Cover crop impact on soil aggregates and organic matter dynamics at different topographic positions

Wakene Negassa[1], Alexandra Kravchenko[1], and Peter Scharf[2]

[1]Michigan State University, Department of Plant, Soil and Microbial Sciences, 1066 Bogue Str., Plant and Soil Sciences Building, East Lansing, MI 48824, [2]University of Missouri, Department of Plant Sciences, 214b Waters Hall, Columbia

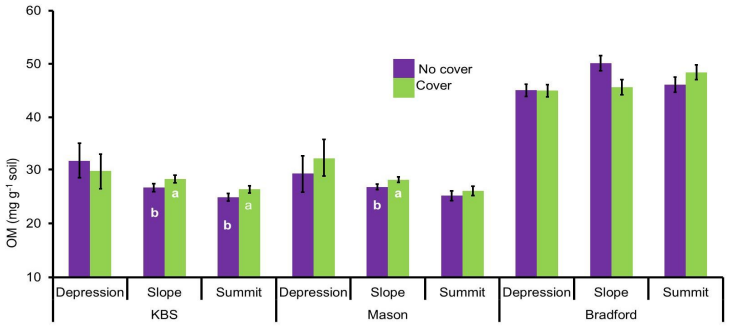
INTRODUCTION

Variations in topographic position can have tremendous effects on soil processes that have direct or indirect implications on contributions of soils to agroecosystem services and functions. For instance, cover crop has many economic and ecological benefits; however, the contribution of cover crop to soil aggregate formation and soil organic carbon (SOC) accumulation at diverse topographic positions get little research attention. Since most of previous studies conducted on topographic positions that did not represent most of diverse agricultural landscapes, understanding how cover crop contributes to aggregate formation and how aggregate stores and protects SOC is essential to develop management practices that improve SOC sequestration. The aim of this study is to evaluate the effects of cover crop on soil aggregates and SOC dynamics at different topographic positions.

MATERIALS AND METHODS

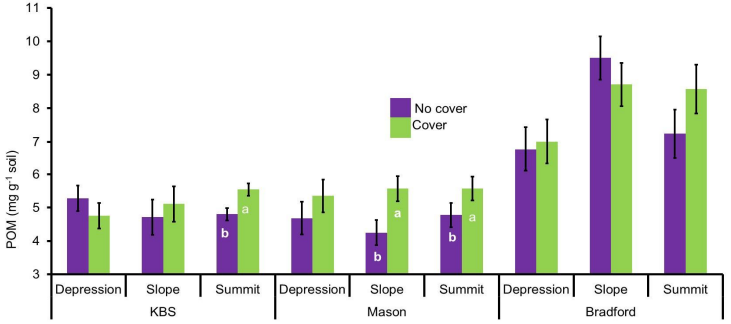
- **Study Locations**: Kellogg Biological Station (KBS) and Mason, Michigan,
- Bradford Research Center, Missouri.
- The studies started in 2011 at all locations.
- **Treatments:** three topographic positions: depression, slope and summit
- Chisel tillage at KBS and Mason, Zero Tillage at Bradford
- With and without rye cover.
- **Soil sampling:** a block of soil sample with 15 cm x 15 cm x 10 cm was collected from each plot after eight weeks rye cover killed.
- **Soil analysis:** dry aggregates size distribution was estimated with nest of sieves using Rx-29 RoTap.
- Organic matter (OM) and particulate organic matter (POM) were determined by combustion.

PRELIMINARY RESULTS



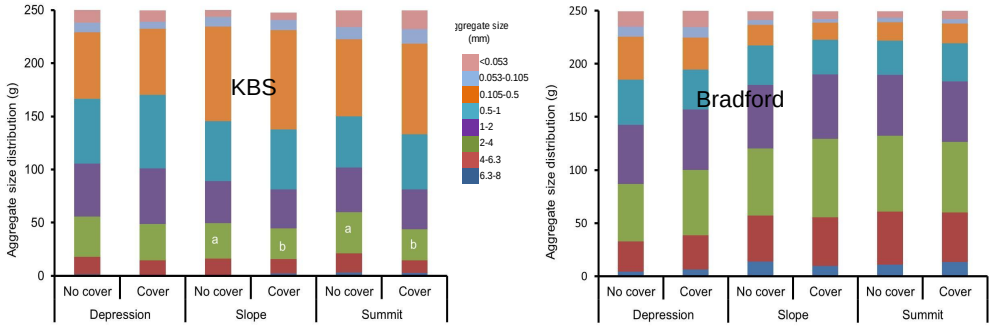
Columns indicated by different letters at each position are significantly different at P<0.10.

Fig.1. Effect of cover crop on OM at diverse topographic positions.



A pair of columns followed by different letters at each position are significantly different at P<0.05.

Fig. 2. Cover crop impact on particulate organic matter.



A pair of columns followed by different letter at each position is significantly different at P<0.05.

Fig. 3. Cover crop effects on dry aggregate size distribution.

CONCLUSION

- The short term effect of rye cover significantly (P<0.01) affected OM at summit and slope positions of KBS, and slope position of Mason.
- Cover crop significantly increased POM (P<0.05) at slope and summit position of Mason, and summit position of KBS.
- There was no significant variation in dry aggregate size distribution at all locations except for 2-4 mm size at KBS.
- Short term cover crop affected OM and POM dynamics differently at different topographic positions particularly on soils with relatively low initial OM content of KBS and Mason as compared to high initial OM content of Bradford.

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