

In summary, canola appears to be the most viable biofuels crop in western Washington, but still faces serious obstacles, including lack of local processing capacity, and exclusion zones where canola cannot be grown because of risk of contamination of brassica seed crops. Although not a biofuel use, organic production of canola could yield organic canola oil for food and organic canola meal for dairies, beef cattle, and poultry that is limited in supply and could command a high price.

Canola and Camelina Diseases

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In 2011 our project focused on identifying potential canola (primarily *Rhizoctonia*) and camelina (downy mildew) diseases in WA, and screening for resistance to those pathogens.

Canola: Previous work with resistance to *Rhizoctonia* diseases has been done with *R. solani* AG 2-1, and little is known about the virulence of two other groups common in the PNW: AG-10 and *Ceratobasidium* spp. We screened 20 canola cultivars to test for resistance/tolerance to soils inoculated with the diseases. None of the cultivars exhibited resistance to AG 2-1; all were killed in the experiment. One *B. napus* hybrid (Visby) showed high level of tolerance to damping-off from *R. solani* AG 8, AG 10 and the binucleate *Rhizoctonia*, while two genotypes (Amanda and Baldur) exhibited high level of tolerance to *R. solani* AG 10.

Camelina: Downy mildew of camelina was observed in fields in 2010 and 2011, with an incidence of less than 5%, but it may be impacting yield. We planted seed infested with downy mildew, and found that infected plants resulted from infested seed, indicating that the disease is seed transmitted. The pathogen was confirmed as *Hyaloperonospora camelinae*. Growers should use certified or tested seed, and seed treatment with mefenoxam may control the disease.

We will continue to monitor and investigate canola and camelina diseases in 2012. We will verify the identity of pathogen on camelina and relation to *H. parasitica* (downy mildew of Brassicas) with DNA work, and confirm if isolates from camelina are cross-pathogenic to canola.



Fig. 1. Flowering stem of camelina infected with downy mildew (*Hyaloperonospora camelinae*).

Winter Canola Rotation Benefit Experiment

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A winter canola rotation benefit study was initiated in August 2007 at the Hal Johnson farm located east of Davenport, WA. Average annual precipitation at the site is 18 inches. The traditional 3-year winter wheat (WW)-spring wheat (SW)-no-till fallow (NTF) rotation is compared to a 3-year winter canola (WC)-SW-NTF rotation. All crops are produced using direct seeding. Experimental design is a randomized complete block with six replications (total area per site is 0.9 acres). Fertilizer rate is based on soil test. All crops are planted and fertilized with a no-till hoe-opener drill and grain yield is determined using a plot combine. In addition to grain yield, soil volumetric water content is measured in all plots just after harvest in August, in mid March, and again after grain harvest.

Excellent stands of WC were once again achieved from mid August 2010 planting into no-till summer fallow. The WC plants survived the winter in good shape and produced a revised seed yield of 2910 lbs/acre in 2011 (Fig. 1 and Fig. 2). This is, by far, the best WC seed yield obtained during the first four years of the experiment. Winter wheat planted into no-till fallow produced 115 bu/acre in 2011; the highest WW yield so far obtained (Fig. 1).

One very interesting phenomena in 2011 was that SW after WC produced a significantly higher 67 bu/acre compared to 60 bu/acre after WW (Fig. 1) despite the fact that there were no differences in soil water content after harvest of WC and WW in August 2010. These data show that WC provided a significant rotation benefit to spring wheat compared to WW that was not related to

water.

Another interesting data set from 2011 show that WW extracted 2.3 inches more water than WC by time of harvest. These soil water differences were highly significant statistically and apparent in all six replicates. Our previous experience had indicated that WC extracts more soil water than WW, but that was obviously not the case in 2011.

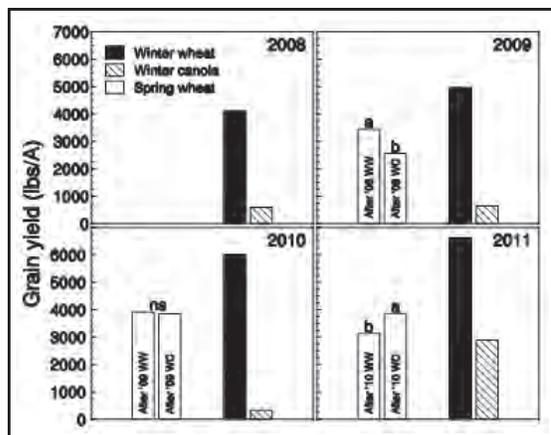


Fig. 1. Grain yield of winter wheat (solid bars) versus winter canola (striped bars) in 2008, 2009, 2010, and 2011. Both crops were planted into no-till fallow on the Hal Johnson farm. Subsequent grain yield of spring wheat (solid white bars) grown after either winter wheat or winter canola is shown for 2009, 2010, and 2011.



Fig. 2. WSU research technician in winter canola plot on the Hal Johnson farm NE of Davenport, WA

Camelina Cropping Systems Experiment at Lind

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A camelina cropping systems experiment was established at the WSU Dryland Research Station at Lind in the 2008 crop year. This experiment will be conducted for nine years to evaluate the traditional 2-year winter wheat-summer fallow (WW-SF) rotation with a 3-year winter wheat-camelina-summer fallow (WW-C-SF) rotation. Experimental design is a randomized complete block with four replications. Each phase of both rotations appears each year in 30 ft x 250 ft plots (total = 20 plots). More than 90% of dry cropland acres in the less than 12-inch annual precipitation zone are in WW-SF. The logical fit for camelina in this dry region is in a 3-year WW-C-SF rotation.

The experiment is located on a south-facing slope. Soils on south-facing slopes are exposed to intense sunlight and drying, thus maintaining adequate seed-zone water content for deep-furrow planting of winter wheat can be a problem in dry years. Crop-year (Sept. 1 – Aug. 31) precipitation was 6.85, 8.46, 11.58, and 11.70 inches in 2008, 2009, 2010, and 2011, respectively. Due to inadequate seed-zone water in late August of 2007 and 2008, we were unable to establish WW with deep-furrow planting into carryover moisture and instead planted WW in late October after the onset of fall rains. For this reason, combined with low crop-year precipitation, WW grain yields were low in 2008 and 2009 (Fig. 1).

For the 2008, 2009, and 2010 crop years, camelina was planted in mid October. However, we learned from the camelina planting date and method experiment (also at the Lind Station, see related article in this booklet) that the best camelina seed yield potential appears to be from a late February-early March planting. A later planting date allows for application of glyphosate herbicide just before planting to control tumble mustard, tansy mustard, and flixweed; these broadleaf weeds establish during the fall and winter. For these reasons, we changed the planting date on or about March 1 beginning in 2011 (Fig. 2).

Grain yields in both the WW-SF and WW-C-SF rotations are shown in Fig. 1. Average seed yield of camelina ranged from less than