

**Effect of seeding date and seeding rate on flea beetle damage and agronomic performance of open-pollinated and hybrid Argentine canola under different tillage practices in 2001-2006**

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*The objective of this study was to investigate the effect of seeding date and seeding rate on the agronomic performance of open-pollinated (op) and hybrid Argentine canola in conventional tillage (CT) and minimum tillage (MT). Flea beetle damage was below the economic threshold in all tests. Establishment of op and hybrid canola over 5 years was highest in CT, intermediate in late-seeded plots with MT and lowest in early-seeded plots with MT. Shoot weights, biomass and yield were higher in hybrid canola than op canola. In MT, seeding in early to mid May rather than late May or early June improved yields by 5.4-7.4 bu/acre. Seeding rate had a significant effect on yield. In most tests, yields of op and hybrid canola increased at lower seeding rates then peaked and stabilized at higher rates. Yields peaked at different seeding rates depending on the canola type and tillage practice. Yields in op canola peaked with seeding rates of 33-41 seeds/m-row (3.6-4.4 lb/acre; 4.0-4.9 kg/ha) and plant densities of 60-100 plants/m<sup>2</sup>. Yields in hybrid canola peaked with seeding rates of 16-33 seeds/m-row (2.1-4.3 lb/acre; 2.4-4.8 kg/ha) and plant densities of 35-80 plants/m<sup>2</sup>.*

As described in the Canola Growers Manual, seeding date and seeding rate may affect the establishment, growth and yield of Argentine canola. The Manual recommends that canola should be seeded at 5-8 lb/acre (5.6-9.0 kg/ha) and provide target plant populations of 40-200 plants/m<sup>2</sup>. Re-seeding is recommended when plant populations are less than 32-43 plants/m<sup>2</sup> with conventional varieties and less than 11-22 plants/m<sup>2</sup> with herbicide-tolerant hybrid varieties. In this study, we investigated the effect of seeding date and seeding rate on flea beetle damage and the performance of Argentine canola in conventional tillage (CT) and minimum tillage (MT).

Field tests were conducted at AAFC-Saskatoon in 2001-2006. Certified seed lots of open-pollinated (op) and hybrid canola were treated with a commercial seed dressing and planted at six rates (8, 16, 25, 33, 41 and 49 seeds/m-row). Based on 1000-seed weights and 12 inch (30.5 cm) row-spacing, seeding rates ranged from 0.8-5.1 lb/acre (0.9-5.7 kg/ha) in op canola and from 1.0-6.3 lb/acre (1.1-7.1 kg/ha) in hybrid canola. Tests in summer fallow (termed CT) were seeded May 19-30. Tests in tilled wheat stubble (termed MT) were seeded May 11-16 when soil temperatures averaged 7-17°C and May 24-June 2 when soil temperatures averaged 14- 21°C. Agronomic assessments focused on seedling establishment, plant densities, shoot dry weight, shoot biomass and seed yield. Shoot biomass was calculated from the number of seedlings/m-row and shoot weight.

**Flea beetle damage**



Flea beetle damage to the cotyledons of op and hybrid canola was relatively low in all field tests. Damage was usually higher in CT than in MT. Seeding date and seeding rate had no effect on damage in most tests.

### **Seedling establishment**

Establishment of op and hybrid canola varied from year to year. Over 5 years, establishment of op canola averaged 81% in CT, 61% in early-seeded plots with MT and 70% in late-seeded plots with MT. Establishment of hybrid canola was slightly higher, averaging 84%, 64% and 74%, respectively. Establishment of both canola types was highest in CT and lowest in early-seeded plots with MT. Seeding rate had no effect on % establishment.

Plant densities of op and hybrid canola varied depending on the year, seeding date, seeding rate and tillage practice. Over 5 years, plant densities were 3-4% higher in hybrid canola than op canola. Plant densities of both canola types were highest in CT, intermediate in late-seeded plots with MT and lowest in early-seeded plots with MT. Plant densities in all tests increased as the seeding rate increased. Depending on the year, minimum plant densities that would require re-seeding of op canola (32-43 plants/m<sup>2</sup>) were exceeded with a seeding rate of 16 seeds/m-row with CT (1.7 lb/acre) and 16-25 seeds/m-row in early- and late-seeded plots with MT (1.7-2.6 lb/acre). Minimum plant densities that would require re-seeding of hybrid canola (11-22 plants/m<sup>2</sup>) were exceeded with a seeding rate of 8 seeds/m-row with CT (1.1 lb/acre) and 16 seeds/m-row in early- and late-seeded plots with MT (2.1 lb/acre).

### **Shoot growth**

Shoot dry weights of op and hybrid canola after 15, 21 and 29 days varied depending on the year, seeding date and tillage practice. Over 5 years, shoot weights in CT and MT were 1.4-1.5 times higher in hybrid canola than op canola. Shoot weights in MT were 2.2-2.5 times higher in late-seeded plots than in early-seeded plots. Seeding rate had no effect on the shoot weight of op and hybrid canola in most tests.

### **Shoot biomass**

The shoot biomass of op and hybrid canola after 15, 21 and 29 days varied depending on the year, seeding date, seeding rate and tillage practice. Over 5 years, shoot biomass in CT and MT was 1.4-1.6 times higher in hybrid canola than in op canola. Shoot biomass in MT was 2.3-3.0 times higher in late-seeded plots than in early-seeded plots. In most tests, the biomass of op and hybrid canola increased as the seeding rate increased. The shoot biomass of hybrid canola seeded at 25 or 33 seeds/m-row was equal to that of the op canola seeded at 49 seeds/m-row.

### **Seed yield**

Seed yields of op and hybrid canola varied depending on the year, seeding date, seeding rate and tillage practice. Yields were, on average, 19-23% higher in hybrid canola than in op canola. Yields of op canola averaged 39.7 bu/acre in CT, 37.6 bu/acre in early-seeded plots with MT and 32.2 bu/acre in late-seeded plots with MT. Yields of hybrid canola averaged 48.7, 45.7 and 38.3 bu/acre, respectively. Seeding early rather than late in MT



improved yields of op canola by 5.4 bu/acre and yields of hybrid canola by 7.4 bu/acre. In most tests, yields of op and hybrid canola increased at lower seeding rates (8-25 seeds/m-row) then peaked and stabilized at higher rates (33-49 seeds/m-row). Yields peaked at different seeding rates and plant densities depending on the canola type and tillage practice.

In CT, peak yields in op canola over 5 years were obtained with a seeding rate of 33 seeds/m-row (3.6 lb/acre, 4.0 kg/ha) and plant density of 85-90 plants/m<sup>2</sup>. Peak yields in hybrid canola were obtained with a seeding rate of 25 seeds/m-row (3.2 lb/acre, 3.6 kg/ha) and plant density of 65-70 plants/m<sup>2</sup>.

In early-seeded plots with MT, peak yields in op canola were obtained with a seeding rate of 33 seeds/m-row (3.6 lb/acre, 4.0 kg/ha) and plant density of 60-65 plants/m<sup>2</sup>. Peak yields in hybrid canola were obtained with a seeding rate of 16 seeds/m-row (2.1 lb/acre, 2.4 kg/ha) and plant density of 35-40 plants/m<sup>2</sup>. Higher seeding rates and plant populations were required for high yields in late-seeded plots with MT. Yields in op canola peaked with a seeding rate of 41 seeds/m-row (4.4 lb/acre, 4.9 kg/ha) and plant density of 95-100 plants/m<sup>2</sup>. Yields in hybrid canola peaked with a seeding rate of 33 seeds/m-row (4.3 lb/acre, 4.8 kg/ha) and plant density of 80 plants/m<sup>2</sup>.

The results suggest that high yields in op and hybrid canola can be attained with relatively low seeding rates. With higher vigour, hybrid canola required a lower seeding rate for high yield than op canola. With the ability of canola to compensate for low plant densities, high yields in op and hybrid canola were obtained with a lower seeding rate in early-seeded plots with MT than in late-seeded plots with MT. Confirmation of these findings at multiple locations in western Canada would allow producers to reduce production costs and seed treatment use.

For information on related studies, go to:

Elliott.CARP2004-14.1. **Effect of neonicotinoid seed treatments on flea beetle damage and performance of Polish canola (*Brassica rapa*) in 2003-2005**

Elliott.CARP2004-14.2. **Effect of neonicotinoid seed treatments on flea beetle damage and performance of Argentine canola (*Brassica napus*) in 2003-2006**

Elliott.CARP2004-14.4. **Effect of seeding rate on flea beetle damage and agronomic performance of sized seeds of open-pollinated and hybrid Argentine canola in 2004-2006**

Elliott.CARP2004-14.5. **Effect of seed quality on the performance of hybrid Argentine canola in early- and late-seeded plots with conventional and minimum tillage**



Elliott.CARP2004-14.6. **Effect of production practices and seed quality on the performance of open-pollinated Argentine canola in conventional, minimum and zero tillage**