

# Evaluation of Two Fungicides Applied at Different Growth Stages to Optimize Efficacy for Blackleg Control in Canola.

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Objective: To identify the most effective fungicide and application timing for control of blackleg caused by the pathogen (*Leptosphaeria maculans* L.) when other control measures cannot be utilized to limit diseases in canola (*Brassica napus* L.)

## Materials and Methods

Studies were conducted at the Langdon Research Extension Center (LREC) in 2004 and 2005 to evaluate fungicides as a management strategy for blackleg control. The study sites were located on the LREC in areas that had soil type Barnes/Svea complex. The selected sites were previously cropped small grains. The LREC had previously only experienced low levels of blackleg infection in canola. The studies were planted with a plot type double disk drill, disks spaced 6-inches apart. The trials were planted in early May of both years. All the seed was treated with Helix Extra seed treatment. Seven additional rows of canola were planted between plots to minimize movement of spray drift to adjacent plots. The fungicides were applied with CO<sub>2</sub> delivery type backpack sprayer with XR8001 nozzles oriented vertically and spaced 20 inches at 9.2 GPA. The previous fall, stems were collected from a field in Cavalier county severely damaged by blackleg. Three of the collected infected stems were placed and secured in the center of each plot after planting to provide inoculum to promote disease infection. The disease was assessed before harvest by counting the number of stems girdled from blackleg at the soil surface and in 2005 the number of stems with blackleg lesions but not girdled in one 16 ft. row/plot. An application of Capture insecticide, 1.3 fl. oz. /acre, was made to control flea beetles that escaped the Helix seed treatment. An application of Ronilan (vinclozolin) fungicide was made at 30% bloom growth stage to prevent infections from the pathogen *Sclerotinia sclerotiorum* in 2005. The trials were swathed and combined with plot combines. The harvested material was dried, cleaned, weighed, and sub sampled to determine oil concentration. Production practices for canola as recommended by NDSU Extension Service for Northeast North Dakota were followed. Data was analyzed with the general linear model (GLM) in SAS. Least significant differences (LSD) were used to compare means at the 5% probability level from yield, test weight, oil concentration, and disease severity.

## Study 1.

The first study was designed as a randomized complete block arranged as a 6x2x2 factorial with four replicates. An untreated for each cultivar was included as a treatment in the trial but was not analyzed with the other data because of incompatibility with the factorial arrangement. Six fungicide application timings; cotyledon (seedling) stage, cotyledon stage with capture insecticide, 1 pair true leaves, 2 pair true leaves, 4 pair true leaves, and bud growth stage were sprayed with Quadris fungicide (azoxystrobin 6.2 fl oz/acre) or Folicur fungicide (tebuconazole 4 fl oz/acre + 0.125% v/v Induce adjuvant) to cultivars, Interstate 'Hyola 357 Magnum', moderately resistant to blackleg, and Croplan Genetics '905RR', resistant to blackleg.

## **Study 2.**

The second study was designed a randomized complete block with four replicates. The trial was planted to Interstate 'Hyola 357 Magnum'. Fungicide treatments included Folicur, Quadris, Quilt (propiconazole + azoxystrobin), and Tilt (propiconazole). The fungicide rates were a 1x, 0.67x, and 0.33x rate for each compound with the 1x rate for each fungicide listed on the Table 13. Induce adjuvant as previously described was included with the Folicur. Fungicide was applied at 2 leaf-pair growth stage.

## **Results and Discussion**

### **Application Timing Study**

In 2004 the study was severely infected with white mold disease caused by *Sclerotinia sclerotiorum* L. The combination of the two organisms complicated measurement of significant differences among the treatments in 2004. Significant differences were determined among cultivars by blackleg severity and oil concentration and fungicides by blackleg severity, yield, and test weight (Table 1). Significant interactions were measured for yield by application timing by cultivar and oil concentration by application timing, cultivar, and fungicide.

Blackleg severity was lower with the resistant cultivar Croplan Genetics 905 RR compared to moderately resistant Interstate Hyola 357 Magnum (Table 2). Oil concentration was significantly different by cultivar by year (Table 4). Oil concentration was greater on Hyola 357 Magnum under greater levels of disease in 2004 but less in 2005 when disease levels were less. Of note are the very large differences between overall oil concentrations in the two seasons. This area warrants more research. Quadris fungicide was more effective than Folicur fungicide in reducing blackleg severity (Table 2). In contrast Folicur fungicide increased yields and test weights over Quadris fungicide indicating a beneficial factor from the Folicur fungicide not related to reduction in blackleg severity as measured by the girdling of the stem. Yield was greater on Hyola 357 Magnum compared to 905 RR when the fungicide application was made at seedling stage (Table 5). No differences were determined in yield regardless of timing when the cultivar was 905 RR. An application to Hyola 357 Magnum at two-leaf growth stage was not different from the seedling stage. An interaction was measured for oil concentration at  $P=0.1$  between application timings, cultivars, and fungicides (Figure 1).

### **Fungicide Rate Study**

Significant differences were measured in blackleg severity (Table 13). The Quadris/Quilt chemistries were generally more effective than the full rate of Tilt. The control by Tilt seemed to be rate dependent with increasing control as rate was reduced below the full rate. No differences were determined among any of the fungicides or rates in yield, test weight or oil concentration.

## Discussion

Timing generally had minimal effects in our studies. Cultivar selection was a critical component in the severity of blackleg with the resistant cultivar at lower levels of blackleg than the moderately resistant cultivar. The Quilt fungicide had the lowest severities overall. The reduction in blackleg severity was affected by Tilt rate with a reduced rate much more effective than the full rate. The propiconazole in the Quilt formulation appears to compliment the azoxystrobin in the Quadris. Further research may be warranted. Oil concentrations were very different among years. Further research will be needed to explain this observation as bio-diesels become more important and differences in oil concentration are rewarded with premiums and discounts.

**Figure 1. Oil Concentration by Cultivar, Fungicide Application Timing, and Fungicide Averaged Across Years**

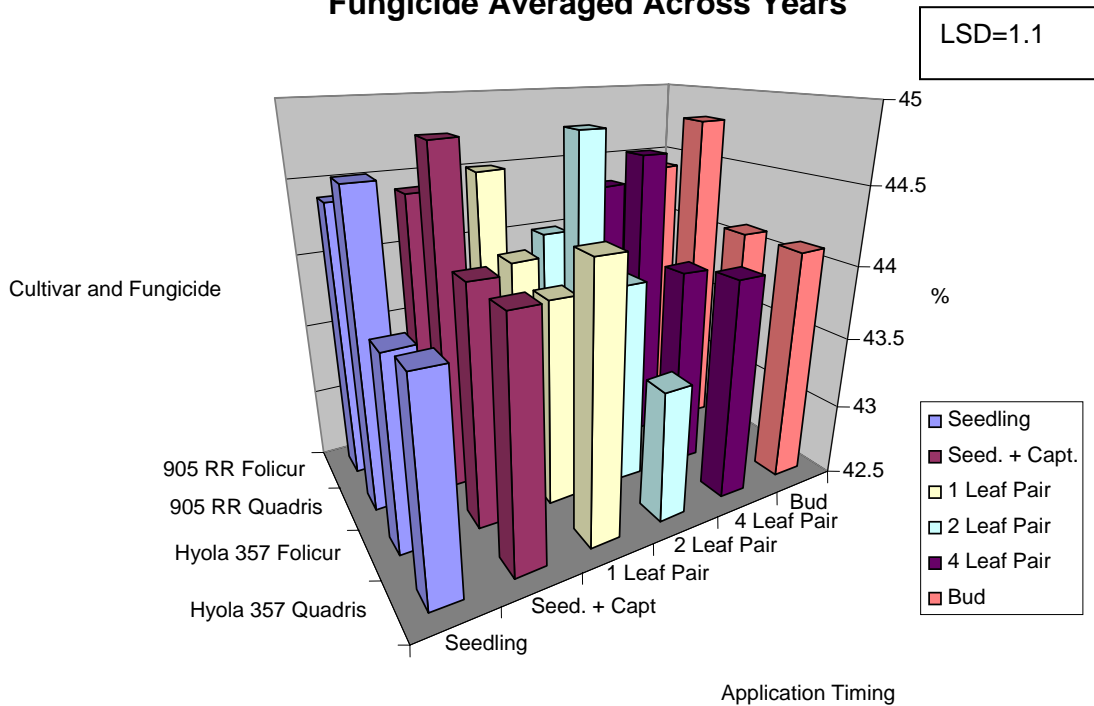


Table 1. Source of variation and confidence levels for significant differences among disease severity, yield, test weight, and oil by timing, cultivar, and fungicide on canola Langdon, 2004 and 2005.

Source of Variation	Blackleg Severity	Yield	Test Weight	Oil
Year	<0.0001	<0.0001	<0.0001	<0.0001
Rep (Yr)	0.0231	0.0054	0.0697	0.0002
Timing	0.8312	0.8755	0.3933	0.8341
Yr*Tim	0.8930	0.0050	0.2288	0.3268
Cultivar	0.0152	0.5998	0.5763	<0.0001
Yr*Cult	0.4518	<0.0001	0.0010	<0.0001
Tim*Cult	0.2204	0.0344	0.2085	0.8517
Yr*Tim*Cult	0.2338	0.8205	0.6742	0.0525
Fungicide	0.0193	0.0571	0.0523	0.1147
Yr*Fung	0.6363	0.0082	0.0641	0.3918
Cult*Fung	0.4476	0.9012	0.2755	0.3915
Yr*Cult*Fung	0.3307	0.2043	0.2149	0.0978
Tim*Fung	0.7089	0.5252	0.6654	0.3905
Yr*Tim*Fung	0.0554	0.2522	0.2100	0.8212
Tim*Cult*Fung	0.6885	0.2985	0.1072	0.0878
Yr*Tim*Cult*Fung	0.5529	0.7420	0.8938	0.8882
% C.V.	59	10	2	2

Table 2. Blackleg severity, yield, test weight, and oil averaged over fungicide timings, cultivars, fungicides, and years Langdon 2004 and 2005.

Fungicide	Timing	Cultivar	Fungicide	Blackleg Severity	Yield (lbs)	Test Weight (lbs/bu)	Oil (%)
	Seedling			9.8	2224	51.4	44.2
	Seedling + Capture			10.1	2162	51.3	44.4
	1 Leaf Pair			10.7	2162	51.7	44.2
	2 Leaf Pair			9.5	2174	51.4	44.0
	4 Leaf Pair			11.3	2195	51.3	44.2
	Bud			10.9	2189	51.4	44.2
				NS	NS	NS	NS
		Hyola 357		11.4	2176	51.4	43.9
		905 RR		9.3	2193	51.5	44.5
				<sup>z</sup>	NS	NS	<sup>z</sup>
			Folicur	11.4	2215	51.5	44.1
			Quadris	9.3	2153	51.3	44.3
				<sup>z</sup>	<sup>z</sup>	<sup>z</sup>	NS

<sup>z</sup> Significant at  $P=0.05$ .

Table 3. Blackleg severity, yield, test weight, and oil by fungicide timing and year Langdon, 2004 and 2005.

Year	Fungicide Timing	Blackleg Severity	Yield (lbs)	Test Weight (lbs/bu)	Oil (%)
2004	Seedling	16.7	1662	52.1	40.8
	Seed. + Capt.	17.3	1672	52.0	40.8
	1 Leaf Pair	16.9	1689	52.0	41.0
	2 Leaf Pair	15.9	1675	52.1	40.4
	4 Leaf Pair	18.7	1581	52.1	40.5
	Bud	16.7	1532	52.1	40.7
Untreated	Hyola 357	18.3	1622	52.1	41.0
Untreated	905 RR	11.7	1575	52.0	41.4
2005	Seedling	2.8	2787	50.7	47.6
	Seed. + Capt.	2.8	2651	50.5	47.9
	1 Leaf Pair	4.5	2636	51.4	47.4
	2 Leaf Pair	3.0	2672	50.7	47.7
	4 Leaf Pair	3.9	2809	50.6	47.8
	Bud	5.1	2845	50.7	47.8
Untreated	Hyola 357	8.5	2381	50.8	47.2
Untreated	905 RR	6.3	2675	50.4	49.1

Table 4. Blackleg severity, yield, test weight, and oil by cultivar or fungicide and year Langdon, 2004 and 2005.

Year	Cultivar or Fungicide	Blackleg Severity	Yield (lbs)	Test Weight (lbs/bu)	Oil <sup>z</sup> (%)
2004	Hyola 357	17.8	1773	51.9	40.9
	905 RR	16.3	1498	52.2	40.5
2005	Hyola 357	5.1	2579	51.0	47.0
	905 RR	2.3	2888	50.5	48.4
2004	Folicur	18.3	1623	52.1	40.7
	Quadris	15.8	1647	52.1	40.8
2005	Folicur	4.5	2808	51.0	47.5
	Quadris	2.8	2659	50.5	47.8

<sup>z</sup>LSD=0.4 for oil.

Table 5. Blackleg severity, yield, test weight, and oil by fungicide timing and cultivar averaged over fungicides and years Langdon, 2004 and 2005.

Fungicide Timing	Cultivar	Blackleg Severity	Yield <sup>2</sup> (lbs)	Test Weight (lbs/bu)	Oil (%)
Seedling	Hyola 357	11.1	2310	51.2	43.9
	905 RR	8.4	2137	51.6	44.5
Seed. + Capt.	Hyola 357	12.0	2163	51.4	44.1
	905 RR	8/2	2160	51.1	44.6
1 Leaf Pair	Hyola 357	13.9	2101	52.0	44.1
	905 RR	7.5	2224	51.4	44.3
2 Leaf Pair	Hyola 357	11.8	2221	51.4	43.7
	905 RR	7.2	2126	51.5	44.4
4 Leaf Pair	Hyola 357	12.2	2141	51.3	43.9
	905 RR	11.8	2249	51.3	44.4
Bud	Hyola 357	12.3	2117	51.4	43.9
	905 RR	9.5	2260	51.4	44.6

<sup>2</sup>LSD=145.7 lbs for yield

Table 6. Blackleg severity, yield, test weight, and oil by fungicide timing, cultivar and year averaged over fungicides Langdon, 2004 and 2005.

Fungicide Timing	Cultivar	Blackleg Severity	Yield (lbs)	Test Weight (lbs/bu)	Oil (%)
<b>2004</b>					
Seedling	Hyola 357	17.9	1889	51.8	40.7
	905 RR	15.5	1434	52.4	40.9
Seed. + Capt.	Hyola 357	20.8	1779	52.0	40.9
	905 RR	13.8	1567	52.1	40.8
1 Leaf Pair	Hyola 357	20.6	1795	51.9	41.2
	905 RR	13.3	1583	52.1	40.8
2 Leaf Pair	Hyola 357	11.5	1478	52.4	39.9
	905 RR	20.4	1872	51.9	40.9
4 Leaf Pair	Hyola 357	18.8	1706	51.9	40.6
	905 RR	18.6	1456	52.2	40.4
Bud	Hyola 357	17.4	1596	52.0	41.0
	905 RR	16.1	1468	52.2	40.4
<b>2005</b>					
Seedling	Hyola 357	4.4	2732	50.6	47.0
	905 RR	1.2	2841	50.7	48.1
Seed. + Capt.	Hyola 357	3.2	2548	50.8	47.3
	905 RR	2.5	2753	50.2	48.5
1 Leaf Pair	Hyola 357	7.2	2407	52.1	47.0
	905 RR	1.7	2866	50.7	47.7
2 Leaf Pair	Hyola 357	2.9	2571	50.8	46.4
	905 RR	3.2	2775	50.6	48.9
4 Leaf Pair	Hyola 357	5.7	2576	50.7	47.3
	905 RR	2.1	3042	50.4	48.4
Bud	Hyola 357	7.3	2639	50.8	46.7
	905 RR	2.9	3051	50.6	48.8

Table 7. Blackleg severity, yield, test weight, and oil by fungicide timing and fungicide averaged over years and cultivars Langdon, 2004 and 2005.

Fungicide Timing	Fungicide	Blackleg Severity	Yield (lbs)	Test Weight (lbs/bu)	Oil (%)
Seedling	Folicur	11.9	2215	51.5	44.1
	Quadris	7.7	2234	51.3	44.3
Seed. + Capt.	Folicur	10.3	2232	51.3	44.3
	Quadris	9.8	2091	51.3	44.3
1 Leaf Pair	Folicur	10.0	2264	52.1	44.2
	Quadris	11.4	2061	51.3	44.1
2 Leaf Pair	Folicur	10.4	2176	51.5	44.0
	Quadris	8.5	2172	51.4	44.1
4 Leaf Pair	Folicur	14.0	2202	51.3	44.1
	Quadris	8.6	2188	51.3	44.3
Bud	Folicur	11.9	2203	51.5	43.9
	Quadris	9.9	2174	51.3	44.6

Table 8. Blackleg severity, yield, test weight, and oil by fungicide timing, fungicide, and year averaged over cultivars Langdon, 2004 and 2005.

Fungicide Timing	Fungicide	Blackleg Severity	Yield (lbs)	Test Weight (lbs/bu)	Oil (%)
<b>2004</b>					
Seedling	Folicur	20.4	1630	52.0	40.8
	Quadris	13.0	1693	52.2	40.8
Seed. + Capt.	Folicur	17.5	1648	52.1	40.8
	Quadris	17.1	1699	52.0	40.8
1 Leaf Pair	Folicur	13.6	1825	52.0	41.1
	Quadris	20.3	1552	52.0	40.9
2 Leaf Pair	Folicur	18.0	1626	52.1	40.5
	Quadris	13.8	1723	52.2	40.3
4 Leaf Pair	Folicur	23.0	1511	52.2	40.5
	Quadris	14.4	1652	51.9	40.6
Bud	Folicur	17.3	1496	52.1	40.2
	Quadris	16.1	1568	52.1	41.2
<b>2005</b>					
Seedling	Folicur	3.4	2799	51.0	47.3
	Quadris	2.3	2774	50.3	47.8
Seed. + Capt.	Folicur	3.1	2817	50.5	47.7
	Quadris	2.5	2485	50.5	48.1
1 Leaf Pair	Folicur	6.3	2703	52.1	47.3
	Quadris	2.6	2569	50.6	47.4
2 Leaf Pair	Folicur	2.8	2726	50.9	47.5
	Quadris	3.2	2620	50.6	47.9
4 Leaf Pair	Folicur	5.0	2893	50.5	47.7
	Quadris	2.8	2725	50.6	48.0
Bud	Folicur	6.5	2909	50.9	47.6
	Quadris	3.7	2781	50.5	48.0



Table 9. Blackleg severity, yield, test weight, and oil by cultivar and fungicide averaged over years and fungicide timings and by year Langdon, 2004 and 2005.

Cultivar	Fungicide	Blackleg	Yield	Test Weight	Oil
		Severity	(lbs)	(lbs/bu)	(%)
Hyola 357	Folicur	12.9	2205	51.6	43.9
Hyola 357	Quadris	10.0	2146	51.3	43.9
905 RR	Folicur	9.9	2225	51.4	44.3
905 RR	Quadris	8.7	2160	51.3	44.7
2004					
Hyola 357	Folicur	19.0	1779	51.9	41.0
Hyola 357	Quadris	16.5	1765	51.9	40.7
905 RR	Folicur	17.5	1466	52.3	40.3
905 RR	Quadris	15.0	1529	52.2	40.8
2005					
Hyola 357	Folicur	6.8	2631	51.3	46.8
Hyola 357	Quadris	3.4	2526	50.6	47.1
905 RR	Folicur	2.2	2985	50.6	48.3
905 RR	Quadris	2.3	2791	50.4	48.6

Table 10. Blackleg severity, yield, test weight, and oil by fungicide timing, cultivar, and fungicide averaged over years Langdon, 2004 and 2005.

Fungicide Timing	Cultivar	Fungicide	Blackleg Severity	Yield (lbs)	Test Weight (lbs/bu)	Oil <sup>2</sup> (%)
Seedling	Hyola 357	Folicur	13.5	2309	51.3	43.8
Seedling	Hyola 357	Quadris	8.8	2312	51.1	43.9
Seedling	905 RR	Folicur	10.2	2120	51.6	44.4
Seedling	905 RR	Quadris	6.5	2155	51.5	44.6
Seed. + Capt.	Hyola 357	Folicur	14.1	2225	51.4	44.1
Seed. + Capt	Hyola 357	Quadris	9.8	2102	51.4	44.1
Seed. + Capt	905 RR	Folicur	6.5	2240	51.2	44.4
Seed. + Capt	905 RR	Quadris	9.8	2080	51.1	44.8
1 Leaf Pair	Hyola 357	Folicur	13.0	2199	52.7	43.9
1 Leaf Pair	Hyola 357	Quadris	14.8	2002	51.2	44.3
1 Leaf Pair	905 RR	Folicur	6.9	2329	51.4	44.5
1 Leaf Pair	905 RR	Quadris	8.1	2119	51.4	44.0
2 Leaf Pair	Hyola 357	Folicur	8.2	2196	51.4	43.9
2 Leaf Pair	Hyola 357	Quadris	6.1	2245	51.3	43.4
2 Leaf Pair	905 RR	Folicur	12.6	2155	51.5	44.0
2 Leaf Pair	905 RR	Quadris	10.9	2097	51.5	44.8
4 Leaf Pair	Hyola 357	Folicur	15.4	2214	51.3	43.9
4 Leaf Pair	Hyola 357	Quadris	9.1	2068	51.3	44.0
4 Leaf Pair	905 RR	Folicur	12.6	2190	51.3	44.3
4 Leaf Pair	905 RR	Quadris	8.1	2308	51.3	44.6
Bud	Hyola 357	Folicur	13.3	2089	51.3	43.8
Bud	Hyola 357	Quadris	11.3	2146	51.3	43.9
Bud	905 RR	Folicur	10.5	2317	51.5	44.0
Bud	905 RR	Quadris	8.5	2203	51.3	45.2

<sup>2</sup>LSD= 1.1 for Oil.

Table 11. Blackleg severity, yield, test weight, and oil by fungicide timing, cultivar, and fungicide Langdon, 2004.

Fungicide Timing	Cultivar	Fungicide	Blackleg Severity	Yield (lbs)	Test Weight (lbs/bu)	Oil (%)
Seedling	Hyola 357	Folicur	21.4	1918	51.6	40.8
Seedling	Hyola 357	Quadris	14.3	1860	51.9	40.7
Seedling	905 RR	Folicur	19.3	1343	52.4	40.9
Seedling	905 RR	Quadris	11.8	1525	52.5	40.9
Seed. + Capt.	Hyola 357	Folicur	24.1	1769	52.0	41.0
Seed. + Capt	Hyola 357	Quadris	17.5	1788	52.0	40.8
Seed. + Capt	905 RR	Folicur	10.9	1527	52.1	40.7
Seed. + Capt	905 RR	Quadris	16.7	1606	52.0	40.8
1 Leaf Pair	Hyola 357	Folicur	15.3	1930	52.0	41.2
1 Leaf Pair	Hyola 357	Quadris	25.8	1659	51.8	41.2
1 Leaf Pair	905 RR	Folicur	11.8	1720	52.0	41.0
1 Leaf Pair	905 RR	Quadris	14.7	1445	52.3	40.6
2 Leaf Pair	Hyola 357	Folicur	12.8	1833	51.8	41.5
2 Leaf Pair	Hyola 357	Quadris	10.1	1910	52.0	40.3
2 Leaf Pair	905 RR	Folicur	23.2	1419	52.4	39.5
2 Leaf Pair	905 RR	Quadris	17.6	1537	52.4	40.4
4 Leaf Pair	Hyola 357	Folicur	23.6	1738	52.0	40.8
4 Leaf Pair	Hyola 357	Quadris	14.0	1674	51.9	40.4
4 Leaf Pair	905 RR	Folicur	22.4	1284	52.4	40.1
4 Leaf Pair	905 RR	Quadris	14.8	1629	52.0	40.7
Bud	Hyola 357	Folicur	17.1	1488	52.0	40.9
Bud	Hyola 357	Quadris	17.5	1703	52.0	41.0
Bud	905 RR	Folicur	17.5	1503	52.3	39.5
Bud	905 RR	Quadris	14.6	1433	52.1	41.3

Table 12. Blackleg severity, yield, test weight, and oil by fungicide timing, cultivar, and fungicide Langdon, 2005.

Fungicide Timing	Cultivar	Fungicide	Blackleg Severity	Yield (lbs)	Test Weight (lbs/bu)	Oil (%)
Seedling	Hyola 357	Folicur	5.6	2701	51.0	46.9
Seedling	Hyola 357	Quadris	3.2	2764	50.3	47.2
Seedling	905 RR	Folicur	1.1	2898	50.9	47.8
Seedling	905 RR	Quadris	1.3	2784	50.4	48.4
Seed. + Capt.	Hyola 357	Folicur	4.2	2680	50.8	47.1
Seed. + Capt	Hyola 357	Quadris	2.1	2417	50.8	47.5
Seed. + Capt	905 RR	Folicur	2.0	2953	50.2	48.3
Seed. + Capt	905 RR	Quadris	3.0	2553	50.2	48.8
1 Leaf Pair	Hyola 357	Folicur	10.6	2468	53.4	46.7
1 Leaf Pair	Hyola 357	Quadris	3.8	2345	50.7	47.3
1 Leaf Pair	905 RR	Folicur	2.1	2938	50.8	47.9
1 Leaf Pair	905 RR	Quadris	1.4	2793	50.5	47.5
2 Leaf Pair	Hyola 357	Folicur	3.6	2560	51.0	46.4
2 Leaf Pair	Hyola 357	Quadris	2.1	2582	50.7	46.6
2 Leaf Pair	905 RR	Folicur	2.1	2892	50.7	48.6
2 Leaf Pair	905 RR	Quadris	4.3	2658	50.6	49.2
4 Leaf Pair	Hyola 357	Folicur	7.3	2691	50.7	47.0
4 Leaf Pair	Hyola 357	Quadris	4.2	2462	50.7	47.5
4 Leaf Pair	905 RR	Folicur	2.7	2345	50.7	47.3
4 Leaf Pair	905 RR	Quadris	1.4	3096	50.3	48.5
Bud	Hyola 357	Folicur	9.5	2689	51.1	46.7
Bud	Hyola 357	Quadris	5.1	2588	50.6	46.8
Bud	905 RR	Folicur	3.5	3130	50.8	48.5
Bud	905 RR	Quadris	2.3	2973	50.4	49.1

Table 13. Blackleg Severity (Stem Girdling), Yield, Test Weight, and Oil by Fungicide and Rate averaged over years, Langdon 2004, and 2005.

Fungicide and Rate	Relative Rate	Blackleg Severity	Yield lbs	Test Weight lb/bu	Oil %
Folicur 4 fl oz/acre	1 X	11.7	2054	51.3	44.6
	0.67 X	13.0	2090	51.3	43.9
	0.33 X	10.1	2149	51.1	44.5
Quadris 6.2 fl oz/acre	1 X	10.5	2037	51.3	44.6
	0.67 X	7.6	2141	51.2	44.5
	0.33 X	10.2	2152	51.4	43.9
Quilt 20.5 fl oz/acre	1 X	7.5	2179	51.2	44.7
	0.67 X	8.6	2141	51.1	44.9
	0.33 X	9.3	2102	51.1	44.7
Tilt 4 fl oz/acre	1 X	16.5	2171	51.4	43.6
	0.67 X	10.6	2186	51.4	44.1
	0.33 X	9.6	2199	51.2	44.4
LSD $P = 0.05$		5.0	NS	NS	NS
% C.V.		48	9	1	4

Table 14. Blackleg Severity (Stem Girdling), Yield, Test Weight, and Oil by Fungicide Treatment on Canola, Langdon 2004.

Fungicide and Rate	Relative Rate	Blackleg Severity	Yield lbs	Test Weight lb/bu	Oil %
untreated		18.3	1622	52.1	41.0
Folicur 4 fl oz/acre	1 X	17.5	1637	51.8	41.3
	0.67 X	16.5	1775	51.9	39.6
	0.33 X	12.7	1862	51.3	41.0
Quadris 6.2 fl oz/acre	1 X	18.3	1627	51.8	41.7
	0.67 X	13.3	1784	51.6	42.0
	0.33 X	15.9	1929	51.8	39.6
Quilt 20.5 fl oz/acre	1 X	13.0	1888	51.6	41.8
	0.67 X	16.5	1828	51.4	42.1
	0.33 X	14.7	1773	51.4	41.0
Tilt 4 fl oz/acre	1 X	17.6	2027	51.6	39.7
	0.67 X	12.0	1976	52.0	40.2
	0.33 X	14.3	1865	51.6	41.0

No significant treatment by year interactions.

Table 15. Stem Girdling, Stem Lesions, Yield, and Test Weight by Fungicide and Rate, Langdon 2005.

Fungicide	Fungicide Rate (Fl oz/acre)	Blackleg Severity		Yield (Lbs/a)	Test Weight (Lbs/bu)	Oil (%)
		Stem Girdling (Stems/row)	Lesions <sup>z</sup> (Stems/row)			
untreated		8.5	7.1	2380.5	50.8	47.2
Quadris	6.2	2.7	12.5	2447.3	50.8	47.5
	4.2	2.0	8.8	2497.8	50.8	47.1
	2.1	4.4	5.8	2376.0	51.0	48.2
Quilt	20.5	2.0	7.2	2470.6	50.8	47.7
	13.7	0.8	8.9	2454.9	50.8	47.7
	6.8	3.9	5.5	2431.1	50.9	47.7
Folicur	4.0	6.0	5.5	2471.8	50.8	47.9
	2.7	9.4	6.5	2404.8	50.8	48.1
	1.3	7.4	7.3	2435.3	51.0	48.0
Tilt	4.0	15.4	7.4	2316.2	51.2	47.9
	2.7	9.3	7.1	2395.6	50.7	47.9
	1.3	5.0	13.2	2533.1	50.8	47.8

No significant treatment by year interactions.

<sup>z</sup> LSD and % C.V. 4.6 and 40 respectively when analyzed with one year's data.