Soybean production systems to control charcoal rot and other soil-borne diseases

March 1, 2019 – Feb. 29, 2020
Final Report

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a. Best management practices for implementing mustard seed cover crop
High-glucosinolate mustard cover crop was planted at Columbus, KS and Ashland Bottoms, KS in early spring, 2019. Exceptionally high rainfall flooded the fields in Columbus and resulted in very poor mustard plant stand. The fields at Columbus were not included in the study in 2019 because of no mustard stand. The mustard cover crop at Ashland Bottoms was terminated with herbicide and treatments implemented. Treatments included two controls with no mustard cover crop, one no-till and one disked. The mustard cover crop in the other four treatments was disked, mowed, rolled and left standing. Soybeans were planted in the plots and grown to maturity. Soil samples were taken after terminating the mustard cover crop and at soybean maturity. Soil samples were analyzed for biological activity using the phospholipid fatty acid analysis (PLFA). Soybean stems and roots were collected at maturity (R7-8) and analyzed for charcoal rot infestation. Charcoal rot infection rates were also measured in the pre- and post-harvested soil samples.

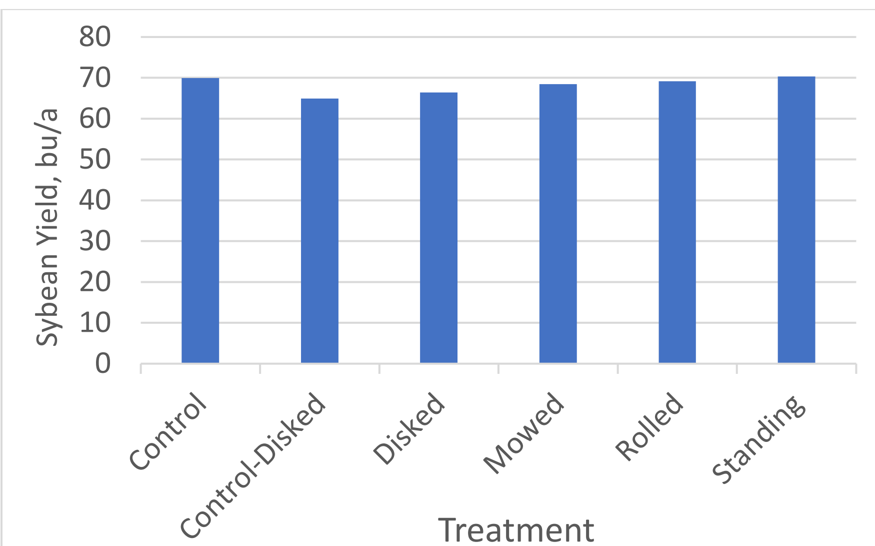

Figure 1. Impact of cover crop treatment on soybean yield.

Soybean yield was reduced slightly with tillage at Ashland Bottom (Figure 1). The cover crop did not affect soybean yield. Tillage most likely reduced yield due to a limitation in soil moisture, since tillage both with and without cover crop reduced soybean yield. This was similar to the yield reduction found at Ashland Bottom in 2018. Soybean yield increased with tillage at Parsons, but showed no dependence on cover crop treatment.

Overall, the largest decrease in CFUs was observed in the rolled treatment (Figure 3). This is similar to the results found in 2018 at both locations.

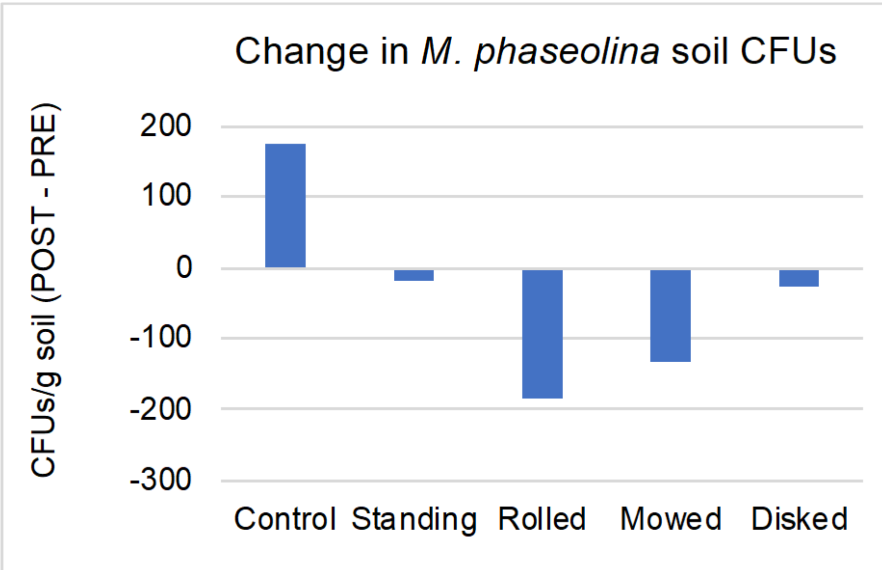

Figure 2. Reduction in *M. phaseolina* CFUs before (PRE) and after (POST) soybean production for four cover crop treatments and one control with no cover crop.

b. Mechanism of charcoal rot infection in soybean roots

Controlled growth studies were implemented in the greenhouses at Throckmorton. Soils were inoculated with *M. phaseolina* in pots in controlled environments to determine the environmental conditions that induced charcoal rot infection. A scatterplot matrix (Figure 3) was developed to explore interactions between PLFA components and *M. phaseolina* CFUs. The work is being summarized for publication after completion of data analysis.

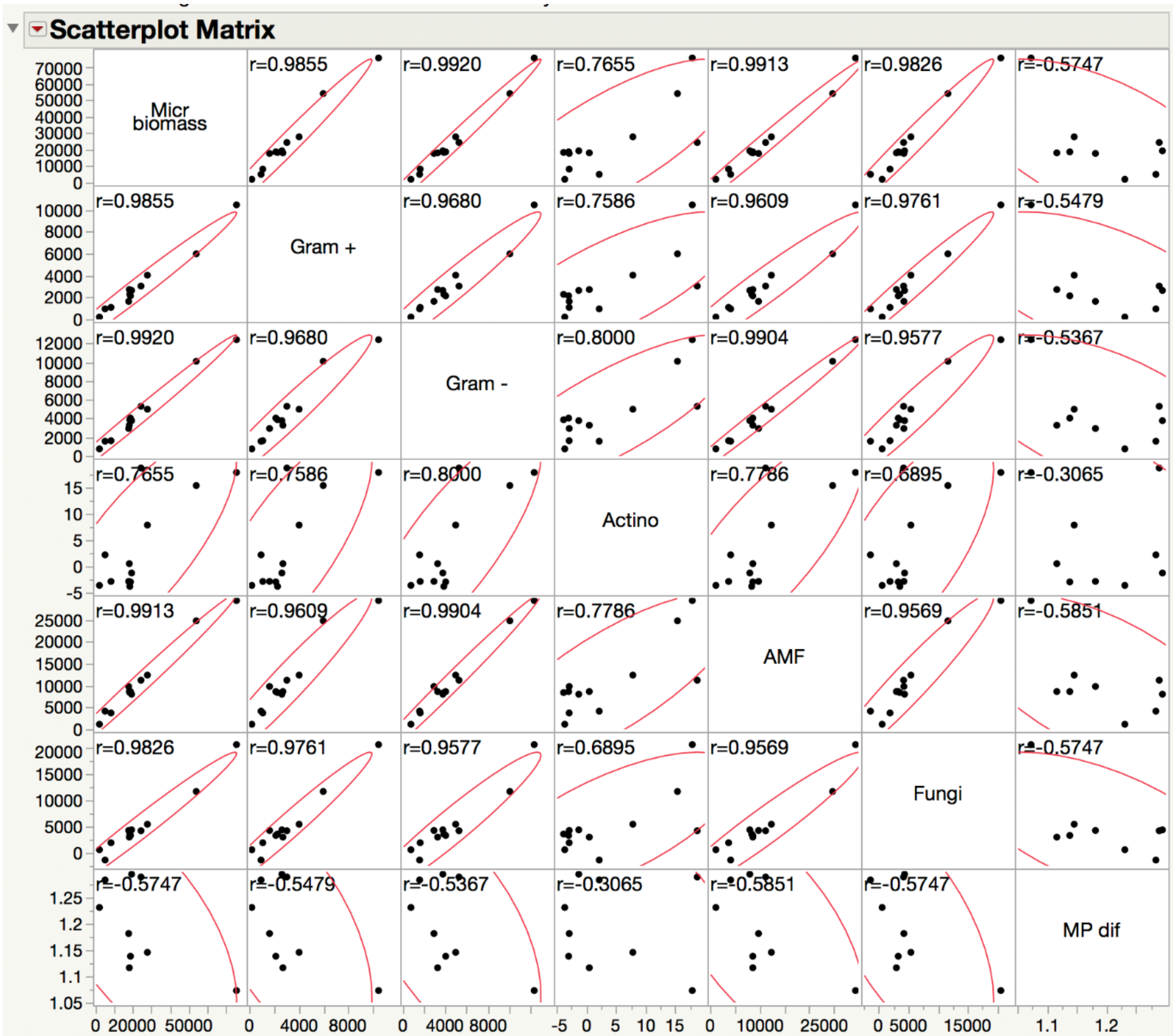

Figure 3. Scatter plot of PLFA soil factors to determine interrelationships.