Title: Spring and Winter Canola Research at the WSU Cook Agronomy Farm

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Technical Support:

Duration: 2001-2009

Objectives:
1. Evaluate agronomic practices and methods used for spring canola production including no-till drill and broadcast planting
2. Measure spring canola yields (2001-2009) and the influence of planting date on yields
3. Determine Roundup Ready spring canola impacts on weed management
4. Calculate the economics of spring canola in rotation for this site and time period.

Background
Spring canola production can diversify cropping systems within dryland cropping zones of the Pacific Northwest. No-tillage systems may be particularly well-suited to spring canola as crop residues promote seed-zone moisture conservation near the soil surface that could benefit the establishment of the small, shallow-seeded crop (Fig. 1). Cereal crop residues create warmer surface air temperatures (Huggins and Pan, 1989) that could protect canola seedlings from spring frosts. 

Field research comparing differences in soil disturbance and residue configuration created by different no-till drills demonstrated that residues remaining standing after the seeding operation were more effective at maintaining spring canola stands following spring frosts (Fig. 2) (Appel, 2010). Emergence tended to be more rapid with the inverted-T opener, however, stands also tended to be more easily affected by spring frost. This occurred as the inverted-T drill left residue relatively flat on the surface as compared to more standing residue with the double-disk and hoe-type openers. The coldest air temperatures tend to be at the surface of the residue and increase within the residue. Therefore, standing cereal residues tend to provide a thicker zone of protection from spring frosts as compared to flattened residue or no residue at all. Spring canola varieties that are resistant to herbicides (e.g. Roundup) can also provide useful alternatives for managing weeds such as annual grasses that are problematic in other rotational crops.

Figure 1. No-till winter canola establishment in winter wheat residue under conditions of marginal seed-zone soil water. Wheat residues may also promote more favorable seed-zone water for the establishment of shallow-seeded spring canola.
Methods

In 2001, three-year rotations including a crop rotation with spring canola were initiated at the WSU Cook Agronomy Farm. Round-up Ready spring canola was no-till planted using a double-disk drill (Great Plains) into spring barley (first year only) or hard red winter wheat residue (8 years). Seeded and harvested strips at the WSU Cook Agronomy Farm were approximately five acres (Fig. 3). Planting dates ranged from as early as March 26 to as late as May 12 and were dependent on spring weather and soil conditions. Seeding rates were initially high (8-10 lbs/ac) but were reduced after the first 3 years to 6 lbs/ac. ‘Ryder’ spring canola was planted the first year, ‘Dekalb 223’ the fourth year, and ‘Hyola 357’ the remaining seven years. All seed was treated for early season control of flea beetles, seed-borne blackleg, seed-borne Alternaria and the seedling disease complex (damping-off, seedling blight, seed rot and root rot) caused by Pythium spp., Fusarium spp. and Rhizoctonia spp. (e.g. HELIX® XTra). No further insecticides were needed for aphids, cabbage seedpod weevil or Diamondback moth with the exception of 2009 when Sniper was applied on Aug. 6th at 2.5 oz/ac. During two years (2003 and 2004), spring canola was broadcast planted into standing winter wheat stubble using a Vermeer spreader. This occurred in strips where winter canola had failed to establish and served as a comparison between drilled and broadcast crops. In 2003, Hyola 357 was broadcast at 10 lbs/ac on April 14 and was then top-
dressed with ammonium nitrate at 112 lbs N/ac. In 2004, DeKalb 223 was broadcast at 8 lbs/ac and then top-dressed with 112 lbs N/ac of ammonium nitrate.

Liquid fertilizer was deep-banded 3 to 4 inches through the no-till drill by low-pressure injection behind a turbo coulter mounted ahead of the double-disk seed openers. Total applied N ranged from 100 to 130 lbs N/ac and averaged 110 lbs N/ac for the nine year period. Liquid phosphorus (10-34-0) was applied at 10-20 lbs P₂O₅/ac and S (thiosul) was applied at 15-30 lbs S/ac averaging 25 lbs S/ac. Weed management with herbicides was accomplished with three separate applications of Round-up: a late fall application, spring prior to seeding, late spring in crop with rates ranging from 12 to 20 oz/ac depending on formulation and time.

Spring canola was harvested by hand in the standing crop at 20-25 geo-referenced points (1 m²) representative of the 5-ac strip. Following hand harvest, the spring canola was combined without further treatment and the full strip combine yields compared to the collective hand harvested yields.

Results

Yield: Spring canola yield ranged from 1065-2758 lbs/ac and averaged 1880 lbs/ac over the nine year period (Fig. 4). Year-to-year variation in crop yields was similar to spring wheat and barley crops (Fig. 4). Spring canola yields were inversely related to planting date (Figure 5). With the exception of one year (2005), spring canola yield decreased 43 lbs/ac for every day seeding was delayed after April 12th.

Figure 4. Spring canola yields, 2001 through 2009, at the WSU Cook Agronomy Farm. Also shown are spring barley and wheat yields for the same time period.

Figure 5. Spring canola planting date effects on seed yield at the WSU Cook Agronomy Farm.
In turn, spring canola planting date was directly related to September through April precipitation where earlier planting was achieved during drier fall and winter soil recharge periods (Fig. 6). During two years (2003 and 2004), spring canola was broadcast seeded using a Vermeer spreader after winter canola failed to establish (Fig. 7). Broadcast seeded and no-till planted spring canola yields were similar for both years averaging 2035 lbs/ac broadcast and 2259 lbs/ac no-till seeded (Fig. 8). As seeding occurred at relatively early (mid-April or earlier) and similar dates, these comparisons do not include the potential benefit of earlier seeding that may be achieved using broadcast methods.

Figure 6. Relationship between spring canola planting date and September through April precipitation at the WSU Cook Agronomy Farm.

Figure 7. Vermeer spreader used to broadcast plant spring canola into winter wheat residue in 2003 and 2004 at the WSU Cook Agronomy Farm.

Figure 8. Spring canola yield comparison of broadcast versus no-till drilled planting methods during 2003 and 2004 at the WSU Cook Agronomy Farm.
Economics

U.S. domestic consumption of canola oil has substantially exceeded U.S. production since the 1980’s with recent demand over 2-times the supply (Fig. 9). Globally, the U.S. is a major importer of canola oil while Canada and Australia are major exporters (Fig. 10). Canola prices remained fairly flat from 1991 through 2006, but recently have experienced substantial gains with prices in 2007 of $11/cwt and in 2011 nearly $19/cwt (Fig. 11). Consequently, as spring canola was produced at the WSU Cook Agronomy Farm from 2001 through 2009, prices ranged from a low of $7/cwt in 2001 to a high of $18/cwt in 2009. In early 2012, the daily cash price for canola was over $24/cwt (Fig. 12).

Figure 9. U.S. canola oil production and demand.

Figure 10. Global canola trade 2008-2009.
Figure 11. Canola prices, 1991 through 2011.

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Figure 12. Daily cash prices for canola on 1/24/12 (Source: Northern Canola Growers Assoc.).

Figure 13. Net returns over total costs for spring canola produced at the WSU Cook Agronomy Farm from 2001 through 2009.

Profits (net returns over total costs) for spring canola production at the WSU Cook Agronomy Farm
ranged from a low of -$97/ac in 2005 to a high of $44/ac in both 2004 and 2009. Net returns over total costs averaged -$30/ac over the nine year period (Fig. 13). In comparison, returns for the other two rotational crops in the study averaged -$75/ac for spring peas and -$20/ac for spring barley over the same nine year period. This was a period of fairly low returns but rising costs, particularly for fertilizer and fuel.

Conclusions
The market outlook for canola oil is strong, with U.S. domestic consumption exceeding U.S. production since the 1980’s. Currently, U.S. demand for canola oil is more than double the national supply. Globally, the U.S. is a major importer of canola oil while Canada and Australia are major exporters.

At the Cook Research Farm, net returns for spring canola averaged -$30/ac, with a standard deviation of $44 over the 2001-2009 study period. Other rotational crops were also unprofitable, however. Returns for spring barley averaged -$20/ac, with a standard deviation of $53 and returns for spring peas averaged -$75/ac with a standard deviation of $46/ac. The January 2012 market price of $24/cwt would dramatically change these results, as it is approximately double the average price during the study period of $12.80/cwt.

References:

Huggins and Pan

Northern Canola Growers Association (www.northerncanola.com/growers_info/index.asp)

University of Idaho Brassica Breeding and Research (www.cals.uidaho.edu/brassica/)

University of Idaho Crop Budgets (www.cals.uidaho.edu/aers/r_crops.htm). This site contains current budgets for canola, camelina and mustard for North Idaho, plus major commodities and rotational crops; lower rainfall dryland canola (eastern Idaho) is also included.