

Progress Report for, “Evaluation of canola cultivars and lines for resistance to diverse strains of the blackleg fungus”, funded by the National Canola Research Program – 2006

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Background

Blackleg, caused by *Leptosphaeria maculans*, is a reemerging disease in North Dakota. Short crop rotations and the development of more aggressive *L. maculans* strains may be partially responsible for the reemergence of the disease, as highly aggressive pathogenicity groups (PG) 3 and 4 of *L. maculans* were identified in North Dakota in 2003 (Bradley et al., 2005). Because of the growing threat of blackleg to canola in the major production region in the U.S., research was conducted to: i) establish a blackleg nursery in North Dakota for screening cultivars and experimental lines for resistance; and ii) evaluate northern canola cultivars and experimental lines for blackleg resistance against highly aggressive and variable *L. maculans* populations in University of Georgia blackleg nurseries.

Materials and Methods

North Dakota blackleg nursery. A blackleg nursery was established near Langdon, ND. The blackleg nursery site was located on the North Dakota State University Research Extension Center located in Langdon, ND. The location had a history of blackleg disease, and disease pressure was augmented by spreading diseased canola stubble across the experimental site as well as inoculating with pycnidiospores of the blackleg fungus when canola plants were at the 2 to 4 leaf stage. In the trial, 64 entries, which included commercial cultivars, lines from University of Georgia, and 4 check cultivars, were evaluated for blackleg resistance. The majority of the lines entered from the University of Georgia were selections of early maturity from material that were segregating for maturity at Langdon in 2004 and 2005. The experimental design was a randomized complete block (RCB) with 4 replications. Plots were evaluated for blackleg severity on 9 August 2006 by cutting stems of 25 plants per plot and rating using a 0 to 5 severity scale where:

0= No penetration or noticeable infection of the stem

1= 25% of the stem circumference infected; lesion superficial

2= 50% of the stem circumference infected; some penetration

3= 75% of the stem circumference infected; significant penetration

4= stem completely girdled, but intact at the base; significant penetration

5= stem girdled at the base, constricted, dry and brittle, may be completely severed; plant dead

University of Georgia blackleg screening nurseries. Two blackleg screening nurseries were planted in October, 2005. The northern nursery at Griffin, GA was planted with 3 replications of 134 canola entries plus standard cultivars. The southern nursery at Plains, GA was planted with 3 replications of 218 canola entries plus standard cultivars. After planting, diseased stubble from the previous nurseries was scattered over the test sites. Both sites were irrigated to promote sporulation of the pathogen and germination of the canola seed.

Results

North Dakota blackleg nursery. Disease pressure was low to moderate, with blackleg severity ranging from 1.1 to 3.1 (on a 0 to 5 scale) (Table 1). Many of the lines tested had good blackleg resistance, with 34 of the 64 tested having less than a 2.0 severity rating. The susceptible check cultivar, 'Westar', had only a 2.3 severity rating, which was quite low. The low severity rating of Westar indicates that the disease pressure was likely not great enough or uniform enough to draw sound conclusions from the trial.

University of Georgia blackleg nursery. The weather in October and November was extremely dry at both locations. Despite irrigations at both locations, the early development of extensive foliar lesions was not observed. A light to moderate development of foliar lesions was observed after several weeks. This was after the critical infection time that results in girdling stem lesions that cause lodging.

Evaluations were delayed as long as possible (late May) in hopes that symptoms would develop enough to allow some evaluation. Virtually no external symptoms developed on the stems at either test site. All plots of the susceptible standard cultivar, Westar, were cut at the soil line and examined for internal symptoms. Fewer than 10% of the plants had only minor internal symptoms. Several other cultivars known to be highly susceptible were cut with similar results and evaluations were discontinued.

This is the first time since blackleg screening began in 1993 that extremely dry weather after planting has caused a complete failure of our blackleg nurseries in Georgia.

Reference

Bradley, C. A., Parks, P. S., Chen, Y., and Fernando, W. G. D. 2005. First Report of Pathogenicity Groups 3 and 4 of *Leptosphaeria maculans* on Canola in North Dakota. Plant Dis. 89:776.

Table 1. Reaction of canola entries to blackleg at Langdon, ND in 2006.

Entry name	Blackleg severity (0-5)^a
G04029.D4	1.1
Nexera 830CL	1.3
WinSpr	1.3
G04023.D1	1.3
V1030	1.3
G04023.D5	1.5
IS 3465RR	1.5
Z5052	1.5
G01114.D2	1.6
G04052.D4	1.6
G02088.D3	1.7
G04023.D3	1.7
Hyola 514 RR	1.7
MB52141	1.7
SWG 5246	1.7
SW H5263RR	1.7
InVigor 5630	1.8
Roper	1.8
Nexera 828CL	1.8
HyLite 618 CL	1.8
G04083.D3	1.8
HyClass 906	1.8
INT 3789 RR	1.8
SW-PF-02-3910	1.8
Hyola 440	1.8
G04026.D4	1.9
G04026.D2	1.9
V1031	1.9
DKL 52-10	1.9
Reaper	1.9
SW Titan RR	1.9
1852 H	1.9
45H21	1.9
Cyclone	1.9
G04029.D3	2.0
HyClass 924	2.0
Crosby	2.0
DKL 38-25	2.0
MB52143	2.0
45H73	2.1
Manor	2.1
1818	2.1
45H26	2.1
HyClasss 905	2.2
HyClass 767	2.2
DKL 35-85	2.2
IS 7145RR	2.2
HyClass 431	2.3

HyClass 712	2.3
SW Marksman RR	2.3
Westar	2.3
AC Excel	2.3
InVigor 5550	2.4
DKL 34-55	2.4
SW Patriot RR	2.4
Q2	2.4
SW-PF-02-3902	2.5
DKL223	2.5
Range RR	2.6
RR 2066	2.6
1759 S	2.7
Hyola 357 Mag.	2.8
HyClass 910	3.1
Defender	3.1
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$P > F$	0.0136
LSD 0.05	0.9
CV %	33.4
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^aBlackleg Disease Severity was rated by cutting 25 stems per plot and rating on a 0 to 5 scale, where:

0= No penetration or noticeable infection of the stem

1= 1/4 of the stem circumference infected; lesion superficial

2= 1/2 of the stem circumference infected; some penetration

3= 3/4 of the stem circumference infected; significant penetration

4= stem completely girdled, but intact at the base; significant penetration

5= stem girdled at the base, constricted, dry and brittle, may be completely severed; plant dead