

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

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The first objective of this study was to investigate the effect of production practices on the quality and vigour of open-pollinated Argentine canola. Seeding date and swathing time of the mother crop had a significant effect on seed quality. Seed lots from plots that were seeded in early May and swathed when the moisture content was less than 20% had the fewest green seeds, lowest conductivity, highest seed weight, highest germination and highest vigour index. The seed lots were grown at multiple locations to determine the effect of seed quality on the performance of the seed lots in conventional tillage (CT), minimum tillage (MT) and zero tillage (ZT). Seed lots with conductivity below 75 $\mu\text{S}/\text{cm}/\text{g}$, 1000-seed weight above 2.8 g, germination above 95% and vigour index above 2.8 had the best stand establishment, highest shoot weight, highest biomass and highest seed yield.

Limited research has been conducted on the effect of production practices on seed quality in canola. In this study, we initially investigated the effect of seeding date and swathing time on the quality and vigour of open-pollinated Argentine canola. Seed lots were then grown at multiple locations with conventional tillage (CT), minimum tillage (MT) or zero tillage (ZT) to assess the effect of seed quality on agronomic performance.

Production practices and seed quality

Seed lots were produced at AAFC-Scott in 2003. The mother crop was planted on three dates (early May, mid May, early June) and swathed at four times or straight-combined. Fifteen seed lots from the test were evaluated in the standard germination test (SGT), pre-chill test (PCT), controlled deterioration test (CDT), accelerated aging test (AAT) and electrical conductivity test (ECT). Green seed content and 1000-seed weights were also determined. The vigour index of each seed lot was calculated from the 1000-seed weight and final % germination/100.

Seed lots from the swathing study differed their 1000-seed weight (1.7-3.1 g), green seed content (0.3-11.8%), electrical conductivity (63-137 $\mu\text{S}/\text{cm}/\text{g}$) and final germination in the SGT (89-99%), PCT (88-99%), CDT (88-99%) and AAT (89-99%). Vigour indices ranged from 1.5-3.0.

Seeding date and swathing time of the mother crop had a significant effect on seed quality and vigour. Seed lots from plots that were seeded in early June and swathed early (60-75% moisture content) had the most green seeds; highest conductivity; lowest 1000-seed weight; lowest germination in the SGT, PCT, CDT and AAT; and lowest vigour index. Conversely, seed lots from plots that were seeded in early May and swathed last (10-20% moisture content) or straight-combined had the fewest green seeds; lowest conductivity; highest 1000-seed weight; highest germination in the SGT, PCT, CDT and

AAT; and highest vigour index. Results indicated that the quality and vigour of canola seed lots can be improved by seeding the mother crop early and delaying swathing until the moisture content is below 20%.

Seed quality and agronomic performance

Seed lots treated with a commercial seed dressing were evaluated in field plots with CT (Saskatoon, Scott, Loon Lake), MT (Saskatoon, Melfort) and ZT (Indian Head) in 2004. Seed lots were seeded between May 11 and May 27. Tests with CT and MT (Melfort) were seeded with a double-disc press drill. Tests with MT (Saskatoon) and ZT (Indian Head) were planted with a hoe drill. Agronomic assessments focused on seedling establishment, shoot growth, biomass accumulation and seed yield. Shoot biomass was calculated from the number of seedlings/m-row and shoot weight. The quality of the seed lots in each laboratory test was correlated with field data from each location to identify seed attributes that provide the best indication of agronomic performance.

Stand establishment

Establishment of the seed lots differed in each field test. Establishment also varied depending on the location and tillage practice. Stand establishment with CT ranged from 52-85% at Saskatoon, from 54-91% at Scott and from 34-74% at Loon Lake. Establishment with MT or ZT ranged from 25-63% at Saskatoon, from 32-82% at Melfort and from 19-56% at Indian Head. Establishment was negatively correlated with conductivity and positively correlated with 1000-seed weight and germination in the SGT, PCT, CDT and AAT. Seed lots with conductivity below 75 $\mu\text{S}/\text{cm}/\text{g}$, 1000-seed weight above 2.8 g and germination above 95% in the SGT, PCT, CDT or AAT had the best stand establishment at most locations.

Shoot growth

Shoot weights differed among seed lots after 14, 21 and 28 days in each test. Shoot weights also varied depending on the location and tillage practice. Shoot weights on each sampling date were positively correlated with 1000-seed weight. Seed lots with seed weights below 2.1 g had the lowest shoot weight whereas seed lots with seed weights above 2.8 g had the highest shoot weight.

Shoot biomass and seed yield

Shoot biomass and seed yield differed among seed lots in each test. Vigour indices of the seed lots in the SGT, PCT, CDT and AAT were positively correlated with biomass and seed yield at most locations. Seed lots with a vigour index below 2.0 had the lowest biomass and lowest seed yield. Conversely, seed lots with a vigour index above 2.8 usually had the highest biomass and yield. With a 1.0 unit increase in the vigour index, yields improved by 1.8-10.2 bu/acre depending on location and tillage practice.

The results indicated that early seeding and delayed swathing of the mother crop improved seed quality and the subsequent performance of the seed lots grown with different tillage practices.

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.CARP2004-14.3. 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

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