CROSS-CUTTING PROJECTS

Title: Oilseed Crop Fertility

PIs: Richard Koenig, Ashley Hammac, William Pan, Robert Stevens

Objectives
1. Develop baseline growth and nutrient uptake curves to characterize major oilseed crop nutrient needs;
2. Develop nutrient (primarily nitrogen and sulfur) management recommendations for major oilseed crops that maximize oil yield and quality;
3. Disseminate information on oilseed crop fertility management to growers in extension bulletins, and to the scientific community in peer-reviewed journal articles;
4. Evaluate phosphorus requirements of oilseed crops, and rotational benefits of oilseed alternatives on subsequent crops of wheat

Materials and Methods: Winter canola was planted on chemical fallow at two dryland locations (Wilke Farm near Davenport and Palouse Conservation Field Station [PCFS] near Pullman) in fall 2007. Preplant soil sampling was conducted to characterize baseline fertility conditions at each site. Treatments consisted of a range of nitrogen rates (0 to 160 lb N/acre in 40 lb increments with 15 lb S/acre) applied in treatments replicated four times in a randomized complete block experiment design. Additional treatments were included at rates of 80 and 160 lb N/acre in which sulfur was omitted to evaluate sulfur responses. Select fall-spring split N application treatments were also included. Winter canola failed to establish at the Pullman location due to lack of moisture. At Wilke, establishment was acceptable but the stand suffered major damage due to a June 2008 frost and was abandoned. Spring canola was sown on the winter site near Pullman; spring canola and camelina were sown on a new site near Davenport. Camelina failed to establish. Spring canola was grown to maturity and harvested to determine seed yield, oil yield and oil quality (oil yield and quality analysis is pending).

An additional study was conducted north of Kamiak Butte to determine phosphorus requirement for oilseed crops (canola, camelina, and flax) compared to lentil in 2008. The above crops were seeded with a Fabro© drill in spring 2008 at recommended rates and triple super phosphate was applied at 5 rates (0, 10, 20, 40, and 60 lb/acre) in a randomized complete block, split plot arrangement. Weeds were controlled by recommended chemical treatment and manual removal. All plots were harvested in fall 2008 with a Hege© plot combine.
Results
There was a linear response to N rate for spring canola at both locations (Figure 1). At both locations, the slope of the response indicated 4.5 lb seed yield increase with each lb of nitrogen applied. There was an 87 lb/ac (15.5%) seed yield response to sulfur at Davenport but no response at Pullman. Nitrogen application timing did not influence yield.

Canola Nitrogen Response, 2007-2008

\[
\text{Seed Yield (lbs acre}^{-1}\text{)} = 701(1-10^{-0.0075524N \text{ supply}})
\]

Pullman \((r^2=0.72)\)

\[
\text{Yield} = 1332 (1-10^{-0.01244N \text{ supply}})
\]

Davenport \((r^2=0.74)\)

Figure 1. Spring canola yield response to N supply (preplant nitrate-N 0-3 ft + ammonium-N 0-1 ft) + fertilizer N). Preplant residual N at Pullman was 54 lb N/A and at Davenport 44 lb N/A.

Spring canola taproot and earthworm activity at Pullman site.
There was no significant effect owing to phosphorus rate (Figure 2). This may be a result of elevated residual phosphorus levels, crop growth limited by water availability, or increased crop phosphorus uptake efficiency for all species. Significant differences were apparent between species with canola and camelina being highest, followed by flax, and then lentil. However, economic analysis is needed to distinguish a significant difference in net return.

**Figure 2.** The effect of phosphorus rate on spring oilseed crop yield at a site near Kamiak Butte in 2008.

**Conclusions**
Spring canola nitrogen response suggests a base recommendation of 1 lb N for each 4.5 lb expected seed yield. Responses to sulfur are expected when soil test recommendations are low. Results for nitrogen application timing are inconclusive at this time.

**Future plans**
Winter and spring fertility studies are being repeated at both dryland locations noted above. Winter canola establishment at the PCFS was excellent. Establishment at Davenport is an apparent failure due to herbicide carry-over or frost damage. Spring canola and camelina will be established at both locations as in 2008.

**Citations**
None at this time.