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Effects of grassland management techniques on soil microbial activity and community structure in Orthic black chernozem soils

The conversion of grasslands to croplands due to grassland productivity declines is resulting in a loss of valuable carbon sinks across the globe. Innovative grassland management approaches are required to improve carbon sequestration of grassland soils and to maintain productivity of said grasslands. Formation of topsoil is heavily influenced by interaction between plant roots and soil microbes: termed the microbial bridge. The microbial bridge is essential for carbon flow within soils and in maintaining the productivity of grasslands. The objective of this study was to determine whether the presence of livestock grazing, or inclusion of legumes would enhance the microbial activity of grassland soils. The study site was located at Lacombe Research Center, on Orthic black chernozem soils. Microbial soil health indicators were assessed and included measurements of pH, soil organic carbon, active carbon, soil respiration, soil protein index, and ongoing work is being completed on soil microbial composition by studying isolated DNA. The results suggest a difference in microbial activity and abundance between treatments. Soil pH differed between treatments, with no identifiable pattern as to the influencing factor on pH. In general, alfalfa plots that were grazed by cattle had 2.9 times less active carbon (mg/kg) than controls. No significant difference was observed in percent organic matter between treatments. No critical differences in soil respiration were observed between treatments. Critical differences were observed in soil protein measurements, where all treatments differed significantly from controls. DNA extraction from soil samples was successful, however the extracted DNA was not successfully amplified via PCR. Continued work on the PCR setup for soil DNA amplification is being completed. The significance of these findings in developing grassland management strategies is discussed.

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