Canola in Wheat-Based Rotations: Update from Two Long-Term Field Experiments Near Ritzville

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Two long-term canola cropping systems experiments are well underway at the Ron Jirava farm near Ritzville, WA. In Study 1, canola grown in a 3-year WC-SW-NTF rotation is compared to 3-year rotations of WW-SW-UTF and WT-SW-NTF (acronyms are defined below). Note that SW follows WC, WW, and WT and that a 13-month fallow period occurs after SW in all three rotations. In Study 2, canola is grown in a 4-year rotation of WC-NTF-WW-NTF and is compared to WP-NTF-WW-NTF as well as a 2-year WW-UTF check. Spring canola is substituted for WC when adequate WC stands are not achieved. Both experiments have gone through full rotation sequences; thus, all crops are truly "in rotation". Agronomic data collected from these experiments includes: soil water dynamics from all phases of all rotations, foliar and root diseases, weed ecology, and grain yields. Soil microbial activity is currently being assessed in both canola rotations using DNA sequencing (Schlatter and Paulitz, see next abstract) and PLFA methods (Hansen, Rieser, Huggins). In addition, mycorrhizal inocula to enhance/promote soil microbial biomass in canola and subsequent crops are being evaluated. Such data can only be obtained through long-term cropping systems experiments. Schillinger and colleagues have published several scientific journal articles on these topics in the past three years and more publications are expected as we more fully explore canola rotations for Washington's drylands.

Acronyms used: NTF, no-till summer fallow; PLFA, phospholipid fatty acid analysis; SW, spring wheat; UTF, undercutter-tilled summer fallow; WC, winter canola; WP, winter pea; WT, winter triticale; WW, winter wheat.

Yield Decline of Wheat After Canola: In Search of a Microbial Cause

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In a series of replicated field trials over six years in the Reardan area, spring wheat grown after winter canola had an average 17% yield decrease compared to when grown after winter wheat (Schillinger and Paulitz, 2018, Field Crops Research 223: 26-32). We could not explain this with diseases, nutrients, weeds, or water use. We postulated that canola may either favor a microbial community deleterious to wheat or may decrease beneficial microbes that are important for wheat health (Hansen et al., 2018, Applied Soil Ecology 130:185-193). We attempted to answer this question by sampling the DNA from the rhizospheres of wheat and canola from fields in Douglas and Adams County (see 2018 Field Day Abstracts page 50) but did not come up with a "smoking gun". Many of the fungal and bacterial communities on the roots of wheat and canola were in common, but we could detect some differences. We now have an opportunity to address this question again in a long-term cropping systems project near Ritzville (see previous abstract) where we are experiencing this same yield reduction of wheat after canola.

The term "rhizosphere soil" refers to soil that adheres to the roots of plants as seen here with winter canola. Photo by Jeremy Hansen, USDA-ARS.

In the spring of 2019 (and planned again for 2020), we sampled bulk and rhizosphere soils of actively-growing spring wheat following canola, winter wheat and winter triticale. DNA will be extracted from the samples and sequenced with Illumina MiSeq. We will analyze the bacterial and fungal communities to identify differences among the three rotations. This will complement the phospholipid fatty