
Project Title: Development of Camelina as a Low-Input Oilseed Crop for Oregon, Idaho and Washington

Project Coordinator: Russ Karow, Head, Crop and Soil Science, Oregon State University

Research Leaders:
OSU Corvallis – Tom Chastain Carol Garbacik
OSU Pendleton – Don Wysocki
WSU Lind – Bill Schillinger
WSU Pullman – Stephen Guy

This is a three-year project with four defined objectives: 1) to determine the optimum planting date for camelina across the PNW; 2) to identify from among available germplasm that best adapted to the PNW; 3) to explore nitrogen fertility needs of camelina grown in different environments in the PNW; and 4) to share research findings through publications, field tours, grower meetings and other venues to allow camelina to become a viable part of cropping systems across the PNW. Other companion studies are being conducted at some locations. Project work began in fall 2007.

OBJECTIVE DETAILS:

Objective 1: Determining optimum planting dates.
Scope of work: Two planting methods - direct drilling and broadcast with packing - and six planting dates are planned to be used at all four sites. Planting dates are planned for fall and through late spring but will be weather dependent at each location. Four replications of each planting date and planting method. Plant Calena variety at 4-5 lbs/acre with nitrogen @ 25 lbs/acre. Stand counts using quadrant method. Grain yield with plot combine. Take samples from each treatment for oil content.

Objective 2: Cultivar Evaluation.
Scope of Work: Evaluate 15 – 20 cultivars and numbered lines at each location. Four replications. Nitrogen @ 25-30 lbs/acre. Grain yield with plot combine. Take samples from each treatment for oil content.

Objective 3: Determining Optimum Fertilizer Rates.
Scope of work: Single variety with nitrogen rates varying by location. Four replications. N rates used will be location specific. Grain yield with plot combine. Take samples from each treatment for oil content.

Objective 4: Technology Transfer
Scope of Work: To share research findings through publications, field tours, grower meetings and other venues as appropriate and opportunity allows.
Objective 1: Determining optimum planting dates.
The first sowing for the date of planting study was November 2, 2009. The variety Calena was broadcast or direct-drilled into spring wheat stubble. This planting date was determined by the availability of seedzone water. This date was the earliest opportunity for fall planting following precipitation that wet the seedzone (Figure 1). Trials were sown using 6 lb seed per acre, which is the same rate as the 2008-2009 growing season. On November 3, a burn down application of Glyphosate was made to control volunteer wheat and winter annual weeds that were emerging. However, it is likely that additional volunteer cereal and weeds will germinate over winter. A Brillion drop seeder was used for broadcast sowing. The Brillion drill has tandem cultipacker rollers. Seed is dropped behind the first roller and the second roller incorporates and presses the seed. Brillion drop seeders are commonly used to sow grass or alfalfa. Direct seeding was done with a Fabro no-till plot drill, placing the seed at a nominal depth of 1/8 inches and applying 30 lb N/acre at 2 inches below and to the side of the seed row. The seed openers are Atom Jet points on C shanks at 12 inch spacing. Nitrogen fertilizer was applied on the broadcast plots using the fertilizer disks on the Fabro drill prior to broadcasting. Plot dimensions are 8 x 40 feet. The experimental design is split plot with four replications with planting date as the main treatment and sowing method as the split plot. Cool temperatures following the planting led to a slow germination and emergence. Cold conditions without snow cover and frozen ground with frost depth greater than 6 inches occurred for 7-10 days in early December (Figure 1). Seedlings are present in both the broadcast and drilled replications of the planting (Figure 2). An application of “Poast”, a grass herbicide registered on camelina, will be made in early spring for control of newly emerged winter annual grasses and volunteer wheat. The next planting, will be completed as soon as ground conditions allow, but current conditions are such that planting may not be feasible until January 2010. Six planting dates are planned in the experiment.

Figure 1. Temperature and precipitation October 1 through December 12, 2009, CBARC.
Objective 2: Cultivar Evaluation.
A fall trial of the 18 cultivars listed in Table 1 was sown on October 19 in a randomized complete block experiment with four replications. Seeding rate was 6 pounds per acre. The trial was planted into ground that had previously been in winter wheat. Wheat stubble was rotary mowed and the plot area was moldboard plowed, cultivated, fertilized with a broadcast of dry urea at a rate of 30 lb N/acre and harrowed with a cultipacker. The trial was sown with a 6-inch spaced Hege plot drill equipped with double disk openers and semi-pneumatic press wheels. Seed was sown at a nominal depth of 1/8 inch. Individual plot dimensions are 5 x 20 ft. The trial had good germination and emergence (Figure 3).

Table 1. Camelina cultivars sown autumn 2009, CBARC

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Code</th>
<th>Registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blaine Creek</td>
<td>GP41</td>
<td>SO-2</td>
</tr>
<tr>
<td>Calena</td>
<td>GP42</td>
<td>SO-3</td>
</tr>
<tr>
<td>Celine</td>
<td>GP48</td>
<td>SO-4</td>
</tr>
<tr>
<td>Cheyenne</td>
<td>GP67</td>
<td>SO-5</td>
</tr>
<tr>
<td>Columbia</td>
<td>Ligena</td>
<td>SO-6</td>
</tr>
<tr>
<td>GP07</td>
<td>SO-1</td>
<td>Suneson</td>
</tr>
</tbody>
</table>

Figure 2: Camelina seedlings in date-of-planting study December 21, 2009, CBARC.

Figure 3: Fall-planted camelina variety trial, photo December 21, 2009, CBARC.
Objective 3: Determining Optimum Fertilizer Rates.
The nitrogen rate experiment will be sown in early March 2010. It will follow the same protocol at
the N trial in Year 1 and Year 2 of this project. The plot dimensions will be 5 x 40 feet to mirror the
changes made in Year 2. Nitrogen rates are: 0, 15, 30, 45, 60, and 75 N/acre with four replications.

Objective 4: Technology Transfer

- Wysocki, D. 9 September 2009. Update and observations on camelina performance and
  experience this season. OSU Extension post-harvest meeting, Pendleton OR.

  CBARC, Pendleton, OR

Update from Corvallis, Oregon State University

Daryl Ehrensing had been the research lead for the Corvallis trials. Daryl died unexpectedly in Aug
2009. Due to budget constraints, his position as an alternate and new crops agronomist has not been
refilled. Dr. Tom Chastain and Ms. Carol Garbacik have assumed responsibility for the last year of
the Corvallis trials. Fall date of planting and variety trials have been seeded. Cleaning and
processing of 2009 variety trials has been completed. Work continues on data analysis.

Update from Lind, Washington State University

Ample fall rain showers occurred beginning on October 14 that allowed us to establish camelina
about a month earlier than in the previous two years. The camelina cultivar evaluation trial (18
entries) was planted on October 21. The first planting of the planting method/planting date
experiment also occurred on October 21. Camelina seedlings began to emerge from the soil nine
days later. Camelina stands are adequate from both of these trials as of December 30.

The second planting of the planting method/planting date experiment was conducted on November
18. To date, there has been no emergence from this experiment.

Drills, implements, and procedures used for the experiments are the same as for the 2009 crop year.
Crop-year precipitation to date (i.e., Sept. 1 – Dec. 30) at Lind is 3.67 inches. Long-term
precipitation for this time period is 3.86 inches.

We plan to establish the “mid winter” planting method/planting date trial as soon as we have
conditions of thawed soil with no soil cover. The fertilizer experiment and the spring planting of
cultivars will occur in early March as in previous years.
Update from Pullman, Washington State University

**Objective 1: Determining optimum planting dates.**
The 2009-2010 date of seeding trial was established at the WSU Spillman research farm near Pullman Washington. The first date of seeding was sown on 28 October 2009 under good conditions, but fairly cool temperatures. This is considered a late-fall planting timing. The first winter-dormant planting was sown on 11 December 2009 onto frozen soil. Both disk drilled and broadcast seeding are performed at each date. At the December planting, the first seeding date was observed to be emerged and healthy, but still small. Those plants were exposed to a week of cold temperatures, reaching 0°F and below 20°F for the week. Additional dates of planting will be during February as another winter dormant, early March probably frozen too, late March as an early spring, and early April as usual spring seeding date.

**Objective 2: Cultivar Evaluation.**
Camelina cultivars, 20 total entries similar to the 2008 trials, were established in a replicated field trial for agronomic performance evaluation. The trial was seeded on 28 October as a late fall planted management near Pullman, WA at the WSU Spillman research farm. The Pullman site is considered a high rainfall site with 22” average rainfall per year. Plants established after seeding and survived cold temperatures (see date of planting trial above). A second spring planted cultivar trial with the same entries will be seeded early spring.

**Objective 3: Determining Optimum Fertilizer Rates.**
Space was allocated for the N fertilizer trial in a previously organic managed site that should have no carryover herbicide and low fertility to allow good N response. This trial will be seeded in early spring for good yield potential.

**Objective 4: Technology Transfer**

**Publications**

**Presentations**

**Rotation Trial**
At the Palouse Conservation farm near Pullman Washington, winter wheat, ‘Brundage 96’, was planted onto eight replicated previous spring crop plot areas on 28 November 2009. After planting, five different N fertilizer rates (32, 64, 96, 128, and 160) were applied within each of the previous crop areas as a split plot factorial design. Urea N fertilizer was applied as a 70:30 split between fall and spring.

The 2009 spring crop yields for this study have not been reported. All 8 of the 2008 crops were successfully raised, but the greatest problem was with the pea. After spring planting, all crops emerged well except the pea (believed due to poor seed quality) and the pea areas were reseeded.
The late pea plants were heavily aphid infested and virus infected and yielded very little, but competed for space with the few early established plants. The brassica crop comparison was a good comparison with all crops growing and performing to capacity. Crop yields are all expressed in pounds of dry grain per acre equivalent:

2009 Crop Yields (lb/A) in a Rotation Trial, Pullman, WA

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>Yield (lb/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Wheat</td>
<td>3915 lb/A</td>
</tr>
<tr>
<td>Spring Barley</td>
<td>5485 lb/A</td>
</tr>
<tr>
<td>Dry Pea</td>
<td>245 lb/A</td>
</tr>
<tr>
<td>Lentil</td>
<td>740 lb/A</td>
</tr>
<tr>
<td>Camelina</td>
<td>2585 lb/A</td>
</tr>
<tr>
<td>Yellow Mustard</td>
<td>1635 lb/A</td>
</tr>
<tr>
<td>Oriental Mustard</td>
<td>2290 lb/A</td>
</tr>
<tr>
<td>Canola</td>
<td>1610 lb/A</td>
</tr>
<tr>
<td>LSD 0.05</td>
<td>765 lb/A</td>
</tr>
</tbody>
</table>