

---

# Seed Quality and Vigour of Polish Canola (*Brassica rapa*).

J. Onyilagha, B. Elliott and O. Olfert

Agriculture and Agri-Food Canada, Saskatoon Research Centre.

---

**Key word Index:** *Brassica rapa*, Polish canola, seed vigour.

## Abstract

Seed vigour of nine Polish canola varieties was studied in the laboratory using the controlled deterioration test and a modified germination test. Vigour ratings were correlated with field data from late May plantings at Saskatoon in 1998 - 2000. Correlation coefficients indicated that the modified germination test provided a better indication of seedling establishment and seedling growth than the controlled deterioration test. Exposure of seed lots to high temperature (45°C for 24 h) substantially reduced the vigour of AC Parkland and Reward but had little effect on the vigour of other Polish varieties.

## Introduction

Several laboratory tests have been developed to assess seed quality and seed vigour (Matthews 1980; Powell and Matthews 1981, 1985; Larsen *et al.* 1998). In this study, seed lots from nine varieties of Polish canola, *Brassica rapa*, were evaluated using a modified germination test and controlled deterioration test. Our objectives were to investigate the effect of temperature on seed vigour and determine which test provided the best indication of field performance.

## Materials and Methods

### a) Laboratory Tests

Uniform sized seeds from nine Polish varieties were evaluated using a modified germination test (MGT) and controlled deterioration test (CDT). The moisture content of the samples was standardized at 20%. Seeds were sealed in aluminum foil bags and equilibrated at 10°C for 24 h. Samples were aged at 20°C (MGT) and 45°C (CDT) for 24 h, then transferred to thermal gradient chambers maintained at 20°C. Germination was assessed 5 - 7 days after incubation.

### b) Field Tests

Field tests were conducted annually at the AAFC Research Farm at Saskatoon in 1998, 1999 and 2000. Uniform sized seeds of each variety were planted without chemical protectants in six-row plots at 200 seeds per 6.0 m row in late May. Tests were replicated four times using a randomized complete block design. Agronomic assessments focused on seedling emergence, fresh weight and biomass.

### c) Statistical Analysis

Data were analyzed using the General Linear Model procedure of the Statistical Analysis Systems (SAS). Germination counts in the MGT and CDT were correlated with field data to identify which test provided the best indication of seedling emergence and seedling growth.

### Results and Conclusions

1. In the modified germination test, germination counts in each variety exceeded 90% within 5 or 6 days after incubation (Table 1). All seed lots exceeded the germination requirement for No.1 certified seed.
2. In the controlled deterioration test, germination in Fairview, Echo, Chinook and 41P55 exceeded 90% within 5 days after incubation (Table 1). Seed lots of the four varieties were the most vigorous and least prone to deteriorate after exposure to high temperature. In contrast, seed lots of AC Parkland and Reward failed to germinate 7 days after incubation. Seed lots of the two varieties were the least vigorous and most prone to deteriorate after exposure to high temperature.
3. Germination counts in the modified germination test were significantly correlated with seedlings/row ( $r=0.74 - 0.85$ ) and biomass ( $r=0.64 - 0.71$ ) of Polish varieties in late May plantings (Table 2). Germination counts were poorly correlated with fresh weight ( $r=0.37 - 0.64$ ).
4. Germination counts in the controlled deterioration test were significantly correlated with seedlings/row on the first sampling date (Table 2). Germination counts were poorly correlated with final seedling counts ( $r=0.59 - 0.63$ ), fresh weight ( $r=0.30 - 0.60$ ) and biomass ( $0.54 - 0.65$ ).
5. Germination counts in the modified germination test provided a better indication of seedling establishment and growth of Polish canola than vigour ratings in the controlled deterioration test.

**Table 1.** Percent germination of Polish varieties in the modified germination test and controlled deterioration test. <sup>1</sup>

Variety	Breeding type	Modified germination test			Controlled deterioration test		
		5 days	6 days	7 days	5 days	6 days	7 days
Fairview	synthetic	99.5a	99.5a	99.5a	98.5a	98.5a	98.5a
AC Boreal	synthetic	99.0ab	99.5a	99.5a	84.0b	92.0b	94.5ab
Hysyn 110	synthetic	97.0a-c	97.5ab	97.5ab	80.5b	87.5bc	90.0bc
Echo	op	99.5a	99.5a	100.0a	98.0a	98.0a	98.0a
Chinook	op	99.5a	99.5a	99.5a	96.0a	97.5a	98.5a
AC Sunbeam	op	99.0ab	99.0a	99.5a	64.5c	83.5c	88.5c
41P55	op	95.0bc	96.0bc	96.0b	96.0a	97.0a	97.5a
AC Parkland	op	93.0c	95.0bc	96.0b	0.0d	0.0d	0.0d
Reward	op	88.0d	93.5c	95.5b	0.0d	0.0d	0.0d

<sup>1</sup> means within columns followed by the same letter are not significantly different (LSD,  $p=0.05$ ); op = open-pollinated.

**Table 2.** Pearson correlations between germination counts and agronomic attributes of Polish varieties in late May plantings at Saskatoon in 1998 - 2000. <sup>1</sup>

Test	Days after incubation	Seedlings / row		Fresh weight		Biomass	
		14 DAS	21 DAS	14 DAS	21 DAS	14 DAS	21 DAS
modified germination	5	0.79	0.74	0.46	0.64	0.70	0.71
	6	0.82	0.74	0.42	0.58	0.68	0.67
	7	0.85	0.75	0.37	0.51	0.66	0.64
controlled deterioration	5	0.63	0.59	0.30	0.52	0.54	0.58
	6	0.67	0.62	0.34	0.58	0.58	0.64
	7	0.68	0.63	0.35	0.60	0.59	0.65

<sup>1</sup>  $r \geq 0.66$  significant at 5% probability level.

### Acknowledgments

We are grateful to Sharon Leung, Mike Robinson and Larry Mann for their technical assistance, and Ralph Underwood for preparing the poster. The research was funded by the Federal Matching Investment Initiative.

### References

- Larsen, S. U., Povlsen, F. V., Eriksen, E. N. and Pedersen, H. C. 1998.** The influence of seed vigour on field performance and the evaluation of the applicability of the controlled deterioration vigour test in oil seed rape (*Brassica napus*) and pea (*Pisum sativum*). *Seed Sci. & Technol.* 26: 627 - 641.
- Matthews, S. 1980.** Controlled deterioration: A new vigour test for crop seeds. In: *Seed Production* (P. D. Hebblethwaite, ed.), Butterworths, London. pp. 647 - 660.
- Powell, A. A. and Matthews, S. 1981.** Evaluation of controlled deterioration, a new vigour test for small seeded vegetables. *Seed Sci. & Technol.* 9: 633 - 640.
- Powell, A. A. and Matthews, S. 1985.** Detection of differences in seed vigour of seed lots of kale and swede by the controlled deterioration test. *Crop Research (Hort. Res.)* 25: 55 - 61.