2010, and the forage was ensiled. Lactating dairy cows were fed either a control total mixed ration (TMR), or a TMR with 9% canola/pea silage that replaced a portion of the alfalfa hay and corn silage. After 21 days the canola/pea silage was increased to 15% of the TMR.

Both peas and winter canola had good stands. Swathing yielded approximately 2000 lbs forage dry matter/acre at 31% DM. Ensiling the forage crop and feeding it as part of a TMR avoided potential problems that might occur with direct grazing. Most notably, nitrate-N concentration was reduced 80% by ensilage. The canola/pea silage was palatable to the cows and substituted well for alfalfa or corn silage into a TMR without affecting milk production or composition. Plant regrowth following swathing was sufficient for winter survival, and canola harvested in 2011 yielded 2200 lbs/acre. The grain was commercially processed for oil (biodiesel) and meal (animal feed), thereby completing the trifecta from a single crop planting. Biennial forage canola appears to be a viable option in crop rotation systems in dryland areas to diversify crop production and obtain forage for ruminants.

Oilseed Analysis at WSU

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The Weed Science laboratory provides oilseed quality analysis as a service in support of the field research component of the WA Biofuels Cropping Systems Research and Extension project. Data produced includes parameters such as oil yield from a seed crusher, total oil content, and fatty acid composition. Fatty acid composition is the key determinant of oil quality for biodiesel, and enables an evaluation of potential for biodiesel from canola, camelina, and other oilseed crops from seed samples produced in field plots. The objective of the research is to support research and extension personnel in developing input recommendations based not just on yield but on quantity and quality of oil.

Almost 2000 oilseed samples have been submitted for analysis by WSU researchers since 2008. The most recent set of samples (825 total) we are processing are from camelina trials at several locations in the PNW. Correlating crop yield and oil analysis by agroclimatic zones, varieties, fertilizer rates, and other factors will allow more site-specific crop recommendations to growers and processors for maximum potential seed and oil production.

Canola oil and meal after seed crushing. After being weighed, the samples are analyzed for oil composition and quality.

Winter Canola Seeding Rate and Date Study in North Central Washington

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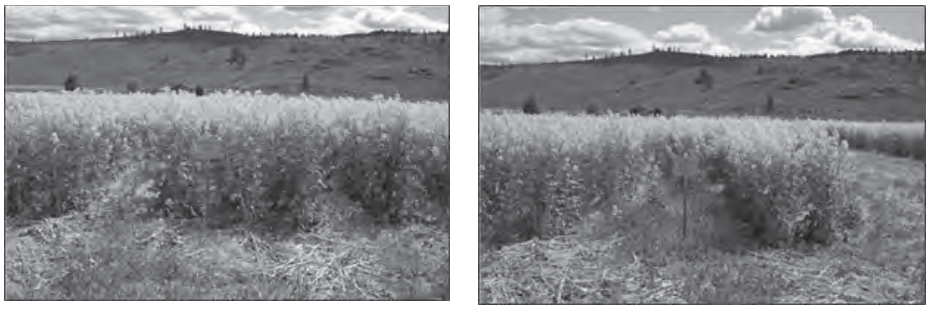
Approximately 60% of the cereal production area of the PNW are characterized by the winter wheat/summer fallow system. This system is plagued by winter annual grass weeds such as jointed goatgrass, feral rye, and downy brome. Growers are becoming more interested in producing winter canola in this region to improve pest management strategies, diversify markets (food, fuel, and feedstock), and increase sustainability. However, winter canola stand establishment is a major impediment to growers in the non-irrigated, low- to intermediate-rainfall zones, so it is considered a high risk to produce. The majority of winter canola research has been conducted in irrigated systems at Prosser and Lind, WA and pre-irrigated systems at Pendleton, OR.

The objective of this four-year project was to establish baseline production information for winter canola production in north central WA, specifically seeding dates and rates that would result in successful stand establishment. "Camas" Roundup Ready® canola was planted at 4 and 8 lbs/A on July 28, August 10, and August 18, 2010. The July 28th planting did not survive a hail and rain storm on July 31 which crusted the soil and prevented emergence. The remaining four treatments (4 and 8 lbs/A seeding on

August 10 and 18) had nice stands going into the winter. Sun and growing degree days were lacking in the spring, yet canola yield was excellent. With all seeding dates, there was no advantage to increasing seed rate with regard to yield. When averaged over the 2010 seeding dates, yield was 1,650 lbs/A at 4 lbs/A, and 1,580 lbs/A at the higher seeding rate. Canola yields for both August seeding dates were also similar – 1,605 lbs/A for August 10 and 1,620 lbs/A for August 18.

We believe the optimum time of planting is when "Mother Nature" tells you to – generally from August 5 to August 20-25 when cool weather is forecast. The past two years, growers have actually stopped wheat and canola harvest to plant their winter canola. Five new growers planted winter canola in Okanogan and Douglas Counties in August 2011. Winter canola acreage has increased from 15 acres to almost 2,500 acres since 2007. One member of the CCT planted 35 acres of winter canola in 2011. We have worked with the CCT to assist them in establishing an Agriculture Team focusing on canola production. The team has 45 acres ready to plant in the fall of 2012. A grower in Okanogan County has contracted to plant an irrigated circle of spring canola for seed increase.



Winter canola seeding rate study at Okanogan; 4 lbs/A (left) and 8 lbs/A (right).

Safflower Oilseed Production under Deficit Irrigation and Variable N Fertilization

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Safflower is considered a low input and drought tolerant crop, but responds well to irrigation and fertilizer. In central WA, safflower may provide an oilseed crop option with lower water demands than some other broadleaf crops in irrigated cropping systems. Safflower is planted in the spring and reaches maturity in about 5 months in south-central Washington. Grain yield is about 3000 to 3500 lbs/acre with oil concentration of 35-40% depending upon variety. Our objectives are to determine 1) varietal responses of safflower to deficit irrigation and N fertilization under center pivot irrigation and 2) oil production and quality under deficit irrigation and N fertilization.

We conducted research from 2007-2011 at the USDA-ARS Integrated Cropping Systems Research Field Station near Paterson, WA. Three safflower varieties (S345, CW99OL, and S334) were planted under center pivot irrigation. Irrigation treatments were 90 and 70% of ET with approximate in-season (May-September) applications of 30 and 23 inches of irrigation, respectively. Fertilizer treatments consisted of four split N application rates at approximately two week intervals for a total of 100 or 145 lbs N/acre.

Safflower yields averaged 2770 lb/acre, and yields were significantly higher with 100 lb N/acre than 145 lb N/acre. Yields averaged over the four years of the study were not significantly different between 90 and 70% ET, suggesting a potential 4.7-7.5" water savings using a deficit irrigation strategy. Similarly, oil yield was higher under deficit irrigation, a reflection of higher yields and greater water use efficiency.

As a result of this study, we will develop an Extension bulletin to aide growers who are interested in irrigated safflower production. Deficit irrigation scheduling and N fertilization recommendations are key components of the information we will provide, as well as the chemical composition of the oil that may provide an alternative value-based market for producers.