

Evaluation of New, Generic, and Pre-Mixed Fungicides for Management of Rust on Susceptible and moderately Resistant Hybrids

Sam Markell¹, Brandt Berghuis¹, Jessica Halvorson¹,
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Benson², Joe Caroline², Dave Caruth³ & Scott Fitterer³

¹North Dakota State University

²Mycogen Seeds, ³BASF

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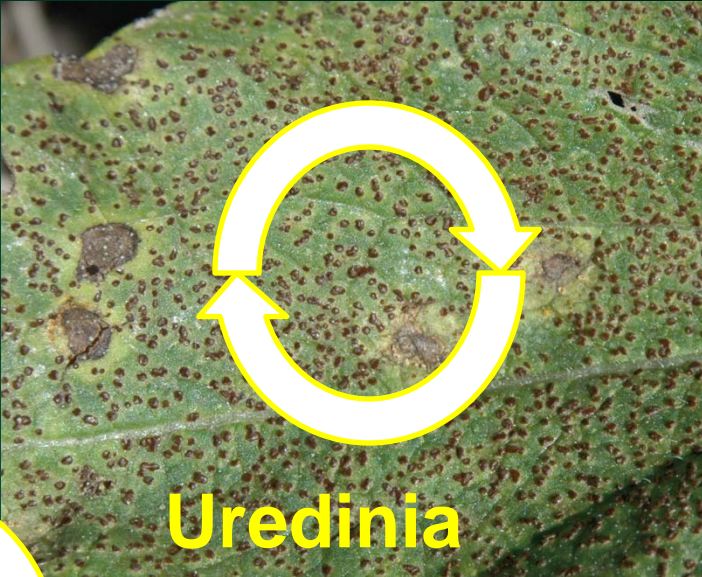
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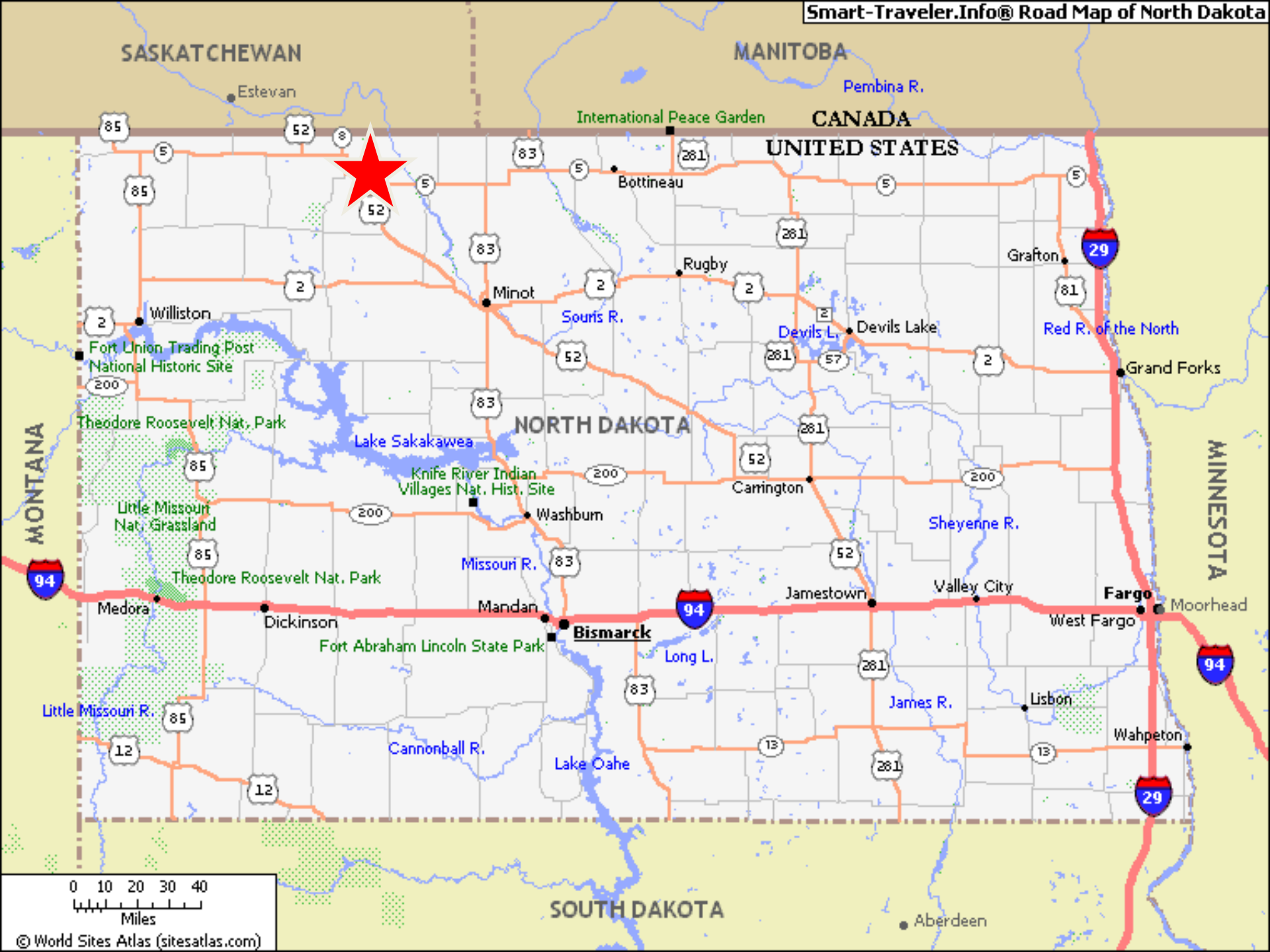
Outline

- The Importance of Rust
- Current Management Recommendations
- Evaluation of New Products

Rust Life Cycle



Photos: Sam Markell and Loayne Voigt NDSU, and <http://www.botany.hawaii.edu/faculty/wong/BOT135/Basidiumbasidiospore.jpg>



SASKATCHEWAN

MANITOBA

Pembina R.

International Peace Garden

CANADA

UNITED STATES

85

52

8

83

281

5



Bottineau

Rugby

Grafton



Williston

Minot

Souris R.

281

57

Devils Lake

Red R. of the North

Grand Forks

Fort Union Trading Post National Historic Site

Theodore Roosevelt Nat. Park

Lake Sakakawea

NORTH DAKOTA

Knife River Indian Villages Nat. Hist. Site

200

Carrington

200

Sheyenne R.

MONTANA

MINNESOTA



85

85

Little Missouri Nat. Grassland

200

Missouri R.

83

Washburn

52

281

Valley City

Fargo

Moorhead

West Fargo



Medora

Dickinson

Mandan

Bismarck

Long L.

Jamestown

281

James R.

Lisbon

Wahpeton

Little Missouri R.

85

12

12

Cannonball R.

Lake Oahe

83

13

281

13



SOUTH DAKOTA

Aberdeen

0 10 20 30 40

Miles







Mohall, ND - By season's end

- **Field sprayed twice**
 - Headline (R1) and Folicur (R5.1)
 - 1,400 lb/A
- **Non-treated Strip**
 - Estimated yield was 200 lb/A
 - Unmarketable quality



Current Management Recommendations

Yield Loss

- Susceptible Confection Hybrids
- 1% Disease Severity = 6.6% Yield Loss
- Assume 2,000 lb/A yield
 - 1% severity = 132 lb/A loss
 - \$0.30 / lb x 132 lb/A loss = \$39.6 / acre

Current Management Recommendations

Fungicides

- Timing is everything
 - 1% severity – at or before R5 (full bloom)
 - Post bloom (R6) is too late
- Triazole and strobilurins work well

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 - 1% severity – at or before R5 (full bloom)
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Objectives

- Evaluate new, generic and premixed fungicides
- Evaluate efficacy on susceptible and moderately resistant hybrids (oil)

Fungicide	Active Ingredient	FRAC Group	Rate (fl oz)
Onset	Tebuconazole	3	4
Orius	Tebuconazole	3	4
Tebustar	Tebuconazole	3	4

Fungicide	Active Ingredient	FRAC Group	Rate (fl oz)
Onset	Tebuconazole	3	4
Orius	Tebuconazole	3	4
Tebustar	Tebuconazole	3	4
Headline	Pyraclostrobin	11	6
Quadris	Azoxystrobin	11	6
Aproach	Picoxystrobin	11	6

Fungicide	Active Ingredient	FRAC Group	Rate (fl oz)
Onset	Tebuconazole	3	4
Orius	Tebuconazole	3	4
Tebustar	Tebuconazole	3	4
Headline	Pyraclostrobin	11	6
Quadris	Azoxystrobin	11	6
Aproach	Picoxystrobin	11	6
Vertisan	Penthiopyrad	7	10
Vertisan	Penthiopyrad	7	20

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Onset	Tebuconazole	3	4
Orius	Tebuconazole	3	4
Tebustar	Tebuconazole	3	4
Headline	Pyraclostrobin	11	6
Quadris	Azoxystrobin	11	6
Aproach	Picoxystrobin	11	6
Vertisan	Penthiopyrad	7	10
Vertisan	Penthiopyrad	7	20
Aproach Prima	Picoxystrobin, Cyproconazole	11, 3	3.4
Priaxor	Fluxapyroxad, Pyraclostrobin	7, 11	4
Priaxor + Onset	Fluxapyroxad, Pyraclostrobin, Tebuconazole	7, 11 + 3	4 + 2

Trial Design

- Two locations
 - BASF Research Farm near Leonard, ND
 - Mycogen Research Farm near Rothsay, MN



Trial Design

- Two locations
 - BASF Research Farm near Leonard, ND
 - Mycogen Research Farm near Rothsay, MN
- Two Oilseed Hybrids
 - Mycogen: Susceptible and Moderately Resistant
- Two adjacent independent trials
 - Designed as RCBD with 4 reps
- Fungicide Applications at R5.3

Inoculum Production



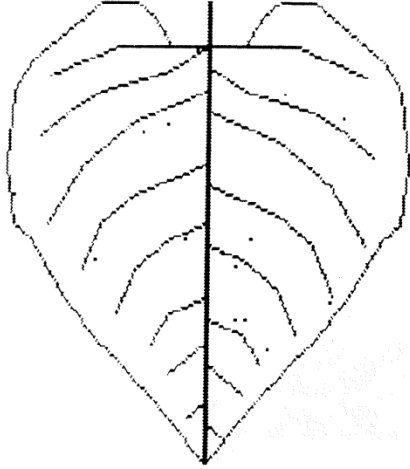
Field Inoculation





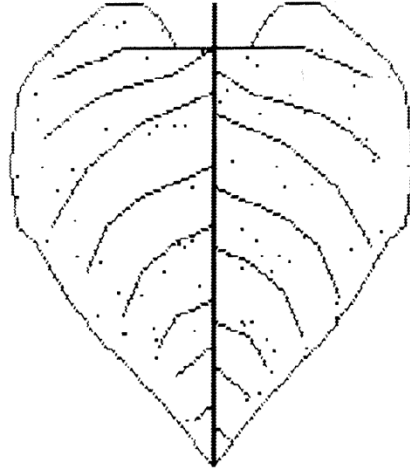
Severity Ratings

0.1%



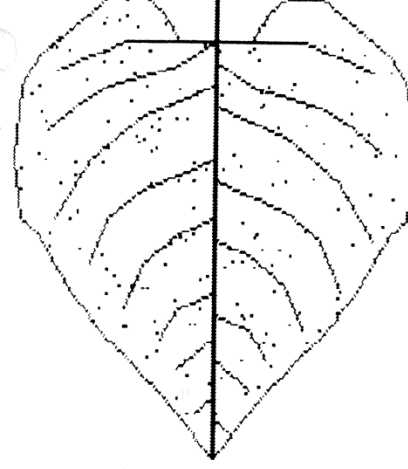
Leaf Area Affected .1%

0.5%



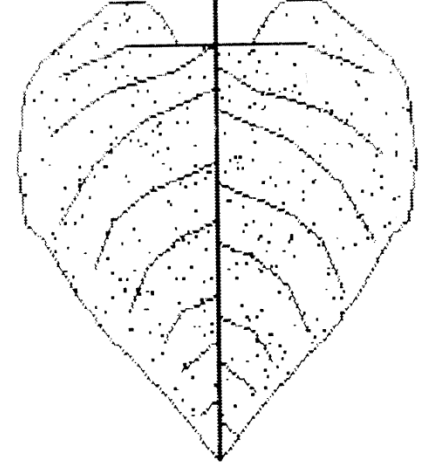
Leaf Area Affected .5%

1%



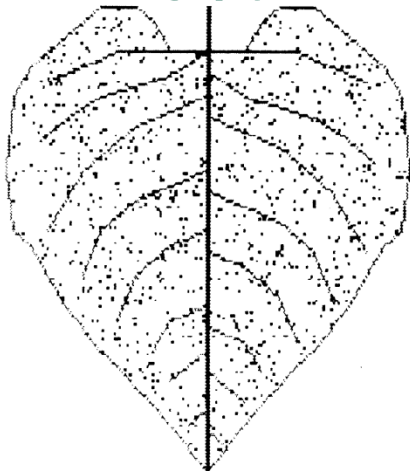
Leaf Area Affected 1%

2%



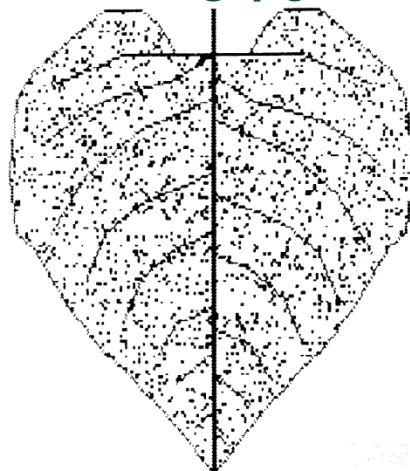
Leaf Area Affected 2%

5%



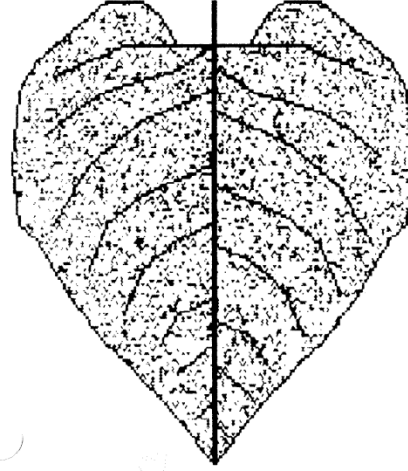
Leaf Area Affected 5%

10%



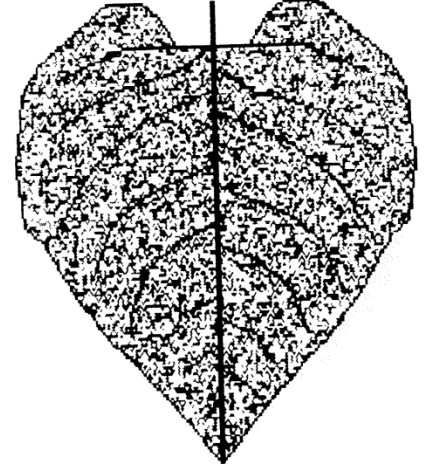
Leaf Area Affected 10%

20%



Leaf Area Affected 20%

40%



Leaf Area Affected 40%

1% Severity







Disease assessments and data

- Visual evaluations at R6 and R7
- Trials were combined across hybrid
 - Levene's test of homogeneity
- No differences were found at R6
- Yield data not valuable

Fungicide	Rate (fl oz)	Disease Severity (%) at R7			
		Moderately Resistant Hybrid		Susceptible Hybrid	
Non-Treated	NA	1.38	a	1.47	a
Onset	4				
Orius	4				
Tebustar	4				
Headline	6				
Quadris	6				
Aproach	6				
Vertisan	10				
Vertisan	20				
Aproach Prima	3.4				
Priaxor	4				
Priaxor + Onset	4 + 2				
LSD _{P=0.05}		0.25		0.18	

Fungicide	Rate (fl oz)	Disease Severity (%) at R7			
		Moderately Resistant Hybrid		Susceptible Hybrid	
Non-Treated	NA	1.38	a	1.47	a
Onset	4	0.03	c	0.02	g
Orius	4	0.02	c	0.06	fg
Tebustar	4	0.02	c	0.02	g
Headline	6				
Quadris	6				
Aproach	6				
Vertisan	10				
Vertisan	20				
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Onset	4	0.03	c	0.02	g
Orius	4	0.02	c	0.06	fg
Tebustar	4	0.02	c	0.02	g
Headline	6	0.09	c	0.21	ef
Quadris	6	0.10	c	0.22	def
Aproach	6	0.22	bc	0.40	cd
Vertisan	10				
Vertisan	20				
Aproach Prima	3.4				
Priaxor	4				
Priaxor + Onset	4 + 2				
LSD _{P=0.05}		0.25		0.18	

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Headline	6	0.09	c	0.21	ef
Quadris	6	0.10	c	0.22	def
Aproach	6	0.22	bc	0.40	cd
Vertisan	10	0.39	b	0.59	b
Vertisan	20	0.25	bc	0.48	bc
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Priaxor	4				
Priaxor + Onset	4 + 2				
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Quadris	6	0.10	c	0.22	def
Aproach	6	0.22	bc	0.40	cd
Vertisan	10	0.39	b	0.59	b
Vertisan	20	0.25	bc	0.48	bc
Aproach Prima	3.4	0.13	c	0.29	de
Priaxor	4	0.24	bc	0.27	de
Priaxor + Onset	4 + 2	0.03	c	0.06	fg
LSD _{P=0.05}		0.25		0.18	

Conclusions

- Low severity and no yield data
- Tebuconazole products were similar
- New products were competitive within FRAC group – some exception
- Addition testing would be beneficial

Acknowledgements

A photograph of a vast field of sunflowers. The sunflowers are in various stages of bloom, with bright yellow petals and dark brown centers. The field extends to the horizon under a clear, light blue sky. The sunflowers in the foreground are more detailed, showing their large green leaves and the texture of their heads.

- National Sunflower Association
- NDSU Agriculture Experiment Station and Extension Service
- Mycogen Seeds
- BASF
- Industry cooperators