



Introduction

Management practices such as crop rotation, tillage, and fertilization can influence soil biological activities through their effects on the quantity, structure, and distribution of soil organic carbon (SOC).

Objective

The objective of this study was to evaluate the effects of different management practices on soil C fractions.

Materials and Methods

Soil samples were taken in 2003-2004 at three locations: Ashland Bottoms, Hays, and Tribune at 0-5 and 5-15 cm.

Treatments

Tillage systems: Conventional tillage (CT), reduced tillage (RT), no-tillage (NT). Native prairie sod (SOD) was included in Tribune site.

N rates: 0 (0-N), 22 (22-N), 45 (45-N), 67 (67-N) kg N ha⁻¹ for Hays.

Crop rotation: wheat-soybean (W/S) and wheat-wheat (W/W).

Measurements

- Soil organic carbon (SOC) (g C kg⁻¹)
- Soil microbial biomass carbon (SMB-C) (%)
- Potentially mineralizable C (PMC) (%) through long-term incubations
- Recalcitrant C (%): SOC - (SMB-C + PMC)

Soil Carbon Pools under Different Management Practices in Kansas

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Results and Discussion

At Hays, SMB-C was higher at 0-N rate than at 67-N at 0-15 cm ($P < 0.05$), but we did not observe a significant tillage effect. Potentially mineralizable C was similar between tillage at 0-N, but it was significantly greater under NT than CT and RT at 67-N treatments ($P < 0.05$). Recalcitrant C was significantly lower under NT at 67-N treatments ($P < 0.05$).

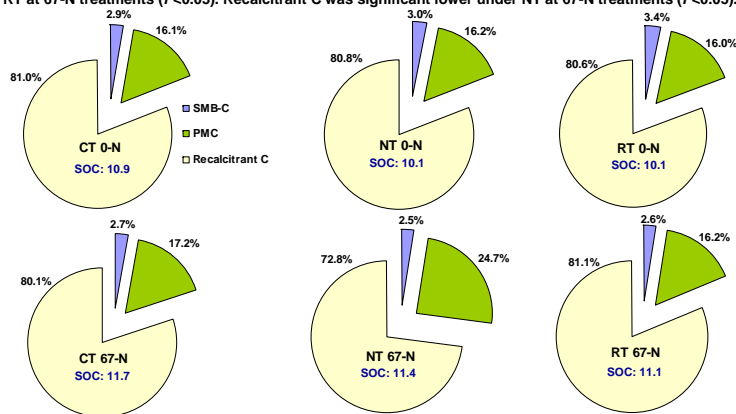


Figure 1. SMB-C, PMC and recalcitrant C at 0-15 cm in Hays.

In Tribune, SMB-C in CT and SOD was similar and significantly greater than NT and RT systems ($P < 0.05$). CT had a significantly lower PMC and greater recalcitrant C ($P < 0.05$) compared with the other tillage systems and native prairie sod.

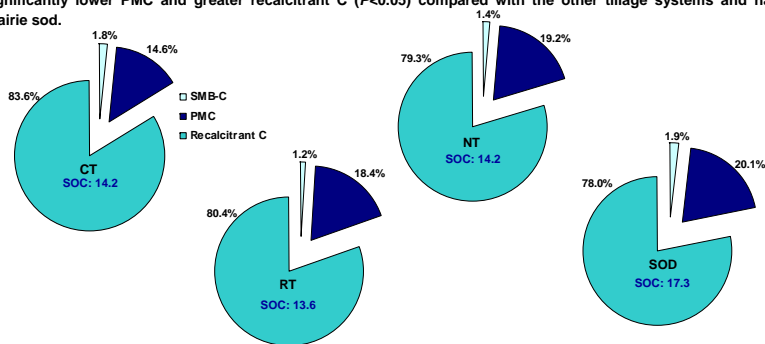


Figure 2. SMB-C, PMC and recalcitrant C at 0-15 cm in Tribune

In Ashland, SMB-C was higher in wheat-soybean rotation than wheat-wheat rotation, but there was no difference by tillage systems ($P < 0.05$). Potentially mineralizable C was significantly greater under CT and RT compared with NT, but recalcitrant C was lower under CT ($P < 0.05$).

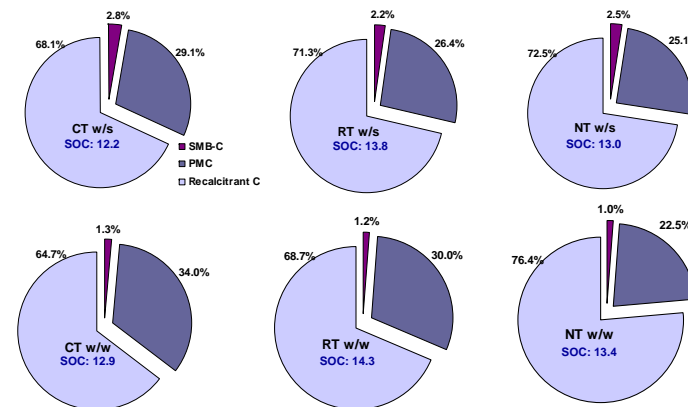


Figure 3. SMB-C, PMC and recalcitrant C at 0-15 cm in Ashland Bottoms

Summary

- In general, NT increased soil organic C.
- Soil microbial biomass was a small fraction of the total C pool and was more variable in response to treatments.
- Potentially mineralizable C and the recalcitrant C appears to be the fractions most affected by tillage treatments. In general, NT increased PMC.
- The recalcitrant C fraction tends to be lower with NT.

Acknowledgments

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