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Evaluation of Canola Dormant Seeding in North Dakota

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Research Summary

Canola (*Brassica napus* and *B. rapa*) is best suited to regions with moderate temperatures during reproductive growth stages. Seeding spring canola in the fall when soil temperatures drop so germination is prevented but before soil freeze-up occurs (i.e., dormant seeding) may allow canola to evade hot July temperatures by hastening maturity. Dormant seeded canola treatments were compared with spring seeded treatments at locations across the state in 2000. Dormant seeding failed to hasten maturity and generally resulted in lower seed yields and seed oil concentrations than spring seeded treatments. An unusually dry and mild winter confounded results and warrants continued research to determine the potential of dormant seeded canola at Dickinson and elsewhere in the state.

Introduction

Research in Saskatchewan has shown that, compared to spring planting, dormant seeding of canola advanced flowering date up to 35 days, swathing date up to 21 days, and combining date up to 25 days (Kirkland and Johnson, 1998). Early-emerging canola exhibited good frost tolerance (down to -17F.), but wide temperature fluctuations result in higher susceptibility to frost. Data from Manitoba also indicate that early planting results in plants with increased cold-hardiness, resisting temperatures down to 20-22 ^{o}F (D. Berglund, personal communication).

Stand establishment from fall planting is frequently poorer than from spring planting and a 10-15% increase in seeding rate is recommended for dormant seeding (Endres and Berglund, 1999). Stands in Saskatchewan were better in stubble than in tilled fallow in 1996 and 1997 (Kirkland and Johnson, 1998). The risk of premature germination is higher in tilled fields than in stubble, due to increased temperature fluctuations. In addition to moderating temperature fluctuations from crop residue coverage and increased snow catch, stubble also reduces the potential for crusting and sandblasting of seedlings. From 1996 to 1998, yields from fall planting into stubble and into tilled soil averaged 58% and 16% higher, respectively, than May planting. The relatively lower yield with tillage was attributed to reduced stands. Averaged across tillage treatments, dormant seeding resulted in a 25% yield increase over May planting. Over six experiments, fall planting also resulted in a more than 1% increase in oil content, due to cooler temperatures during the reproductive phase. Also, fall planting consistently resulted in shorter plants and less susceptibility to lodging.

Research at the NDSU North Central Research Extension Center in Minot showed yields of Crusher and Hyola 401 planted in fall to be lower, but statistically similar, to those from spring planting (M. Zarnstorff, unpublished data). However, dormant seeding at the NDSU North Central, Carrington, and Langdon Research Extension Centers in the fall of 1998 all resulted in unacceptable stands in the spring of 1999. No other research data exist on the practice of dormant seeding canola in North Dakota.

The general objective of this project is to determine the viability of fall (dormant) seeding of canola in North Dakota. Specific objectives include evaluation of the importance of the following factors in dormant seeding: (i) effectiveness of commercially-available polymer seed coating in reducing fall germination, (ii) seed size (hybrid vs. open-pollinated), (iii) planting date (relative to fall freeze-up, (iv) seeding rate, (v) residue coverage (tillage effects), and (vi) geographic area within the state.

Materials and Methods

This research was conducted at the North Dakota State University (NDSU) Carrington, Langdon, North Central (Minot), Williston, Dickinson, and Hettinger Research Extension Centers and the NDSU field site at Prosper. Canola research is routinely conducted at these locations and the necessary field, equipment, laboratory, office, and personnel resources are already in place.

At each site, treatments were planted in a randomized, complete block design with 4 replicates. Standard canola row spacings and plot sized (approximately 5 x 22 feet) were utilized at each location. Fall-planting of each variety with polymer seed coating ('Extender') was compared to uncoated seed planted in fall and in spring. The effect of seed size were studied by comparing an open-pollinated variety (Minot) to a hybrid (Hyola 357). Fall planting dates studied were approximately the last week of October (shortly before the date of normal freeze-up) and later (immediately before freeze-up in 1999). The performance of a spring planting of each variety was compared to the fall plantings. A standard seeding rate of 600,000, live seeds / acre was compared to 800,000 and, at some sites, 1,000,000.

Data were collected on the dates of emergence, flowering, and harvest, as well as stand establishment, pest occurrence, height and lodging at maturity, and the yield and quality (test weight, oil content) of the harvested grain. The results were statistically analyzed within each site and, where possible, across locations. Treatments were considered fixed effects with location a random effect in the combined analysis across locations. Treatment means separation were performed by f-protected LSD comparisons at the $P = 0.05$ level of

significance.

Results and Discussion (Dickinson only)

Early-spring frosts, damping off, and root feeding damage resulted in poor stands, regardless of seeding date or seed treatment (Table 1). Fewer plants resulted from dormant seeding than early spring seeding, as expected. Dormant seeding, however, failed to reduce the time from emergence to flowering or to physiological maturity.

Dormant seeded treatments generally produced lower seed yields than early-spring seeded treatments (Table 1). Seed weights and test weights were unaffected by dormant seeding, but seed oil content was reduced. These preliminary data indicate that dormant seeding is a risky practice in some years when environmental conditions develop like those that occurred during this study.

Acknowledgements

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Literature Cited:

Berglund, D.R., and K. McKay. 1998. Canola production. North Dakota Agricultural Extension Service Bulletin A 686 (revised).

Endres, G., and D. Berglund. 1999. Fall dormant-seeding canola strategies. Canola Production Meeting: 1999 Season Review and Fall Dormant-seeding Strategies. NDSU Carrington Research Extension Center, 29 September.

Kirkland, K.J., and E.N. Johnson. 1998. Summary of late fall and early spring seeding of herbicide tolerant canola 1994-98. Agriculture and Agri-Food Canada, Scott, Sk.

North Dakota State Farm Service Agency. 1996.1996 Reported Acreage, October 9.

North Dakota State Farm Service Agency. 1999. 1999 Reported Acreage, September 15.

Table 1. Plant stand, vigor, and flowering of dormant and early spring seeded canola at Dickinson, ND, in 2000.

				-- Plant Stand --	-- Vigor --	-- Flowering ---

Hybrid	Seeding Rate	Seed Treatment	Planting Date	First[1]	Second[2]	First[1]	Second[2]	first	90% complete
Hyola357	600,000	None	Spring	6	5	1	5	Jul 7	Jun 6
Hyola357	800,000	Benlate	Fall	3	2	5	4	Jul 11	Jun 7
Hyola357	600,000	Benlate	Fall	2	2	5	4	Jul 11	Jun 8
Hyola357	600,000	Extender	Fall	2	2	5	3	Jul 11	May 31
Minot	600,000	None	Fall	2	3	5	3	Jul 14	Jun 8
Minot	800,000	Benlate	Fall	1	3	5	2	Jul 13	Jun 9
Minot	600,000	None	Spring	5	2	3	5	Jul 9	Jun 7
Minot	600,000	Extender	Fall	2	4	5	2	Jul 13	Jun 9
Minot	600,000	Helix + Extender	Fall	2	4	5	3	Jul 11	Jun 8
Mean				3	3	4	3	Jul 12	Jun 8
C.V. %				28.2	58.0	13.2	23.6	--	--
LSD .05				1	NS	1	1	--	--

[1] First evaluation done approximately 21 days after emergence.
[2] Second evaluation done approximately 35 days after emergence.

Table 2. Weed control, seed yield, test weight, and oil content of dormant and early spring seeded canola at Dickinson, ND, in 2000.

				Seed		
Hybrid	**Planting Date**	**Weed Control**	**Yield**	**Test Weight**	**Weight**	**Oil Content**
		%	**lbs/ac**	**bu/ac**	**seed/lb**	**%**
Hyola357	Spring	85	2,025	52.4	145,485	43.5
Hyola357	Fall	74	1,351	51.8	158,184	41.8

Hyola357	Fall	65	1,298	51.4	152,822	41.6
Hyola357	Fall	69	1,190	51.6	154,343	41.6
Minot	Fall	70	906	51.3	154,049	42.6
Minot	Fall	64	850	51.6	155,110	42.6
Minot	Spring	83	1,507	51.9	143,095	44.3
Minot	Fall	69	935	51.5	152,503	42.7
Minot	Fall	71	1,116	51.6	143,301	43.2
Mean		72	1,242	51.7	150,988	42.6
CV%		9.3	19.5	1.6	9.7	1.8
LSD .05		10	354	NS	NS	1.1

Planting Date: November 10, 1999 (Fall) April 4, 2000 (Spring)
Harvest Date: August 8, 2000

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