Reduced tillage and cover crop use does not alter macroaggregate stability in a South-Central Texas row cropping system

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IMPORTANCE

Managing for Soil Health (SH) is key for sustainable agriculture and resource management. Common SH practices include reduced tillage, double cropping, and cover cropping.

There are low adoption rates of SH practice in Texas due to incomplete local SH information. Increase adoption by: (1) evaluating the effect of soil health promoting practices and (2) collecting more local and regional data.

Aggregate Stability measures the resistance soil aggregates have to disassociation when disturbed. We focused on **wet aggregate stability (WAS)**, or soil's resistance to wetting events. It is a useful SH indicator because it is involved in maintain soil ecosystem functions.

OBJECTIVES & HYPOTHESES

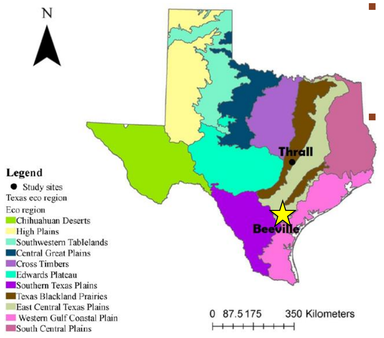
O1. Quantify wet aggregate stability changes under select tillage and cropping systems

O2. Identify which agricultural management treatment leads to the highest wet aggregate stability

H1. No-till and mixed cover crop will increase wet aggregate stability.

H2. An interaction between the tillage and cropping treatment would cause no-till + mixed cover crop to have highest overall wet aggregate stability.

SITE DESCRIPTION



- Beeville, TX
  - Previous land use perennial peanut for 25 years
- Soil Type
  - Parrita sandy clay loam (loamy, mixed, superactive, hyperthermic, shallow Petrocalcic Paelustoll)

Figure 1. Research site (star) on Texas ecological regions map.

EXPERIMENTAL APPROACH

Field Design

- Randomized Complete Block Split-Plot
- Annual wheat cropping system
- Study started in 2016
- 3 plots/treatment (n = 5)
- 5 samples/plot (N = 90)
- Sampling Depth: 0-5 cm
- Sampled Sept. 2019

Treatments (2 till x 3 crop)

- Conventional Till
- No-Till
- Fallow (F)
- Grain Sorghum (GS)
- Mixed Cover Crop (MC)

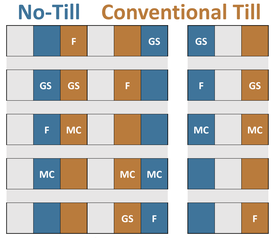


Figure 2. Plot map of treatments.

Wet Aggregate Stability

- **Manual wet-sieving method (**250 µm)
- Submerge every 2 seconds for 5 minutes
- Sand and pebble correction wash

Calculation

- $$WAS\ (\%) = \frac{Corrected\ Soil\ Aggregate\ Weight}{Corrected\ Sample\ Weight} \times 100$$

(B)

Figure 3. Samples air-drying after correction wash.

Figure 4. Sample manually wet-sieved in DI water.

RESULTS

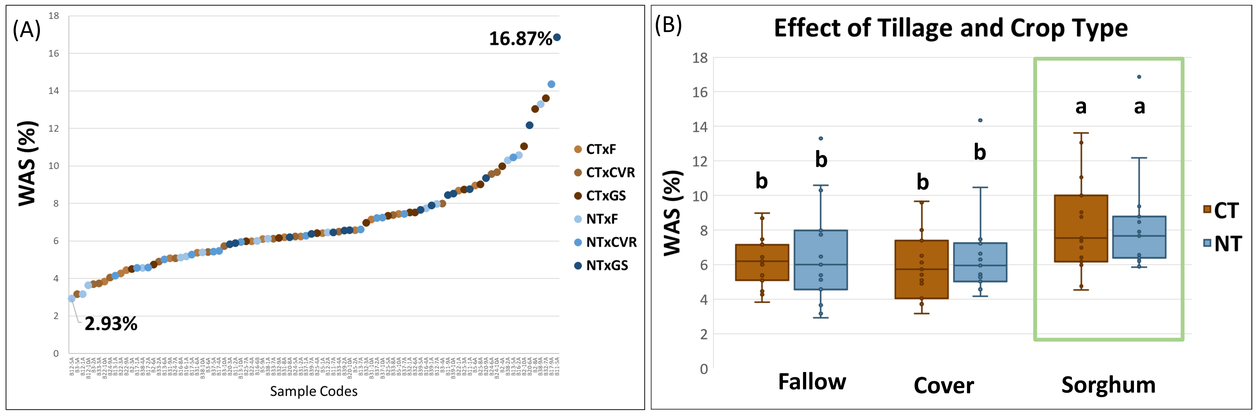


Figure 5. (A) Scatter plot showing the range of WAS values. (B) Box plots showing the effect of crop type separated by tillage type. Connecting letters report show the significance effect of crop type and lack of effect of tillage.

- Significant effect of crop type **(P = 0.003)**
  - **Sorghum** had highest WAS
- No effect of tillage (P = 0.57)
- No interaction between tillage and crop treatment (P = 0.78)

Crop treatment, not tillage, altered aggregate stability

CONCLUSION

- Under 3 years of treatment, crop type had significant effect on wet aggregate stability.
- Sorghum had highest WAS compared to fallow and mixed cover crop treatments.
- No significant effect of tillage nor significant interaction between tillage and cover type found.

Future Directions

- Potential longitudinal study – when do we see change?
  - Only under these treatment for 3 years
- Study the relationship of WAS to other soil health indicator such as carbon content.

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