Spring Canola and Mustard Variety Trial, 2006

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Abstract

The production of canola and mustard for oil to be used for biodiesel has attracted considerable interest from farmers in central Oregon wishing to become self sufficient in fuel. This study was conducted to determine grain and oil yield of spring brassica oilseed crops. Five canola (*Brassica napus*), one brown mustard (*B. juncea*), and one yellow mustard (*Sinapsis alba*) cultivars were trialed at two locations in central Oregon. Although mustards were lower in oil content, their higher seed yields resulted in oil yields comparable to the canola cultivars at Madras. At Powell Butte the yellow mustard, but not the brown, produced oil yields comparable with most of the canola cultivars at Powell Butte. However, oil yields determined from this trial would indicate that oilseed crops for the production of biodiesel would not be economically viable at current diesel prices.

Introduction

With gasoline and diesel prices approaching $3/gal there has been considerable interest locally and nationally in the ability to produce renewable energy fuels. Canola is often put forward as an ideal temperate crop that can be grown for its oil, which can then be processed into biodiesel. Current regulations prohibit the growing of canola in central Oregon because of 1) out-crossing with the brassica seed crops (e.g., Chinese green vegetables, cabbage, etc.) grown in the area; 2) attracting bees and other pollinating insects away from other specialty seed crops (e.g., hybrid carrot and onion seed crops); and 3) transgenic contamination of seed lots. A special permit from the Oregon Department of Agriculture (ODA) was obtained so this experiment could be conducted. The objective of this study is to determine the yield potential of non-transgenic spring canola crop grown under irrigation in central Oregon. Yield, as well as flowering date, height at maturity, oil content, and oil yield were determined.

Methods and Materials

Two variety trials were conducted at Central Oregon Agricultural Research Center in Madras (44.68°N, 121.15°W, 2,424ft elevation) and Powell Butte (44.25°N, 120.95°W, 3,194 ft elevation). Five *Brassica napus* cultivars (‘Sterling’, ‘Clearwater’, ‘Gem’, ‘Premier’, and ‘Sunrise’), one *B. juncea* (‘Pacific Gold’) and one *Sinapsis alba* (‘IdaGold’) were supplied by the Brassica research group at the University of Idaho. ‘Clearwater’ and ‘Gem’ are imadizolinone tolerant while ‘Sterling’ and ‘Gem’ both produce industrial rapeseed quality oil. Initially, four Roundup Ready® lines were supplied by the University of Idaho and Monsanto’s breeding group in Winnipeg, Canada, but these were removed from the trial prior to flowering at the request of the ODA and local growers. Both trials were organized as randomized complete blocks with four reps. Plots measured 20 ft long by 4 ft wide. The *B. napus* cultivars were all treated

with Helix® XTra (Syngenta). Treflan® TR-10 (Dow AgroSciences) at 5lb/acre to control weeds and 350lb/acre of 30-10-0-7 fertilizer were incorporated into the soil prior to sowing. Sowing took place on 10 May, 2006 at Madras and 11 May, 2006 at Powell Butte. Plots were sown 1 inch deep with a 6-row double-disk plot drill on 8-inch centers. The first and sixth rows and 2 ft on each end of plots were removed prior to harvest. A severe hailstorm struck the Powell Butte site on 12 June, removing most of the leaves from the plants. Plant recovery was generally good and although unmeasureable, they did not appear to suffer a yield penalty. Plots were swathed using a sickle-bar mower and the windrows were threshed in the field. Swathing and harvesting occurred on 14 and 23 August, respectively, at Madras, and on 22 and 28 August, respectively, at Powell Butte. Days to flowering was defined as the period from sowing to when the first flowers opened (Stage 4.1, Harper and Berkenkamp 1975). Height, lodging, and shattering scores were measured or determined at swathing. Oil content was conducted by the University of Idaho's brassica breeding team using nuclear magnetic resonance (NMR) spectroscopy.

Results and Discussion

Yield at both sites was generally poor (Tables 1 and 2), although it was surprising to see the recovery of the crops at Powell Butte following the June hailstorm. Signs were evident of elk walking through the plots at this site although they did not appear to damage the crop. The short period to time from sowing to flowering may have been the reason for the poor yield as the plants did not have enough time in the vegetative phase to establish yield potential. The late sowing reduced the period of time the plants spent in their vegetative state and therefore reduced their ability to develop sufficient biomass to support a high-yielding crop. Differences existed in the heights of the various cultivars examined in these trials and the rankings were consistent between the two sites. Lodging did not differ significantly between cultivars or sites, although 'Pacific Gold' did shatter more than the other cultivars at Powell Butte, which explains its lower yield. Both 'IdaGold' and 'Pacific Gold' matured approximately a week earlier than the canola cultivars and under ideal conditions, harvest would have been earlier for these cultivars. 'IdaGold' has excellent resistance to shattering, with seeds still in the siliqua of the buffer plants several months after the plots were harvested.

Oil content was higher for all cultivars at Powell Butte than Madras ($P < 0.001$), averaging almost 4 percent with the interaction between site and cultivar not significant. Cool temperatures during grain filling have been shown to result in a higher oil content (Gunasekera et al. 2006). Powell Butte is climatically cooler that Madras (average maximum/minimum temperatures between 16 June and 15 August in 2006 at Powell Butte were 82.1/47.4°F while at Madras they were 86.0/50.1°F) and this may account for Powell Butte's higher oil yield. Location and cultivar had no effect on the amount of oil produced per acre, although the interaction was significant because of yield loss resulting from shattering of 'Pacific Gold' at Powell Butte. This reduced the grain and oil yield, bringing down the site average that otherwise would have resulted in a greater oil yield at Powell Butte than Madras.

Table 1. Yield, days to flower, height, lodging score, shattering score, oil percent, and oil yield of spring oil seed brassica cultivars grown at Central Oregon Agricultural Research Center, Madras, 2006.

Cultivar	Yield (lb/ac)	Days to flower	Height (cm)	Lodging score[1]	Shattering score[2]	Oil %	Oil yield (gal/ac)
Clearwater	877	51	132	8.5	8.3	36.3	40.75
Gem	661	46	116	9.0	8.3	36.9	31.00
IdaGold	1457	37	125	9.0	9.0	23.3	43.00
Pacific Gold	1439	40	139	9.0	7.0	32.2	59.25
Premier	766	49	121	8.5	8.3	35.7	35.50
Sterling	826	48	117	8.5	8.3	36.9	39.00
Sunrise	765	51	131	9.0	8.5	36.1	35.25
LSD (0.05)	474	1	12	NS[3]	1.0	1.7	NS

[1]Lodging score: 0 = completely lodged, 9 = fully erect.
[2]Shattering score: 0 = completely shattered, 9 = no shattering.
[3]NS = not significant.

Table 2. Yield, days to flower, height, lodging score, shattering score, oil percent, and oil yield of spring oil seed brassica cultivars grown at Central Oregon Agricultural Research Center, Powell Butte, 2006.

Cultivar	Yield (lb/ac)	Days to flower	Height (cm)	Lodging score[1]	Shattering score[2]	Oil %	Oil yield (gal/ac)
Clearwater	865	ND[3]	130	8.8	8.3	40.6	44.75
Gem	1173	ND	109	8.5	8.0	40.0	60.00
IdaGold	1525	ND	109	9.0	9.0	27.2	52.25
Pacific Gold	641	ND	129	9.0	3.5	34.7	28.50
Premier	898	ND	119	8.5	8.8	41.8	48.25
Sterling	890	ND	113	9.0	7.0	40.5	46.00
Sunrise	827	ND	128	8.5	7.8	40.2	42.25
LSD (0.05)	358	ND	12	NS[4]	0.9	2.0	17.00

[1]Lodging score: 0 = completely lodged, 9 = fully erect.
[2]Shattering score: 0 = completely shattered, 9 = no shattering.
[3]ND = not determined.
[4]NS = not significant.

Mid-May is almost certainly too late to sow spring canola in central Oregon and future variety trials will be sown in mid-April. Better yet, winter canola may be better adapted to central Oregon. Trials to determine the yield potential of winter canola are planned for 2006-2007 and 2007-2008. With relatively expensive land and the need to irrigate, albeit with a generally reliable allocation of water, the production of hybrid canola seed may also be a more worthwhile operation for central Oregon growers. There are currently plans for small scale hybrid seed production of winter canola seed during the 2007-2008 growing season.

References

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