WESTERN CANADA

High Yielding Canola Production

By George Clayton, Kelly Turkington, Neil Harker, John O'Donovan, and Adrian Johnston

In the sub-humid regions of western Canada, canola is often referred to as the 'economic engine' of the farming system. This is in reference to the value of the canola crop, which often exceeds that of wheat in the region. The success of the canola crop in any given year becomes synonymous with the success of the cropping enterprise.

Canola grown on the Canadian prairies is an important economic crop and has a high demand for nutrients. Researchers are finding good results with improved seeding and other management practices.

Canola yield is positively influenced by the length of the flowering period, while reductions in yield come from pest problems, including insect damage, weed competition, and plant disease. Growing conditions in these sub-humid regions, characterized by a short frost-free period, cool night temperatures, and abundant moisture, are ideal for a prolonged flowering period for the canola crop. The 1999 growing season was cool and wet in most areas of the Canadian prairies, and as a result there were several reports of above average crop yields for cereals, oilseed and pulse crops.

Researchers working at the Agriculture and Agri-Food Canada Research Centre at Lacombe, Alberta, have been evaluating the agronomic components necessary to achieve high yielding canola. During the 1999 growing season they reported canola yields of 70 bu/A, a record for spring canola in this region where the yields generally are in the 35 bu/A range (**Table 1**). Achieving a spring canola yield approaching 70 bu/A is something that all farmers would consider a significant accomplishment. While weather conditions vary considerably from year to year, many of the management practices that support high yielding canola are also important and within the control of the grower.

In this experiment the researchers were evaluating dormant-seeding of canola, an innovative management practice developed by scientists at the Scott Experimental Farm of Agriculture and Agri-Food Canada. By seeding the canola in the fall after soil temperatures have dropped below 0ºC (freezing) the seed lies dormant and does not germinate until the following spring. This seeding method has been evaluated a number of times over the past 30 years. However, its success has been limited due to the crop competition from winter annual weeds that could not be controlled in dormant-seeded canola. With the development of herbicide tolerance, the farmer is now capable of removing competitive winter annual weeds that also emerge early in the spring with the dormant-seeded canola. The results of this project show that dormant seeding increased canola yield by 17 percent over late-April and 64 percent over mid-May seeding dates. In addition, this yield increase came with

TABLE 1. Agronomic response of canola (*Brassica napus* cv. Invigor 2153) to seeding date at Lacombe, Alberta in 1999.

Plant characteristic	Seeding date		
	November 8	April 29	May 13
Plant emergence, plants/yd^2	81	66	75
Grain yield, bu/A	71.0	60.9	43.4
Harvest dry matter yield, tons/A	12.1	11.9	13.2
Harvest index	0.32	0.28	0.18

almost no change in harvest dry matter, resulting in an improved harvest index (**Table 1**).

Next to forage crops, canola has the greatest nutrient demand of crops grown on the Canadian prairies. With a seed protein content of 22 to 24 percent and seed oil content of 38 to 42 percent, canola requires large amounts of nitrogen (N) and sulfur (S), along with all other nutrients. The research site used for this trial had high levels of soil residual N, phosphorus (P), potassium (K), and S (**Table 2**). Nitrogen and P were side-banded at seeding, with additional N top-dressed in the spring after crop emergence. A herbicide tolerant hybrid canola cultivar was used in this study (Invigor 2153), seeded at 17 seeds/square foot (5 lb/A). Seed was pre-treated with a systemic insecticide for flea beetles and a fungicide for suppression of seedling disease. Weeds were controlled using an early single in-crop herbicide application.

Implications of Changing the Seeding Date of Canola

In addition to improved crop yield, dormant and early spring seeding has been found to bring several production advantages to the canola grower. It appears that this may be the most effective means for canola to be moved into semi-arid production regions where high temperature and moisture stress during flowering minimize the flowering period and seed formation. Early crop growth and development result in the canola avoiding the yield limiting stress, with reports of both flowering and maturity being advanced by up to two to three weeks. In addition, early season growth and development of the canola crop increase seed oil content by up to 2 percent and are effective in minimizing chlorophyll in the seed (green seed).

In sub-humid regions, where temperature and moisture stress at flowering are generally not considered a serious problem, early seeding may have a significant impact on crop yield losses due to disease, mainly white mold (*Sclerotinia* spp.). In a second seeding date study carried out in the same field as the one reported here (also using Invigor 2153), crop disease evaluation in 1999 revealed that only 9 percent of dormant seeded plants were affected by white mold, while 38 percent of the late-April and 59 percent with mid-May seeded plants were found to be diseased. Early crop development allowed the canola to flower and set seed prior to the release of disease spores, minimizing the negative effect of white mold on the crop. In 1999, the two spring seeding dates suffered moderate to severe lodging, contributing to the level of white mold observed in these treatments.

Polymer seed coatings, which effectively prevent the seed from taking up water for two to three weeks, have been developed to improve the success of dormant seeding canola. Without some form of coating, the farmer is forced to delay planting until soil temperatures drop below 0ºC (freezing). By this time the soil surface is often frozen, increasing the challenge of planting a small seeded crop shallow. In addition, the probability of ground cover with snow is high, which abruptly ends any further field operations until the following spring.

Innovative and new methods continue to be developed for the production of canola on the Northern Great Plains. The ability to include an oilseed crop in rotation with cereals in the semi-arid regions of the Canadian prairies will have a positive impact on the profitability of farming systems in this region. BC

Dr. Clayton is a cropping systems agronomist, Dr. Turkington is a plant pathologist, and Dr. Harker is a weed scientist at the Lacombe Research Centre, Lacombe, Alberta. Dr. O'Donovan is an agronomist at the Beaverlodge Research Farm, Beaverlodge, Alberta, and Dr. Johnston is PPI/PPIC Western Canada Director located in Saskatoon, Saskatchewan. E-mail: ajohnston@ppi-ppic.org.

TABLE 2. Soil nutrient concentration and fertilizer application on canola seeding date trial at Lacombe, Alberta in 1999.

	N and S at 0 to 24 in. depth; P and K at 0 to 6 in. depth			
	NO_3-N	P	K	S
	lb/A			
Available	73 M[1]	62 O	450 M-O	83 O
Fertilizer applied:	N	P_2O_5	K_2O	SO_4-S
Side banded at seeding	61	23	0	0
Surface broadcast after emergence	45	0	0	0

[1]M - marginal soil test level; O - optimum soil test level.