Evaluation of Dormant Seeding Canola in North Dakota

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Introduction

Dormant (frost or fall) canola seeding has been implemented with limited success in Canada and the U.S.A. in recent years. A multi-location project was undertaken by North Dakota State University (NDSU) research extension centers to investigate the viability of dormant seeding in North Dakota. Fall vs. spring seeding were compared, as well as the effectiveness of Extender, a polymer seed coating, in reducing premature germination. At some sites, conventional tillage was compared to no-till. Results of the Fall 1999 – Spring 2000 and Fall 2001 – Spring 2002 trials are summarized in the annexed document. A final trial was initiated in the fall of 2002.

Procedures

The trial was conducted at the NDSU Carrington, Langdon, and Hettinger Research Extension Centers. Depending upon the site, DKL 34-55 (open-pollinated) and / or Hyola 357 (hybrid) varieties were sown on one or two dates in the fall of 2002 and in the spring of 2003. Seeding rates of 600,000 and 800,000 live seeds / acre were used in fall and 600,000 in spring. Seed for spring plots was treated with Helix Xtra. Seed for fall plots was treated with fungicide, fungicide + Extender, or, in some cases, no seed treatment (bare).

Results

Results from the first two growing seasons (1999-2000 and 2001-2002) of this project were not encouraging (see annexed report). Yields from fall seeding rarely approached those of spring seeding and any advantages in time management were more than offset by reduced yields. In the 2002-2003 project year, both proposed fall plantings and a timely spring planting were only accomplished at Hettinger (Table 1). Fall freeze-up and rainy weather in May complicated planting plans in Carrington and Langdon.

Table 1. Dormant-seeded canola trial data, NDSU, 2002-03.

Planting Date	Carrington	Langdon	Hettinger
Fall Date 1	7 Nov.	7Nov.	28 Oct.
Fall Date 2	---[1]	---	12 Nov.
Spring	30 May	16 May	7 Apr.

[1]Not planted

Carrington. All fall-seeded treatments resulted in a lower plant stand that spring seeding (Table 2). Plant height of DKL 34-55 at maturity was unaffected by planting treatment, while spring-planted Hyola 357 was significantly taller than the fall-seeded. Lodging, test weight, and seed oil concentration were similar for all treatments. Spring-sown yields of both varieties were undoubtedly reduced by the late planting date. Bare seed (no fungicide, no polymer coating) of DKL 34-55 yielded significantly less that the fungicide-treated seed sown in the fall, while the spring treatment was intermediate. Yields of fall-seeded Hyola 357 with only fungicide tended to be lower than spring seeding, while the yields of treatments with Extender were similar to spring seeding. Increasing the fall seeding rate from 600,000 live seeds / acre to 800,000 tended to improve the yield of DKL 34-55 with fungicide and Hyola 357 with fungicide + Extender.

Table 2. Evaluation of seed coating and seeding rate in fall-seeded canola, NDSU Carrington, 2002-03.

Planting Time	Seeding Rate (x 1000)	Seed Treatment[1]	Variety	Spring Stand (plants/ft^2)	Height (cm)	Lodging (1-9)[2]	Yield (lbs/acre)	Test Weight (lbs/bushel)	Seed Weight (g/200)	Oil (%)
Fall	600	Bare	DKL 34-55	1.3	89.5	3.0	619	48.4	0.63	39.6
Fall	800	Bare	DKL 34-55	1.3	99.3	3.5	653	48.6	0.62	39.5
Fall	600	F	DKL 34-55	3.4	90.0	2.5	1180	47.7	0.65	38.4
Fall	800	F	DKL 34-55	3.8	88.5	3.0	1359	48.4	0.64	41.1
Spring	600	F	DKL 34-55	6.0	96.3	3.5	831	49.2	0.63	39.5
Fall	600	F	Hyola 357	1.6	91.5	2.5	740	47.8	0.64	39.4
Fall	800	F	Hyola 357	2.9	98.8	2.5	727	48.9	0.56	40.7
Fall	600	F + E	Hyola 357	2.2	93.3	2.3	886	48.2	0.59	38.6
Fall	800	F + E	Hyola 357	3.0	106.3	2.0	1156	49.0	0.59	41.9
Spring	600	F	Hyola 357	5.8	125.0	1.8	1075	49.5	0.55	41.9
Mean				3.1	97.8	2.7	928	48.6	0.61	40.1
C.V. (%)				40.8	10.8	39.9	25	2.0	7.3	7.3
LSD (0.05)				1.9	15.3	NS	341	NS	0.07	NS
LSD (0.01)				2.6	20.7	NS	460	NS	NS	NS

[1]Bare = no seed treatment, F = Fungicide, F+ E = Fungicide + Extender

[2]1 = Erect, 9 = Prostrate

Langdon. Fall-seeded plots resulted in very good stands, especially when the seeding rate was increased to 800,000 live seeds / acre (Table 3). Due to late planting and soil crusting, spring-seeded stands were significantly lower that those with fall seeding. Fall-seeded treatments did not differ appreciably in date of beginning or end bloom, but reached beginning bloom 13-15 days earlier than the spring treatment and end bloom 21-24 days earlier. Thus, spring seeding resulted in a longer duration of flowering. Ordinarily, earlier emergence should result in a longer duration of flowering because the reproductive period will usually escape hot, dry temps later in summer. Relatively cool temperatures in the weeks after the fall seedings finished flowering probably contributed to this phenomenon. Plant height in Langdon was unaffected by seeding treatment. Seed oil concentration was lowest in the low-yielding spring planting. Yields of all fall treatments were similar and significantly higher than with spring seeding. The relatively poor performance of the spring treatment can be attributed to poor stand establishment

Table 3. Performance of dormant-seeded canola, NDSU Langdon, 2002-03.

Planting Time	Seeding Rate	Seed Treatment[1]	Spring Stand	10% Bloom	90% Bloom	Height	Yield	Oil
	(x 1000)		(plants/ft^2)	(DAP)[2]	(DAP)	(cm)	(lbs/acre)	(%)
Fall[3]	600	Bare	6.9	24.8	46.0	115.3	3308	46.9
Fall	800	Bare	6.1	26.0	48.0	114.0	3268	47.1
Fall	600	F	6.2	24.5	46.5	115.0	3398	47.4
Fall	600	F + E	6.3	25.0	47.0	115.5	3395	48.0
Fall	800	F	8.4	25.0	46.3	111.5	3491	47.1
Fall	800	F + E	10.4	24.5	45.0	112.5	3468	47.7
Spring	600	F	3.1	39.0	69.0	114.0	2684	43.9
Mean	---	---	6.8	27.0	49.7	114.0	3288	46.9
C.V. (%)	---	---	26.8	0.8	0.8	3.1	10.2	1.9
LSD (0.05)	---	---	2.7	1.9	2.2	NS	496	1.3
LSD (0.01)	---	---	3.7	2.7	3.1	NS	NS	1.8

[1]Bare = no fungicide, no Extender, F = Fungicide, F+ E = Fungicide + Extender

[2]Days after spring planting

[3]Fall variety = DKL 34-55, spring variety = Hyola 357

Hettinger. Averaged across other treatments and compared to spring seeding, fall seeding emerged approximately one week earlier and began flowering 11 days earlier, but all treatments reached physiological maturity at approximately the same time (Table 4). Plant stand was improved slightly when fall planting occurred just before freeze-up. As planting was delayed from 28 October to 12 November to 7 April, plant height increased, lodging decreased, and grain test weight and yield were improved. Fall planting resulted in a significantly lower yield than spring planting. Across treatments, seed treatment with Extender improved spring stands and tended to increase yields, but had a minimal effect on other parameters (Table 5). Increasing the fall seeding rate had no effect on yield or most of the other characteristics measured (Table 6).

Table 4. 2003 Dormant Seeded Canola at Hettinger- No-till Combined Means - Seeding Date

Seeding Date	Date of Emergence	Plant Stand	10% Bloom	Duration of Bloom	Physiological Maturity	Plant Height	Lodging	Test Weight	Oil Content	Yield
	April	#/sq ft	----- Julian days -----			inch	0 - 9	lb/bu	%	lb/ac
28-Oct	15	1	154	25	199	30	1.9	51.7	40.8	572
12-Nov	14	1.4	154	25	197	37	1.3	52.6	41.9	985
7-Apr	21	--	163	17	197	39	0.9	53	40.4	1273
C.V. %	7.4	43.5	0.7	3.1	0.5	7.3	48.2	1.6	3.1	34.1
LSD .05	1	0.3	1	1	1	2	0.5	0.7	1.1	257
LSD .01	1	0.3	1	1	1	3	0.7	0.9	1.4	342

Table 5. 2003 Dormant Seeded Canola at Hettinger- No-till Combined Means - Seed Treatment

Seed Treatment	Date of Emergence	Plant Stand	10% Bloom	Duration of Bloom	Physiological Maturity	Plant Height	Lodging	Test Weight	Oil Content	Yield
	April	#/sq ft	----- Julian days -----			inch	0 - 9	lb/bu	%	lb/ac
Untreated	16	1.1	156	23	198	35	1.3	52.5	40.9	910
Extender	15	1.6	154	25	198	36	1.4	52.5	41.6	957
Fungicide	15	1.1	154	25	197	37	1.5	52.5	42.9	830
C.V. %	15.1	42.4	2.1	11	0.6	11.7	53.7	1.8	3.1	42.2
LSD .05	1	0.3	1	1	NS	NS	NS	NS	1	NS
LSD .01	NS	0.4	NS	NS	NS	NS	NS	NS	1.4	NS

Table 6. 2003 Dormant Seeded Canola at Hettinger- No-till Combined Means - Seeding Rate

Seeding Rate	Date of Emergence	Plant Stand	10% Bloom	Duration of Bloom	Physiological Maturity	Plant Height	Lodging	Test Weight	Oil Content	Yield
pls/ac	April	#/sq ft	----- Julian days -----			inch	0 - 9	lb/bu	%	lb/ac
600,000	16	1.2	156	23	198	36	1.3	52.6	41.3	948
800,000	14	1.5	154	25	197	35	1.5	52.3	41.5	878
C.V. %	14.9	45.3	2	10.9	0.6	11.7	52.8	1.7	3.4	41.9
LSD .05	1	NS	1	1	NS	NS	NS	NS	NS	NS
LSD .01	1	NS	1	1	NS	NS	NS	NS	NS	NS

Summary
Over the course of this project (three cycles and multiple locations), dormant seeding has not been shown to be a promising management tool for North Dakota canola producers. In most site-years, the yield penalty has been too great for this practice to warrant serious consideration. The aspect of time management (spreading out the workload for planting, spraying, and harvesting) was usually offset by reduced yields. However, exceptions do exist. In Langdon in 2003, delayed planting and soil crusting in spring resulted in a tremendous benefit to dormant seeding. Extender provided only occasional improvements in plant stands and yield. Increasing the fall seeding rate from 600,000 live seeds / acre to 800,000 was more beneficial than Extender. However, seed cost is already high in canola production and an increase of 33% is not an attractive option for growers.

This project and others have shown that no-till provides a more favorable environment for dormant seeding than conventional tillage, due to increased snow catch and insulation of the soil from cold and fluctuating temperatures. As such, the western part of the state seems to offer more potential for dormant seeding because no-till is an established practice. Also, growers in western North Dakota tend to plant early and plant early-maturing crops. As such, they have time to plant in the fall. Producers in the central and northeast regions plant considerable acres of full-season crops (sunflower, soybean, corn). As such, favorable fall weather is dedicated to harvesting, with little time available for seeding.