Title: Canola Production in the Intermediate Rainfall Cropping Region

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Funding term and duration: 2007 - present

Technical Support: Derek Appel

Background and justification:
The adoption of oilseeds into rotation have been talked about by growers and researchers for years, yet oilseed planting and production success remains hit and miss across the intermediate (13-17 inches annual precipitation) cropping zone. Spring canola varieties have shown a trend for increased yield (12% over the last 8 years. Source: University of Idaho Brassica Breeding web page) and offer unique weed control options that can fit well with cereal grain cropping systems. This project uses large scale long-term crop rotation studies and targeted extension outreach of key results to provide growers with information needed to successfully adopt canola into their crop rotation. At the WSU Wilke Research and Extension Farm we have fully incorporated spring canola into the 4-year rotation and “practicing what we preach.” A second study has been initiated at Wilke examining spring canola in crop rotation compared to spring wheat and garbanzo beans. A third large scale on-farm test north of Almira, WA is examining nitrogen (N) fertilization of winter canola at seeding to help improve yield.

Objectives:
The objective of this project is to utilize “show and tell” large scale projects to demonstrate canola as a positive fit into a crop rotation in this region. For this to happen, growers need to see long-term economic benefits and improved weed control efficacy.

Methods:
The WSU Wilke Research and Extension Farm has been divided into seven large (~25 acres each) strips since 2004. Three of these strips are maintained in a 3-year rotation of no-till fallow, winter wheat and spring cereal. Four strips are maintained in a 4-year rotation of no-till fallow, winter wheat, spring cereal and spring cereal. In 2012, spring canola was incorporated into the 4-year rotation - no-till fallow, winter wheat, spring canola and spring cereal. The large strips are not replicated each year but results over time will be documented on a large commercial scale.

The north side of the farm has been continuously cropped to cereal grain production in a 3-year rotation of spring barley, spring wheat, and re-crop winter wheat. In 2014 a large study was initiated that has three treatments: spring wheat, garbanzo beans and spring canola in rotation with recrop winter wheat and then spring barley. This study is a randomized complete block design with 4 replications. A second
location is going to be established in 2015 and a third location will be added in 2016. Treatment and subsequent grain yields and economic production data will be collected each year.

In 2013 at Brunner’s farm eight miles north of Almira, an on-farm test (OFT) was established examining winter canola liquid N fertilizer rates placed approximately two inches away from the seed. The trial was seeded into no-till fallow using a JD ConservaPak direct seed drill on 12-inch row spacing. The three fertilizer treatments are detailed below:

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Drill applied N</th>
<th>Fall applied N</th>
<th>Spring applied N</th>
<th>Total applied N</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 lbs N/ac</td>
<td>0</td>
<td>60</td>
<td>30</td>
<td>90</td>
</tr>
<tr>
<td>15 lbs N/ac</td>
<td>15</td>
<td>45</td>
<td>30</td>
<td>90</td>
</tr>
<tr>
<td>30 lbs N/ac</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>90</td>
</tr>
</tbody>
</table>

Note: All three treatments received 25 lbs/ac MicroEssentials® SZ™ (MESZ) fertilizer applied with the seed. MESZ is a granulated fertilizer that incorporates phosphorus, sulfur and zinc with each granule.

Subsequent fertilizer applications are applied with a sprayer equipped with stream jet fertilizer nozzles. The OFT is a randomized complete block design with 3 replications, and was established for a second year in 2014.

Results and Discussion:
In 2014 spring canola at the WSU Wilke Research and Extension farm had the lowest overall economic return over input costs of $55.09/ac (Table 1). Winter wheat, spring wheat and no-till fallow averaged $335, $45 and -$45/ac return, respectively. This was mostly due to an insecticide application cost in canola and low yields because of dry conditions and hot temperatures. However Plot 3 and Plot 1, which have had canola over the past three years, had the highest average economic return over input cost of $200 and $199/ac compared to Plot 4, 5, 2, North, 6 and 7 with $184, $180, $156, $137, $123, and $119/ac respectively.

In the crop rotation study, spring wheat had the greatest yield at 1,514 lbs/ac, and garbanzo beans produced the least amount at 526 lbs/ac (Table 2). Canola yields were less then wheat and greater than garbanzo beans at 745 lbs/ac. Wheat had the greatest economic return at $194/ac and no differences were detected between canola and garbanzo beans at $123 and $121/ac. No differences were detected in input costs between the three crops with an average of $117/ac. Wheat had the highest economic return over input costs of $77/ac compared to $6 and $5/ac for canola and garbanzo beans, respectively. Sprinter hard red winter wheat was seeded over the top of the study in the fall of 2014 and will be harvested in 2015 to capture rotation impacts on grain yield and economic returns.

In the OFT at Brunner’s, fertilizer applied at seeding significantly decreased winter canola yield (Figure 1). Canola that received no fertilizer at seeding yielded 818 lbs/ac, compared to only 741 and 719 lbs/ac when 15 and 30 lbs N/ac was applied at seeding.

Impact/Potential Outcomes:
This research/extension project will show how spring canola incorporated long-term in a rotation has positive benefits reflective in greater economic returns over time. The fertilizer timing with winter canola, if repeatable over years, has the potential to increase winter canola average yields and may help
improve winter survivability. Research plots and outreach go hand-in-hand with field days, social media, web pages, and extension bulletins. At the inception of this study virtually no spring canola was produced in Lincoln County and over the last two years more than five growers have produced spring canola.

Affiliated projects and funding:
REACCH funding is the closest affiliated project with this one.

Publications:


In the near future I will also submit for publishing the results for the WSU Wilke Research and Extension Farm in 2015; the crop rotation study and the fertilizer placement study data might be used in combination with other work being completed on canola fertilization.

References:
Appendix:

**Table 1.** Agronomic and economic performance of crops produced under a 4-year crop rotation at the WSU Wilke Research and Extension Farm.

### 4-year crop rotation production at the Wilke Farm, 2014.

<table>
<thead>
<tr>
<th>Plot</th>
<th>Cropping Specifics</th>
<th>Crop Production</th>
<th>Gross Economic Return†</th>
<th>Input Costs</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acreage</td>
<td>'L120 Liberty Link' Canola</td>
<td>Yield</td>
<td>Mkt Grade</td>
<td>Mkt Price</td>
</tr>
<tr>
<td>1</td>
<td>28.2</td>
<td>701 lb/ac</td>
<td>23.0 bu/ac</td>
<td>#1 Canola 0.8% dockage</td>
<td>$0.1647/lb</td>
</tr>
<tr>
<td>3</td>
<td>27.5</td>
<td>23.0 bu/ac</td>
<td>55.9 bu/ac</td>
<td>#3 SSWW 57.8 tw, 1.8% dockage, 13.0% protein</td>
<td>$6.33/bu</td>
</tr>
<tr>
<td>4</td>
<td>26.1</td>
<td>55.9 bu/ac</td>
<td>-</td>
<td>#1 SSSW 55.8 tw, 0.6% dockage, 11.60% protein</td>
<td>$8.23/bu</td>
</tr>
<tr>
<td>6</td>
<td>29.4</td>
<td>-</td>
<td>-</td>
<td>No-till Fallow</td>
<td>-</td>
</tr>
</tbody>
</table>

† Revenue does not include crop insurance revenue.
‡ Costs do not include fixed costs associated with the farm.
Table 2. Canola, garbanzo beans and spring wheat yields, gross economic returns, input costs and economic returns over input costs at the WSU Wilke Research and Extension Farm in 2014.

<table>
<thead>
<tr>
<th>Crop Treatment</th>
<th>Yield (lb/ac)</th>
<th>Return ($/ac)</th>
<th>Costs ($/ac)</th>
<th>R/C ($/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>1514</td>
<td>194</td>
<td>117</td>
<td>77</td>
</tr>
<tr>
<td>Canola</td>
<td>745</td>
<td>123</td>
<td>118</td>
<td>6</td>
</tr>
<tr>
<td>Garbs</td>
<td>526</td>
<td>121</td>
<td>115</td>
<td>5</td>
</tr>
</tbody>
</table>

Level of Sign. 0.001 0.001 n/a 0.001
Tukey (P<0.10) 114.91 18.4 n/a 18.4
CV 6.96 7.09 n/a 35.05

† Means within columns assigned different lower case letters are different (P<0.10) LSD(0.10) = 54

Figure 1. Winter canola yield with varied rates of fertilizer applied about 2 inches from the seed with a ConservaPak direct seed drill at Brunner’s farm in 2014.