy white clouds.

Acknowledgements

- DuPont
- National Sunflower Association
- NDSU Agriculture Experiment Station
- NDSU Extension Service
- NDSU Ext. Plant Path Group
- Carrington Research Extension Center Group

Questions

References

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