Assessment of Aggregate Stability Methodologies for Soils in Idaho's Magic Valley

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Introduction

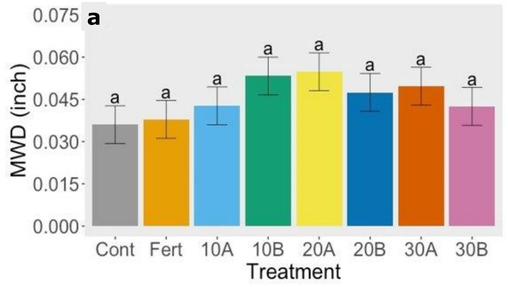
- Idaho (US) is ranked 5th in the nation for overall agricultural production.
- Top commodities grown include potatoes, sugar beets, barley, wheat, dry beans, alfalfa, and corn silage; most in grown in Magic Valley
- Sediment and P loading to irrigation and drinking water sources has improved but more efforts needed
- Intensive tillage is still used on 77% of farmed acreage while cover crops are only used on 5%.
- Objective:
  - ✓ Identify best method for aggregate stability (AS) on calcareous, silt loam soil to measure progress in producer efforts to reduce erosion.

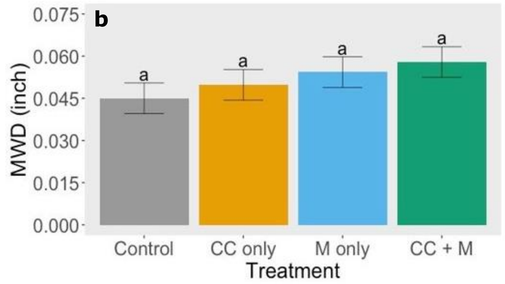
Methods

- AS assessed in two studies in summer 2020 (Fig. 1).
- Study 1 began in 2013 and had three rates of manure (10, 20, or 30 tons ac^{-1}) annually (A) or biennially (B), inorganic fertilizer (Fert), or no fertilizer (Cont) with a randomized block design with four reps
  - Sugarbeets in 2020 with heavy tillage
- Study 2 began in 2016 was arranged in a split plot design with four reps; tillage (CT) vs no tillage (NT) as main plot with compost (M), no compost, cover crop (CC), and no cover crop as sub plots.
  - Silage corn every year with triticale as cover crop
- Both studies were irrigated with handlines

Fig. 1. Methods used for aggregate stability included wet sieving (left), Cornell Sprinkle Infiltrometer (middle), and the Slakes phone application (right) (data not presented here).

Results





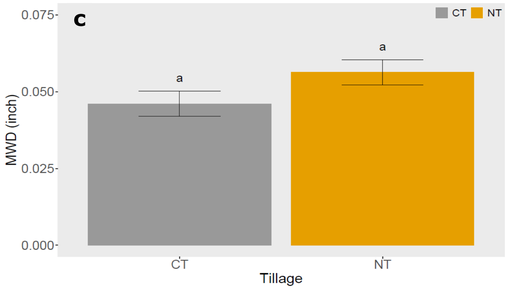
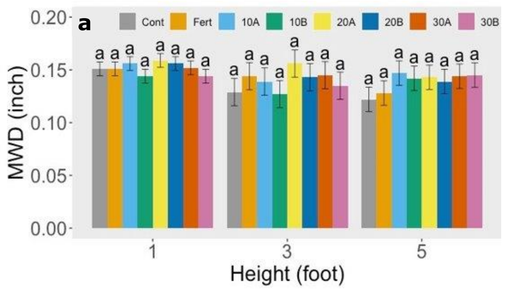
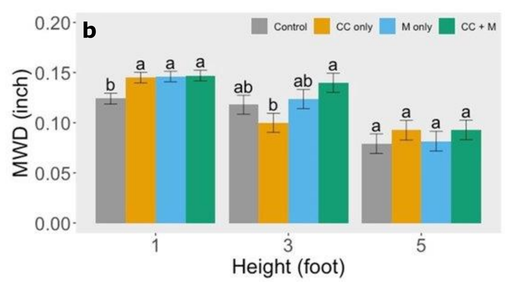


Figure 2. Mean weight diameter (MWD) from the wet sieving method in inches of aggregates by treatment for study 1 (a) and study 2 (b and c). Means not connected with the same letter are significantly different (p<0.05). Average MWD of study 1 was 0.046 inches and an average of 0.051 inches in study 2.





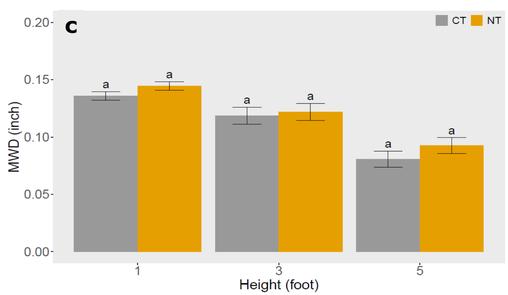


Figure 3. Mean weight diameter (MWD) from the Cornell Sprinkle Infiltrometer method in inches of aggregates by sprinkler height (feet) and treatment for study 1 (a) and study 2 (b and c). Means not connected with the same letter are significantly different (p<0.05). Average MWD of study 1 was 0.15, 0.14, and 0.14 inches for heights of 1, 2, and 3 feet, respectively, and average MWD of 0.14, 0.12, and 0.087 inches for heights of 1, 2, and 3 feet, respectively, in study 2.

Discussion & Conclusion

- Slakes (data not shown) results indicated that all samples had very high stability and no differences between treatments.
- Wet sieving method was not sensitive to treatment in either study.
- The Cornell Sprinkler Infiltrometer was not sensitive to treatment in study 1 at any height.
- For study 2, all treatments with M and/or CC had greater MWD than the control at sprinkler height of one foot and CC + M was greater than CC only at three feet of height.
- Wet sieving had lower average MWD compared to the Cornell Sprinkler Infiltrometer.
- Study 1 likely had no differences in treatments due to heavy tillage (moldboard plowing and discing).
- Cornell Sprinkler Infiltrometer better represents natural erosion processes for irrigated soils and showed sensitivity to management practices.

References

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