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2003 Evaluations of Fungicides for Control of Sclerotinia Stem Rot of Canola in North Dakota and Minnesota

Canola grown in North Dakota and Minnesota is subject to attack by *Sclerotinia sclerotiorum*, the fungus that causes Sclerotinia stem rot (SSR). Because there are no resistant canola varieties available, the principal means of managing SSR is with fungicides.

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At the end of 2003, four fungicides were registered for use on canola grown in North Dakota and Minnesota for SSR management. These four fungicides consist of vinclozolin (Ronilan), thiophanate-methyl (Topsin M, T-methyl, and others), boscalid (Endura), and azoxystrobin (Quadris). The objective of this project was to evaluate the efficacy of several registered and experimental fungicides on SSR of canola at three locations in North Dakota and one location in Minnesota. A published report of canola fungicide trials conducted in 2001 is also available.

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Materials and Methods

Field trials were conducted at North Dakota Research Extension Centers located at Carrington, Langdon, and Minot, N.D. The University of Minnesota trial was conducted at Red Lake Falls, Minn. See **Table 1** for varieties, planting date, and plot size at each location. Nine different fungicides were evaluated at each location **(Table 2)**. There were 21 to 22 treatments at each location including an untreated control. Fungicides were applied at 30 and/or 50 percent bloom stages. All plots were inoculated with *S. sclerotiorum* ascospores at approximately the 60 to 70 percent bloom stage after fungicide treatments were applied. Mist or sprinkler irrigation was used at each location to provide environmental conditions conducive for ascospore infection and disease development.

Fifty plants within each plot were evaluated for disease incidence and severity just prior to swathing. A 0 to 5 disease severity scale was used in which 0 = no disease; 1 = superficial lesions or small branch infected; 2 = large branch dead; 3 = main stem at least 50 percent girdled; 4 = main stem girdled but plant produced good seed; and 5 = main stem girdled, much reduced yield. A 0 to 100 disease severity index (DSI) was calculated for data collected at Carrington, Langdon, and Minot, N.D., by: ((mean % incidence) x (mean severity))/5.

Table 1. Canola variety, planting date, and plot size at each location for the 2003 fungicide trial.

Location	Variety	Planting Date	Plot Size
			(ft)
Carrington, N.D.	Hyola 357 Magnum	15 May	5 x 25
Langdon, N.D.	Hyola 257 Magnum	6 May	3.5 x 16
Minot, N.D.	Invigor 2663	13 May	4 x 16
Red Lake Falls, Minn.	Invigor 2663	16 May	6 x 20

Table 2. Fungicides tested in the 2003 canola fungicide trials.

Product/experimental Name	Active Ingredient	Company
Blocker	PCNB	AMVAC
Endura	boscalid	BASF
JAU6476	prothioconazole	Bayer
Ronilan	vinclozolin	BASF
Rovral	iprodione	Bayer
TD 2193-07	thiophanate-methyl	Cerexagri
Topsin M	thiophanate-methyl	Cerexagri
V-10114	NA	Valent
V-10116	NA	Valent

Results and Discussion

■ Carrington, N.D.

Disease pressure at Carrington was moderate, with the untreated control having a DSI value of 32 **(Table 3)**. Five treatments had a significantly lower DSI value than the untreated control, and were: Endura at 5.8 oz./A. applied at either 30 or 50 percent bloom; JAU6476 at 5 fl. oz./A. applied at 50 percent bloom; and JAU6476 at 5.7 fl. oz./A. applied at either 30 or 50 percent bloom. None of the fungicide treatments had a yield significantly greater than the untreated control.

■ Langdon, N.D.

Disease pressure at Langdon was very high, with the untreated control having a DSI value of 83 **(Table 4)**. Six treatments had a significantly lower DSI value than the untreated control, and were: Endura at 5.8 oz./A. applied at either 30 or 50 percent bloom; JAU6476 at 5 fl. oz./A. at either 30 or 50 percent bloom; JAU6476 at 5.7 fl. oz./A. applied at 50 percent bloom; and Rovral at 14.4 fl. oz./A. applied at 50 percent bloom. Ten treatments had a significantly greater yield than the untreated control, and were: Ronilan at 12 oz./A. applied at 50 percent bloom; Endura at 5.8 oz./A. applied at either 30 or 50 percent bloom; JAU6476 at either 5 or 5.7 fl. oz./A. applied at either 30 or 50 percent bloom; Rovral at

Table 3. Effect of fungicides on Sclerotinia stem rot and yield at Carrington, N.D. in 2003.

Product	Adjuvant	Rate/A	Timing	Disease Severity Index	Yield
			(% bloom)	(0-100)[a]	(lb/A)
Untreated				32	1534
Blocker		3 pt	30	27	1391
Blocker		3 pt	50	32	1487
Blocker + Topsin M		3 pt + 8 oz	30	31	1421
Endura		5.8 oz	30	24	1593
Endura		5.8 oz	50	17	1695
JAU6476	Induce 0.125% v/v	5 fl oz	30	26	1745
JAU6476	Induce 0.125% v/v	5 fl oz	50	21	1753
JAU6476	Induce 0.125% v/v	5.7 fl oz	30	24	1720
JAU6476	Induce 0.125% v/v	5.7 fl oz	50	18	1660
Ronilan		12 oz	30	38	1576
Ronilan		12 oz	50	27	1664
Rovral 4 FL	COC 1% v/v	14.4 fl oz	30	30	1540
Rovral 4 FL	COC 1% v/v	14.4 fl oz	50	26	1466
TD2193-07		20 fl oz	30	30	1476
TD2193-07		20 fl oz	50	28	1525
Topsin M		16 oz	30	33	1581
Topsin M		16 oz	50	31	1527
V-10114		19 fl oz	30	42	1745
V-10116		9.5 fl oz	30	27	1756
V-10116		9.5 fl oz	50	29	1777
LSD 5%[b]				8	NS[c]

[a] Disease severity index was calculated for each plot by: ((% incidence x mean severity)/5), where severity was measured on a 0 to 5 scale.

[b] Fisher's protected least significant difference (LSD) was used to compare means at the 5% significance level.

[c] NS, not significant at $P \leq 0.05$.

Table 4. Effect of fungicides on Sclerotinia stem rot and yield at Langdon, N.D. in 2003.

Product	Adjuvant	Rate/A	Timing	Disease Severity Index	Yield
			(% bloom)	(0-100)[a]	(lb/A)
Untreated				82	1516
Blocker		3 pt	30	95	1623
Blocker + Topsin M		3 pt + 8 oz	30	79	1676
Endura		5.8 oz	30	53	1978
Endura		5.8 oz	50	40	2191
JAU6467	Induce 0.125% v/v	5 fl oz	30	46	2291
JAU6467	Induce 0.125% v/v	5 fl oz	50	34	2444
JAU6467	Induce 0.125% v/v	5.7 fl oz	30	59	2151
JAU6467	Induce 0.125% v/v	5.7 fl oz	50	35	2437
Ronilan		12 oz	30	78	1952
Ronilan		12 oz	50	67	2081
Rovral 4FL	Aphoil 1% v/v	14.4 fl oz	30	65	2078
Rovral 4FL	Aphoil 1% v/v	14.4 fl oz	50	58	2224
TD2193-07 4.5F		20 fl oz	30	66	1895
TD2193-07 4.5F		20 fl oz	50	70	1892
Topsin M		8 oz	30	88	1862
Topsin M		16 oz	30	74	1911
Topsin M		16 oz	50	79	1706
V-10114		19 fl oz	30	87	1802
V-10114		19 fl oz	50	76	1723
V-10116		9.5 fl oz	30	74	2028
V-10116		9.5 fl oz	50	83	1779
LSD 5%[b]				24	450

[a] Disease severity index was calculated for each plot by: ((% incidence x mean severity)/5), where severity was measured on a 0 to 5 scale.

[b] Fisher's protected least significant difference (LSD) was used to compare means at the 5% significance level.

14.4 fl. oz./A. applied at either 30 or 50 percent bloom; and V-10116 at 9.5 fl. oz./A. applied at 30 percent bloom.

■ Minot, N.D.

Disease pressure at Minot was low, with the untreated control having a DSI value of 5.8 **(Table 5)**. All fungicide treatments except for Blocker alone applied at 3 pt./A. had a significantly lower DSI value than the untreated control. None of the fungicide treated plots had a significantly greater yield than the untreated control.

■ Red Lake Falls, Minn.

Disease pressure at Red Lake Falls was moderate, with the untreated control having an incidence of 23 percent and severity of 4.0 **(Table 6)**. All fungicide treatments had significantly less DSI than the untreated control. None of the fungicide treatments had a yield significantly greater than the untreated control.

Overall, where disease pressure was high (Langdon, N.D.), yield was significantly increased with efficacious fungicides; however, yield was not significantly increased with fungicides at locations with moderate to low disease pressure. The newly registered fungicide Endura and unregistered products Rovral, JAU6476, and V-10116 show the potential for SSR control in canola.

Table 5. Effect of fungicides on Sclerotinia stem rot and yield at Minot, N.D. in 2003.

Product	Adjuvant	Rate/A	Timing	Disease Severity Index	Yield
			(% bloom)	(0-100)[a]	(lb/A)
Untreated				6	2669
Blocker		3 pt	30	6	2698
Blocker + Topsin M		3 pt + 8 oz	30	3	2708
Endura		5.8 oz	30	1	2630
Endura		5.8 oz	50	1	2835
JAU 6476	Induce 0.125% v/v	5 fl oz	30	2	2993
JAU 6476	Induce 0.125% v/v	5 fl oz	50	1	2484
JAU 6476	Induce 0.125% v/v	5.7 fl oz	30	1	2685
JAU 6476	Induce 0.125% v/v	5.7 fl oz	50	1	2898
Ronilan		12 oz	30	1	2849
Ronilan		12 oz	50	1	2943
Rovral 4 FL	COC 1% v/v	14.4 fl oz	30	3	2879
Rovral 4 FL	COC 1% v/v	14.4 fl oz	50	2	2484
TD 2193-07		20 fl oz	30	2	2859
TD 2193-07		20 fl oz	50	2	2790
Topsin M		8 oz	30	2	3007
Topsin M		16 oz	30	1	2944
Topsin M		16 oz	50	1	2925
V-10114		19 fl oz	30	3	3015
V-10114		19 fl oz	50	3	2510
V-10116		9.5 fl oz	30	4	3164
V-10116		9.5 fl oz	50	3	2744
LSD 5%[b]				2	NS[c]

[a] Disease severity index was calculated for each plot by: ((% incidence x mean severity)/5), where severity was measured on a 0 to 5 scale.

[b] Fisher's protected least significant difference (LSD) was used to compare means at the 5% significance level.

[c] NS, not significant at $P \leq 0.05$.

Table 6. Effect of fungicides on Sclerotinia stem rot and yield at Red Lake Falls, Minn. in 2003.

Product	Adjuvant	Rate/A	Timing	Disease Severity Index	Yield
			(% bloom)	(0-100)[a]	(lb/A)
Untreated				18	1870
Blocker		3 pt	30	8	1732
Blocker + Topsin M		3 pt + 8oz	30	12	1766
Endura		5.8 oz	30	6	1750
Endura		5.8 oz	50	3	1824
JAU6476	Induce 0.125% v/v	5 oz	30	3	1816
JAU6476	Induce 0.125% v/v	5 oz	50	4	1877
JAU6476	Induce 0.125% v/v	5.7 oz	30	4	1827
JAU6476	Induce 0.125% v/v	5.7 oz	50	3	1873
Ronilan		12 oz	30	7	1755
Ronilan		12 oz	50	5	1716
Rovral 4 FL	COC 1% v/v	14.4 oz	30	3	1696
Rovral 4 FL	COC 1% v/v	14.4 oz	50	4	1820
TD 2193-07 4.5F		20 fl oz	30	5	1829
TD 2193-07 4.5F		20 fl oz	50	4	1772
Topsin M		8 oz	30	5	1512
Topsin M		16 oz	30	4	1748
Topsin M		16 oz	50	2	1680
V-10114		19 fl oz	30	8	1600
V-10114		19 fl oz	50	6	1921
V-10116		9.5 fl oz	50	7	1880
LSD 5%[b]				6	NS[c]

[a] Disease severity index was calculated for each plot by: ((% incidence x mean severity)/5), where severity was measured on a 0 to 5 scale.

[b] Fisher's protected least significant difference (LSD) was used to compare means at the 5% significance level.

[c] NS, not significant at $P \leq 0.05$.

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Literature Cited

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