Components of Improved Canola Nitrogen Use Efficiency with Increasing Water and Nitrogen

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Spring canola is being adapted as a rotational crop for the high rainfall and transitional fallow zones of the PNW. Our nitrogen (N) fertility trials indicate that water stress lowers nitrogen use efficiency (NUE) of spring canola (Pan et al., 2016). An NUE component analysis was performed in 2011 and 2012 to identify the soil and plant processes that attribute to lower yield potential under low water availability of spring canola following wheat.

Our NUE component analysis indicated that differences in water-limited yields were associated with lower N uptake efficiency from soil (plant N/N supply) and utilization efficiency to produce grain (grain yield/plant N). In particular, most of the reduction in yields were attributed to a lower grain N utilization efficiency (grain yield/grain N-inverse of grain N concentration), followed by a lower N retention in the soil (available N/N supply). Differences in grain N accumulation due to a lower availability of water were mostly attributed to a lower N retention efficiency.

When water availability decreases by an inch, wheat yields and grain N losses are attributed to the various NUE components?

	Yield↓	Grain N↓
	lb/ac	lb/ac
Lower N supply=	0	0.1
N retention efficiency=	22	1.4
Available N uptake efficiency=	15	0.7
N harvest index=	15	0.1
Grain N utilization efficiency=	32	
Total=	84	2.3

With decreasing available water and fertilization, spring canola became less efficient at accumulating (1) grain biomass per unit grain N and (2) grain N per unit of available N supply. These results emphasize the need to develop breeding and management strategies to improve water use efficiency and to select canola varieties capable of coping with water stress that limits grain biomass production per unit plant N accumulation.

Pan, W.L., T.M. Maaz, W.A. Hammac, V.A. McCracken, and R.T. Koenig. 2016. Mitscherlich-modeled, semi-arid canola nitrogen requirements influenced by soil N and water. Agron. J. *in press*.

Soil Characteristics and Associated Wind Erosion Potential Altered by Oilseeds in Wheat-Based Cropping Systems

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Oilseeds are integral to the production of biofuels and diversifying rainfed cropping systems in the Pacific Northwest. However, there is evidence to suggest greater potential for wind erosion when growing oilseeds in wheat-based rotations when tillage is used during fallow. Little is known concerning the impact of growing oilseeds on soil surface characteristics that affect erosion. Soil characteristics were examined during the fallow phase of three crop rotations: (i) winter wheat-summer fallow (WW-SF), (ii) winter wheat-camelina-summer fallow (WW-C-SF), and (iii) winter wheat-safflower-summer fallow (WW-SAF-SF) at Lind and Ritzville, Washington. Crop residue biomass and soil water content, roughness, surface strength, and aggregate size distribution were measured immediately after planting winter wheat. Camelina and safflower did not affect random roughness, penetration resistance, geometric mean diameter, or the erodible fraction. Flat residue biomass and cover, however, tended to be greater in the WW-SF rotation. The Revised Wind Erosion Equation suggested that sediment transport could be from 57 to 212% greater for the WW-C-SF or WW-SAF-SF than the WW-SF rotation due to differences in crop residue characteristics after sowing wheat. These results