determined total profile water content. A rough planting date comparison was observed at Asotin, as the cooperating farmer planted the field surrounding the plots one month earlier (Fig. 2). Within the first 2 feet, the canola in the grower's field used 5.3 inches of water and terminated growth for winter a month earlier than the plots (which used 3.5 inches of water).

Moisture measurements will be continued in spring at all locations, and yield characteristics will be determined at harvest. This water use study will be continued next year, along with a repeated season of the planting date study in Ritzville.

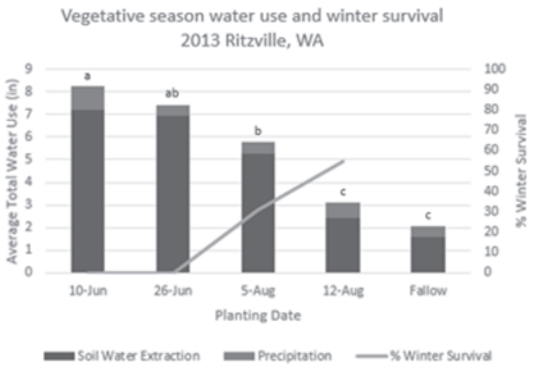

Figure 1. Average fall total water use for each planting date in Ritzville. Values marked by the same letter indicate no significant difference. Average percent of plants surviving winter is depicted as well and corresponds to the right axis.

Figure 2. Winter canola plots and surrounding field at Asotin, WA. Photo taken 10/30/14.

Utilization of Winter Canola for Seed and Silage

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We have developed an integrated two-year study which investigates agronomic production as well as animal end use of canola to determine if it is possible to make high quality silage from canola and to determine if harvesting a forage crop in the fall affects the seed/meal yield and quality at the subsequent harvest for seed. The objectives of the study are: 1) to determine canola forage and seed yield, quality, and silage quality when grown at various N:S fertility levels; 2) determine ensiling characteristics of winter canola by field treatments; 3) reduce silage effluent with absorbents (alfalfa cubes). Roundup Ready® canola was planted in research plots on August 13, 2014 at WSU IAREC, Prosser, WA (8 lbs. PLS/acre). Eight soil N:S treatments were applied to the soil following baseline soil sampling. The N:S treatments included 100 and 200 lbs Nitrogen (N) and 0, 20, and 40 lbs Sulfur (S) for each N treatment. In addition 100-20+Agrotain® and 200-40+Agrotain® were included. All plots received 52 lbs P_2O_5 in the fall with no additional K. One-third of the N:S was applied before planting and two-thirds was applied in April 2015. Stand counts were determined on 9/29/2014 and forage harvest commenced on October 13, 2014. Half of each plot was harvested. At harvest, DM yields were determined and experimental tube silos were filled (n = 48; 4 replications). Tube silos were emptied on 11/24-26/2014 and the pre- and post-ensiled samples were prepared for analysis. Fermentation profiles of the ensiled materials were conducted to determine the ensiling characteristics of the material. All samples will be scanned by NIRS for forage quality determination and prediction equation development and sulfur content were determined by ICP. The regrowth and the undisturbed plots will be harvested for seed in summer 2015 to determine the effect of harvesting a forage crop on seed yield and seed/meal/quality and oil content. Field results indicate no differences in initial stand count for forage vs. seed (15.8 and 16.7 plants/0.5 m^2, respectively). Forage plot DM yields were similar across treatments (Table 1). Sulfur content for 100:0 and 200:0 (N:S) were similar but lower than when S was added at 20 or 40 lbs./acre. Agrotain® DM yields were similar to no Agrotain® treatments. Forage quality and effluent analysis is under way. Significantly less effluent is observed when the alfalfa cube absorbents were added to forage canola during the ensiling process.

Table 1. Dry matter (DM) yield (tons/acre) and sulfur (S; mg/kg tissue) of winter Canola harvested October 13 and 14, 2015.

Nutrient Treatment (lbs/acre)	DM Yield (tons/acre)	S (mg S/kg tissue)
100 N : 0 S	0.95	1682.0
100 N : 20 S	0.98	3152.0
100 N : 40 S	0.99	4156.8
100 N : 20 S + Agrotain	0.60	3835.8
200 N : 0 S	0.98	1746.8
200 N : 20 S	0.94	2777.8
200 N : 40 S	1.07	3503.6
200 N : 40 S + Agrotain	0.83	3167.2
LSD $_{0.05}$	NS	652.1

Development of a Herbicide Tolerant Camelina Variety

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While markets for Camelina oil and meal are slowly growing, barriers to efficient production in the Pacific Northwest (PNW) exist. One problem is its extreme insensitivity to group 2 herbicides (imidazolinones and sulfonylureas) which have residual activity in soils for multiple years. The popularity of some group 2 herbicides, like Beyond, has grown in recent years due to the popularity of Clearfield wheat varieties. This further limits the use of camelina as a wheat rotation crop. Following the identification of a mutant line that is tolerant to both imidazolinone and sulfonylurea herbicides, we established breeding populations by crossing the mutant to camelina varieties like Calina which have performed well in the PNW. The utility of lines carrying the mutation was demonstrated by planting after Clearfield wheat to which four times the recommended rate of Beyond herbicide was applied and observing no damage or yield reduction. Advanced breeding lines carrying the herbicide tolerant (HT) trait have now been tested in several locations over the past two years and evaluated for yield and oil content. Following final testing and seed increase this season, a variety is planned for release this fall. The variety will have yield and oil content similar to Calina along with the HT trait.

Evaluation of a collection of European camelina germplasm over the last three years has indicated that gains in other traits could be made in future varieties. A Danish variety was identified that appears to have significantly higher yield potential than Calina in dryland PNW environments. Lines have also been identified with much larger seed than commercial varieties. The large seeded trait should provide more consistent emergence and faster stand establishment for better competition with weeds. Lines with significantly different fatty acid composition in the oils have also been identified. One line has lower erucic acid, comparable to canola, which has potential as an FDA-approved cooking oil. Breeding populations have been developed for the purpose of combining these traits to make varieties with larger seed and higher yield with good oil content. Advances in fatty acid composition will also enable the development of specialty varieties for expansion or flexibility in potential markets.