Developing Practices for Optimum Canola Production In Southwestern North Dakota

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Research Summary

Practices which optimize canola production generally have been developed outside of southwestern North Dakota. These practices may not be suited to local conditions, unless they first are modified. The objective of this study is to develop seeding and tillage strategies for optimum economic returns of canola produced in southwestern North Dakota. Separate studies were begun in 2001 and 2002 to begin to develop these strategies. However, late spring frosts killed most canola seedlings in 2002. Canola was reseeded but hot and dry conditions developed and seed yields were <100 lb/acre. The study will be continued in 2003 so more reliable data can be collected.

Introduction

Timely seeding is important for growing canola successfully. Research in eastern North Dakota indicates that seed yield is optimized by planting canola in early spring (Johnson et al., 1995). Early-spring seeding is not always possible, however, particularly when cool, wet conditions develop.

Frost- or dormant-seeding is an alternative to early-spring seeding. Yield advantages have been demonstrated when canola was dormant-seeded rather than spring-seeded in Canada (Kirkland and Johnson, 1998), but dormant-seeding can be a risky practice in North Dakota.

A polymer seed-coating was developed to reduce the risk of dormant-seeding canola and other summer annual crops. The seed-coating induces a dormancy period lasting approximately 3 weeks that protects the seed from fall germination, thereby providing some flexibility in timing the seeding operation. Unpublished data indicate that coating canola seed increased winter survival of fall-sown seed compared to sowing bare seed in Canada (K. Zaychuk, 2000, per. comm.).

Attempts at dormant-seeding canola generally were unsuccessful in southwestern North Dakota in 2000, whether polymer-coated or bare seed was sown. Environmental factors partially explain why dormant-seeding failed, but lack of knowledge about this practice also was a contributing factor.

The objectives of this project are to: (i) develop seeding strategies for optimum economic returns of canola produced in southwestern North Dakota; (ii) develop tillage strategies for optimum economic returns of canola produced in southwestern North Dakota; and (iii) determine the impact of canola on wheat in a wheat-canola rotation compared with continuous wheat.

Materials and Methods

Develop seeding strategies for optimum economic returns of canola produced in southwestern North Dakota.

Plots were arranged in a randomized and replicated study (i.e. treatments will be arranged in a randomized complete block with 5 replications). Transgenic (RR) canola was sown in 10 x 100 ft NT plots using the following strategies: (i) dormant-seeding polymer-coated seed by 15 November or when the soil temperature at a 1-in (2.5-cm) depth remained ≤ 40ºF over a 5-d period preceding sowing, whichever was first; (ii) dormant-seeding bare seed when the soil temperature remained ≤ 36ºF over a 5-d period preceding sowing; and (iii) seeding bare seed at spring warm-up (soil temperature at a 1-in depth remains ≥ 40ºF over a 3-d period preceding sowing). A low-disturbance JD-750 planter with a grass-seed box was used to sow all plots.

Canola plant population was determined by visually evaluating canola plants at 10 and 20 days after spring warmup, and counting seedlings at 4 locations in a 5.4-ft^2 (0.5-m^2) area in each plot at 30 and 40 days after spring warmup.

A different study from the study described under Objective (i) will be used to achieve Objectives (ii) and (iii)

Develop tillage strategies for optimum economic returns of canola produced in southwestern North Dakota.

Treatments were established in 30 x 40 ft plots arranged in a randomized and replicated design (i.e., treatments were arranged in a randomized complete block with four replications). Tillage systems (CT, RT, NT) comprised treatments: (i) CT plots were worked until < 30% residue cover remained prior to sowing; (ii) RT plots were worked so that > 30% residue cover remained after sowing; and (iii) no tillage occurred in NT plots. Crop residue cover (%) for each tillage treatment was determined using crop residue frame estimators (KCS Enterprises, Gurley, NE). Canola was sown as described under Objective (i) for the spring-sown treatment.

It was anticipated that soil and plant nutrient concentration, soil temperature, plant moisture use, crop growth, seed production and seed quality were determined for each tillage treatment as described for the seeding treatments in the study described under Objective (i).

Determine the impact of canola on wheat in a wheat-canola rotation compared with continuous wheat.

Treatments were arranged in a randomized and replicated design (i.e., treatments are arranged in a split plot with four replications; tillage treatments comprised whole plots and crop rotation [wheat-canola, continuous wheat]) comprised subplots.

Wheat plant stand was determined in crop rotation subplots as described for canola in seeding treatment plots under Objectives (i). Wheat plant growth (tiller development, plant-water concentration, spikes/plant, kernels/spike) was determined following the procedure used in similar studies located at Dickinson (Carr et al., 2000). Grain yield, protein concentration, test weight, and kernel weight were determined when wheat plants reach physiological maturity.

Data in each study were analyzed using PROC GLM available from SAS. Seeding, tillage, and crop rotation treatments were considered fixed effects. Replications and years were considered random effects. Where F tests indicate significant differences between treatments, means were separated using Fischer's protected LSD at $P < .05$.

Results and Discussion

Late frosts after canola seedlings emerged killed most seedlings in both field experiments. Fewer than 1 seedling/ft^2 remained by late May. Canola plots were reseeded but the hot and dry conditions that developed by mid-June resulted in seed yields less than 100 lb/acre in most plots in the field experiments. The damaged data rendered the 2002 field experiments relatively meaningless. A field experiment will be repeated in 2003 in an attempt to collect useable data from this project.

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Literature Cited

Johnson, B.L., K.R. McKay, A.A. Schneiter, B.K. Hanson, and B.G. Schatz. 1995. Influence of planting date on canola and crambe production. J. Prod. Agric. 8:594-599.

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.