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Evaluaton of Canola Lines in the Utah Valley

Sergio Muñoz-Valenzuela and Andrew Easton

Canola (*Brassica* spp., Brassicaceae) has become a popular oilseed crop in the US. North Dakota leads the US in canola production with approximately 88% of domestic production. Canola is a specific edible type of rapeseed, developed in the 1970s, which contains about 40% oil. The term "canola" is a registered name by the Western Canadian Oilseed Crushers Association. Canola cultivars must have an erucic acid content of less than 2% and also have less than 30 μmoles of glucosinolates per gram of seed. Canadian and US farmers mostly grow low erucic acid and low glucosinolate cultivars. High erucic acid oil rapeseed is grown and used for industrial lubricants. This type of rapeseed is mostly grown in Europe, although there is some production in Canada and the US In January 1985, the US Food and Drug Administration granted canola oil GRAS (Generally Recognized as Safe) status for use in human foods. This has led to greatly increased sales and demand in the US with only part of the demand being met by US production. Canola oil has achieved worldwide commodity status and is extensively used in Japan, Canada, and Europe (Berlund and McKay 2002).

Oilseed rape (*Brassica* and related species, Brassicaceae) is now the second largest oilseed crop in the world providing 13% of the world's supply. The world's commerce is largely supplied by two species, *Brassica napus* L. and *B. rapa* L. Both species contain both spring and winter forms that are distinguished by vernalization requirement. Seeds of these species commonly contain 40% or more oil and produce meals with 35% to 40% protein. The fatty acid composition of the oil is genetically controlled and has been successfully manipulated to produce products specifically tailored for end use. Commodity canola oil today contains only traces of erucic acid, 5% to 8% saturated fats, 60% to 65% monosaturated fats, and 30% to 35% polyunsaturated fats. Canola oil is widely used as a cooking oil, salad oil, and in making margarine. It is appealing to health-conscious consumers because it has the lowest saturated fat content of all major edible vegetable oils (Raymer 2002).

The term "industrial rapeseed" does not have any regulatory basis but generally refers to oilseed rape cultivars that produce oils with 45% or more erucic acid and seed meals that are either high or low in glucosinolates. Cultivars with these characteristics are used primarily for non-edible purposes such as lubricants and hydraulic fluids. The term "specialty canola" most often refers to canola-quality cultivars with improved oil profiles for use in high temperature or continuous frying. Specialty canola cultivars normally produce oils that contain less than 4% linolenic acid and/or greater than 70% oleic acid. Oils from these cultivars have greater temperature stability and improved shelf life (Raymer 2002).

Canola is produced extensively in Europe, Canada, Asia, Australia, and to a more limited extent here in the United States. The world's commerce is largely supplied by two species, *Brassica napus* and *B. rapa* and to a lesser extent by the mustards, *B. juncea* Coss. (brown mustard) and *Sinapis alba* L. (yellow mustard). At present, cultivars of both species have been developed with low-erucic and low glucosinolate quality, and these are now widely grown commercially. It is likely that canola-quality cultivars of *B. juncea* and perhaps *B. carinata* A. Braun will be developed in the near future, and if this occurs, it will significantly influence the choice of oilseed *Brassica* species in some areas. Low-erucic acid strains of *B. juncea* have been obtained in Australia using the half-seed technique (Kirk and Oram 1981). The development of low-glucosinolate *B. juncea* in Canada, required interspecific hybridization of *B. rapa* and *B. juncea* (Love et al. 1990), also, cultivars with low levels of linolenic acid has been developed and registered (Scarth et al. 1988). 'Winfield' has been released from Guelph University (Beversdorf and Hume 1990); 'Cathy' is a winter canola cultivar from University of Idaho, US (Auld et al. 1991), 'Plainsman' and 'Wichita' are canola cultivars from the Kansas Agricultural Experiment Station (Rife et al. 2000, 2001).

During the 1998–1999 winter season, the canola commercial area in southern Sonora, México was 400 ha with good results. The crop was planted on several soil types including clay, alluvial, and saline soils. There were different seeding dates, seeding rates, crop systems, and fertilization and water management systems. Grain yield from early seeding (Dec. 1–15) averaged 3214 kg/ha, the highest yield was 3610 kg/ha for 'Hyola 401'. Intermediate seeding date (Dec. 16–31) grain yield averaged 2749 kg/ha and the highest yield was 3000

kg/ha. In late seeding (Jan. 1–15) grain yield averaged 1941 kg/ha and the highest yield obtained was 2500 kg/ha. In saline soils yield varied from 1350 to 2300 kg/ha (Muñoz et al. 2002).

In Utah, producers do not know this crop, because the data for production are limited. Canola rapeseed yields from dry land farming during winter months may range from 225 kg/ha to quantities in excess of 2685 kg/ha. A comparison of yield trials from Montana, Oregon, Washington, Colorado, and Utah provide a wide range of yield values. Yields of approximately 1122 kg/ha are probably more reasonable expectations for dry land production, but further research with large crop areas is necessary for Utah producers (Beard 2006). Therefore, Utah State growers can expect some obstacles in marketing canola seeds in areas without crushing facilities and where transportation cost are high. Yield and adaptation trials with canola cultivars from others similar places, are necessary in different seasons, and varied soils and environment conditions are required. The objective of this study was to evaluate and characterize ten genotypes of canola from Australia, during Utah Valley's fall season environmental conditions.

MATERIALS AND METHODS

The research work was conducted in Utah Valley, US, in the locality of Provo, during spring and summer seasons 2006. Provo is located at 40° 14' 40" North and 111° 39' 39" West of Greenwich, and at an elevation of 1381 m about see level. An evaluation trial was carried out with 9 entries from Pacific Seeds, Australia and a local check ('IMC 204' InterMountain Canola) as shown in Table 1. The randomized complete blocks statistical design was used with three replications (Table 1). Planting date was on April 22, 2006 in clay soil and irrigation. Germinative strength, bloom, pod length, seed per pod, maturity, diseases reaction, insects damage, lodging, plants height, seed weight, seed density, and seed yield were measured.

RESULTS AND DISCUSSION

The experimental canola genotypes planted in the Utah Valley showed acceptable results (Table 1). The plants developed earlier and were shorter in comparison to those in Yaqui Valley, because in Mexico, 'IMC 204' has shown a height of 160 cm in average, and it matured at 117 days. However, plant height was acceptable, which varied from 118 cm (H1480), to 97 cm (H1750 and Y3000). Pod length varied from 72 mm (H1750) to 43 mm (H1480) (Fig. 1, 2); the number of seeds per pod varied from 34 (H1750) to 17 (H1480) (Fig. 3). Seed weight (1000) varied from 3.5 g (H4815 and H4816) to 2.7 g (H1480). Seed density (kg/HL) varied from 72.8 kg/HL (H1750) to 67.1 kg/HL in (H1432). Seed yield varied from 2338 kg/ha (H1750) to 1047 kg/ha (H4592), while 'IMC 204' yielded 1462 kg/ha. The presence of diseases and insect damage was low.

CONCLUSION

The results show that the canola oilseed crop will be able to adapt to the Utah Valley's environmental conditions. Further studies on different soil types and evaluation of other canola cultivars is required.

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Fig. 1. Large pod in genotype H1750 (72.0 mm).

Fig. 2. Short pod in genotype H1480 (47.3 mm).

Fig. 3. The number of seeds per pod, varied from 17 to 34.

Table 1. Agronomic characteristics of canola genotypes yield trial in Utah Valley conditions ranked by seed yield (Benson Institute-BYU, Provo, Utah, US 2006).

	Days										
Genotype	Sprout	Bloom initial	Bloom finish	Maturity	Uniformity rate (%)	Plant height (cm)	Pod length (mm)	No. seed/ pod	Seed weight (g)	Seed density (kg/HL)	Seed yield (kg/ha)
H1750	7	49	75	90	85	97	72a	34a	3.2ab	72.8a	2338a
H4722	8	46	75	88	95	105	68ab	30ab	3.2ab	70.4bcd	1880b
H1480	8	50	85	100	90	118	47d	17d	3.2ab	69.4bcde	1792b
H4815	8	45	75	88	90	98	69ab	26bc	3.5a	69.3cde	1765b
IMC 204	9	54	85	103	90	110	64bc	24bcd	3.1bc	69.0def	1462c
H1432	7	45	75	88	95	112	63bcd	25bc	3.2ab	67.1f	1434c
H4816	9	45	82	93	95	100	57d	20cd	3.5a	71.1bc	1301cd
Y3000	8	47	75	90	95	97	67ab	20cd	3.5a	69.7bcd	1069d
H4481	8	46	85	98	85	108	58cd	18d	3.4ab	67.6ef	1050d
H4592	8	45	75	91	90	107	58cd	20cd	2.7c	71.3ab	1047d
Coefficient of variation							3.89	9.37	4.20	0.97	6.53