Broadcast Seeding Potential of Canola

G.L. Androsoff
Saskatchewan Wheat Pool
Research and Development Farm
Box 670, Watrous, SK., SOK 4T0

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Introduction

The availability of granular broadcast equipment has resulted in broadcast seeding of canola, with varied success. Such a practice increases risk because of poor and/or uneven emergence which may reduce weed competition and cause uneven maturity and harvestability problems.

Producers mav decide to broadcast canola seed because of 1) time savings, 2) desire to apply all fertilizer at seeding, 3) ability to seed on wet fields, or 4) dissatisfaction with shallow depth control on air seeder. Fields may be harrowed afterwards, harrowed and packed, or cultivated prior to being harrowed and/or packed. Broadcast seeding also prevents application of seed placed phosphorus fertilizer which helps seedlings develop strong, healthy rooting systems. The increased acreage means that we should examine aspects of this practice so as to provide sound recommendations.

Objectives

1. To compare the efficiency of broadcast seeding canola versus conventional seeding methods.
2. To determine if some of the risks associated with this practice can be reduced.

Methodology

The test was set up as an RCBD design with seven treatments that comprised combinations of seeding method, post seeding operations, and phosphate application method. All trials were located on summerfallow at the Saskatchewan Wheat Pool Research Farm at Watrous.

Quantum B. napus canola seed with/without Provide was obtained from Grow Tec Inc. (Nisku, AB) in 1996 and 1997. Seed originated from one lot and was treated with Vitavax RS and coated. Similarly, canola-quality mustard seed (B. ***juncea canola*** was included in a 1997 trial.

A pre-emergent trifluralin herbicide (Treflan) along with appropriate post-emergent herbicides were used to control weeds. Fertilizer nitrogen and sulphur were applied according to soil test recommendations.

The conventional method consisted of seeding with a hoe-drill on 20 cm (8 inch) spacing with a 5 cm (2 inch) spread pattern and on-row packers. Seeding depth was approximately 0.19 cm (3/4 inch) with seed placed into good moisture. Broadcast seeding consisted of disconnecting seed hoses and attaching to a metal broadcast plate that allowed seed to be spread evenly over the soil surface. For broadcast treatments, packers were lifted and plots were tine harrowed and then coil packed immediately afterwards according to treatment protocol.

All treatments received the same amount of total phosphorous (25 lbs/ac actual as P_2O_5) either as 1) a shallow band at 6.4-7.6 cm (2.5-3 inches) just prior to seeding, 2) seedplaced, or 3) as Provide (phosphate solubilizing fungal inoculant equivalent to 10 lbs/ac actual P). Soil tests recommended a rate of 20-25 lbs/ac actual P as P_2O_5. Seeding rate was 7.5 kg/ha. Swathing occurred at 30-40% seed colour change. Plots were harvested with a plot combine. Oil content was determined with an NMR analyzer. The treatments included:-

1. Conventional (25 lbs/ac banded P)
2. Conventional (25 lbs/ac seedplaced P)
3. Broadcast + harrow (25 lbs/ac banded P)
4. Broadcast + harrow + coil packing (25 lbs/ac banded P)
5. Conventional (15 lbs/ac seedplaced P + Provide)
6. Broadcast + harrow (15 lbs/ac banded P + Provide)
7. Broadcast + harrow + coil packing (15 lbs/ac banded P + Provide).

Note: P is actual phosphorous as P_2O_5.

Results and Discussion

Initially, only one seeding date (May 15th) was planned for ***B. napus*** canola in 1996 but evening rainfall began just as seeding was completed and before all packing operations on broadcast treatments were complete. A total of 1.24 cm (0.5 inches) of precipitation was recorded overnight and another 1.92 cm (0.8 inches) was recorded on May 17th.

Therefore, a second seeding date was also planted for ***B. napus*** canola in 1996 (May 23rd). Soil moisture conditions were excellent on both dates but the first significant precipitation of 0.5 cm (0.2 inches) did not occur until nine days after second seeding date (June 1st).

Growing season climatic conditions were good for canola during June and July of 1996. Soil conditions were cool and wet in early May. June was wetter and warmer than the long-term average and July was wetter and cooler than normal. August was drier and warmer than normal and hastened crop maturity.

The trial was repeated in 1997 for ***B. napus*** canola and for ***B. juncea*** canola (canola-quality mustard). Both tests were seeded on June 4th under good soil moisture conditions. Precipitation of 1.14 cm (0.45 inches) was recorded from June 8-10th.

Growing season climatic conditions were not particularly good for canola crops in 1997. June was slightly warmer and drier than normal. Temperatures were normal for July but only 17% of normal precipitation was recorded (1 .O cm). August was warmer than normal with the first rainfall event on August 8th. Crop maturity was hastened because of very dry conditions from July 1st through August 15th.

A summary of three site-years data for stand and maturity is shown for ***B. napus*** canola (Table 1). Plant stand differences between conventional and broadcast seeding treatments were not consistent with combined data. The lowest mean plant stand, treatment 6 (broadcast + harrow), was well above the level for which plant density may reduce yield (60 plants/m*). Although not measured it was noted that growth stages for conventional treatments were more uniform than for broadcast treatments. The exception to this was the May 15th, 1996 seeding date when significant rainfall shortly after seeding allowed broadcast seeds to germinate quickly and seedlings to emerge uniformly.
Generally, conventional treatments matured earlier than broadcast seeding treatments. Packing appears to have had an effect on reducing maturity whereas Provide had no effect.

The range of maturity for treatments were minimized by growing conditions in 1996 and 1997.

Table 1. Means of plant stand and maturity at 3 sites for B. napus canola.

Seeding method	Phosphorous (lbs/ac)	Stand (plants/O.25 m^2)	maturity (davsl
1. Conventional	25 band	38	84
2. Conventional	25 seedplaced	36	85
3. Broadcast + H	25 band	35	86
4. Broadcast + H + CP	25 band	35	85
5. Conventional	15 seedplaced + Provide	36	85
6. Broadcast + H	15 band + Provide	31	87
7. Broadcast + H + CP	15 band + Provide	36	86
$LSD_{(0.05)}$		3	1
cv (%)		11	1

Note: H = harrow, CP = coil packing.

The combined yield and oil content data is shown for B. *napus* canola (Table 2). All conventional treatments yielded more than broadcast treatments and neither packing nor Provide had a beneficial effect on yield. No differences in oil content were found between treatments.

Table 2. Means *of* yield and oil content at 3 sites for *B. napus* canola.

Seeding method	Phosphorous (lbs/ac)	Yield (bu /ac)	Oil (%)
1. Conventional	25 band	38	45.2
2. Conventional	25 seedplaced	37	45.1
3. Broadcast + H	25 band	31	45.3
4. Broadcast + H + CP	25 band	30	44.8
5. Conventional	15 seedplaced + Provide	38	45.3
6. Broadcast + H	15 band + Provide	32	44.9
7. Broadcast + H + CP	15 band + Provide	32	45.3
$LSD_{(0.05)}$		3	NS
cv (%)		12	2

Note: H = harrow, CP = coil packing.

The plant stand and maturity data for B. juncea canola (canola-quality mustard) is summarized for the 1997 trial (Table 3). Plant stand trends for *B. juncea* canola were similar to that of *B. napus* canola data in that no consistent differences existed between conventional and broadcast treatments. Only treatment 4 (broadcast + harrow + packing) had a lower plant stand than others, 38 plants/O.25 m^2 not low enough to cause concern. Broadcast seeding delayed maturity with respect to conventional seeding and neither packing nor Provide had an effect on reducing days to maturity.

Table 3. Means of plant stand and maturity at 1 site for B. juncea canola.

Seeding method	Phosphorous (lbs/ac)	Stand (plants/0.25 m^2)	Maturity (days)
1. Conventional	25 band	45	82
2. Conventional	25 seedplaced	48	82
3. Broadcast + H	25 band	49	84
4. Broadcast + H + CP	25 band	38	84
5. Conventional	15 seedplaced + Provide	42	82
6. Broadcast + H	15 band + Provide	42	84
7. Broadcast + H + CP	15 band + Provide	47	84
$LSD_{(0.05)}$		8	1
CV (%)		12	1

Note: H = harrow, CP = coil packing.

Yield and oil content data for the B. juncea canola trial is outlined (Table 4). Conventional treatments yielded higher than broadcast treatments. Packing did not improve yield but Provide improved yield within the packing operation.

Differences existed within treatments for oil content with conventional treatments having higher oil content than broadcast treatments except for treatment 7 (broadcast + packing + Provide). The delay in maturity of broadcast treatments may have exposed seed to warmer and drier environmental conditions during seed maturation and thus decreased oil content.

Table 4. Means of yield and oil content at 1 site for B. *juncea* canola.

Seeding method	Phosphorous (lbs/ac)	Yield (lbs/ac)	Oil %
1. Conventional	25 band	39	44.4
2. Conventional	25 seedplaced	38	44.2
3. Broadcast + H	25 band	16	42.9
4. Broadcast + H + CP	25 band	18	43.2
5. Conventional	15 seedplaced + Provide	39	44.2
6. Broadcast + H	15 band + Provide	19	43.2
7. Broadcast + H + CP	15 band + Provide	23	43.8
$LSD_{(0.05)}$		5	1.0
cv (%)		12	2

Note: H = harrow, CP = coil packing.

Summary

Plant stand differences did not display any pattern within or between conventional and broadcast treatments. Plant stands were acceptable for all treatments. A measure of days to emergence would provide additional insights. Successive emergence counts may also tell us if later emerging seedlings in broadcast treatments die off from competition with older, established plants and help explain yield loss. Neither packing nor Provide by itself seemed

to have a consistent measurable benefit on plant stand although packing plus Provide had the highest values.

Maturity was generally delayed by broadcast seeding compared to conventional seeding although fall frosts were not a factor in 1996 or 1997. Packing had an effect on decreasing maturity for B. ***napus*** canola whereas neither packing nor Provide had an effect on maturity of B. juncea canola in 1997.

Yields were higher with conventionally seeded treatments for both B. ***napus*** and B. *juncea* canola. For B. ***napus*** canola neither packing nor Provide affected yield. Within the broadcast treatments of the B. *juncea* canola trial the inclusion of packing and Provide was more beneficial than packing alone.

Oil contents were not affected by treatments in combined data for B. ***nupus*** canola. Differences in 1997 for B. juncea canola may have been due to differences in maturity and the impact of temperature variations during seed maturation. Minimum daily temperatures fluctuations were fairly erratic in the latter half of August (3.0- 15.5 °C).

With conventional seeding, the method of phosphorous placement did not affect any variables as measurements were fairly consistent for all three treatments. The use of a shallow band, which was essentially in-row, just prior to seeding and warm moist soils at time of seeding may have limited the effect of phosphorous placement.

The data obtained thus far does imply that broadcast seeding has inherent risks and generally agrees with previous results (Canola Growers Manual). The risks of delayed and uneven maturity were not apparent, as fall frosts were not a concern during the past two growing seasons. Effects of weed competition on yield and maturity in an uneven stand were not examined because of weed-free conditions that would not be realistic in commercial fields. The benefits of packing and Provide are somewhat inconclusive, as the database is small. No attempt has been made to examine the economic significance of Provide versus phosphorous fertilizer at this point.

References

Thomas, P. 1984. Canola Growers Manual. Canola Council of Canada.