

Nitrogen Loss and Residue Breakdown Potential for Fall-Applied Diammonium Phosphate

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Background

Many growers apply diammonium phosphate (DAP) in the fall to replenish the soil phosphorus levels. Along with phosphorus, DAP also contains 18% nitrogen. There is debate on how much, if any, of this nitrogen is available for the spring crop. The nitrogen component of DAP may leach through the soil profile and contribute to water quality problems. There is also debate on whether or not the nitrogen component of DAP, UAN, or a bacterial breakdown agent can contribute significantly to corn residue decomposition.

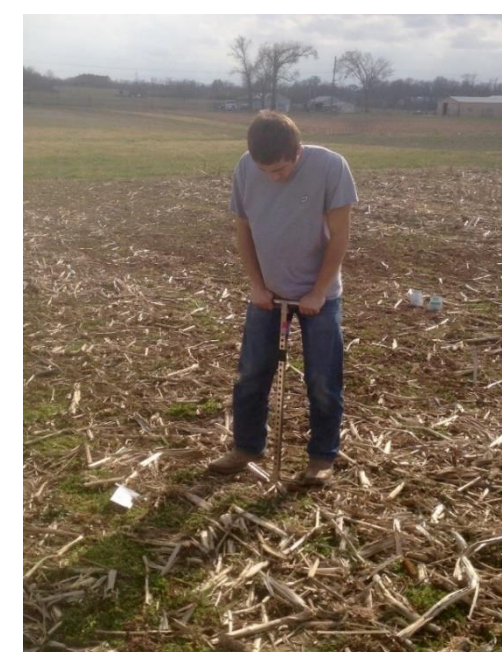
Objectives

- Track the nitrogen component of fall-applied DAP after its application in the fall throughout the winter until spring planting.
- Determine whether or not the nitrogen component of DAP significantly increases the breakdown of corn stover.
- Evaluate effects of two additional treatments on residue breakdown: UAN (32% N), and UAN combined with an experimental bacterial residue breakdown agent (Breakdown).

N-Loss Potential for DAP

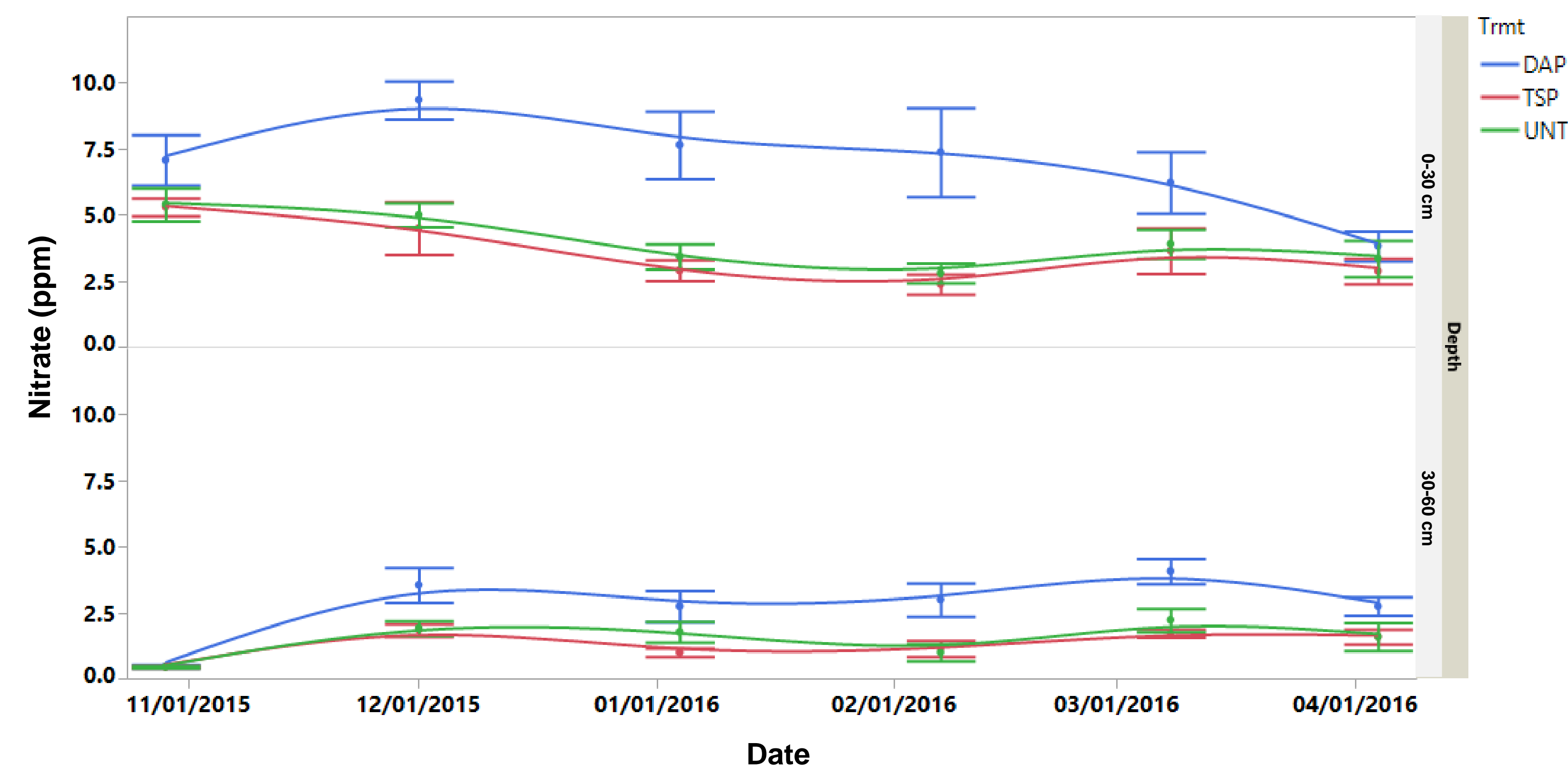
Three treatments (replicated four times) were tested in 3m x 3m plots. The treatments were 336 kg/ha of DAP, 336 kg/ha of TSP, and an untreated control.

- Soil samples were taken approximately every 30 days, starting with a baseline sample before treatments were broadcasted.
- Samples for each plot were taken at depths of 0-30 cm and 30-60cm.
- Samples were analyzed for ammonium and nitrate content (Fig. 1).



Results

Fig. 1



- One month after the treatments were applied, the average nitrate level in the DAP plots increased significantly.
- Nitrate levels remained higher in the DAP plots until April. **As of April 4, there was no significant difference in nitrate levels between any of the plots** ($P = 0.5784$).
- This data demonstrates that within one month, the fall-applied nitrogen had leached through the soil profile and was lost entirely by April.

Residue Breakdown Potential

Set-up

Three treatments were tested against an untreated control.

- 28 l/ha UAN (8.96 kg N)
- 28 l/ha UAN + Breakdown (8.96 kg N)
- 224 kg/ha DAP (40.3 kg N)

Each treatment was replicated four times. Litterbags were used to contain the residue. Seven sets of litterbags were deployed in four locations with various soil types in the fall.



Collection

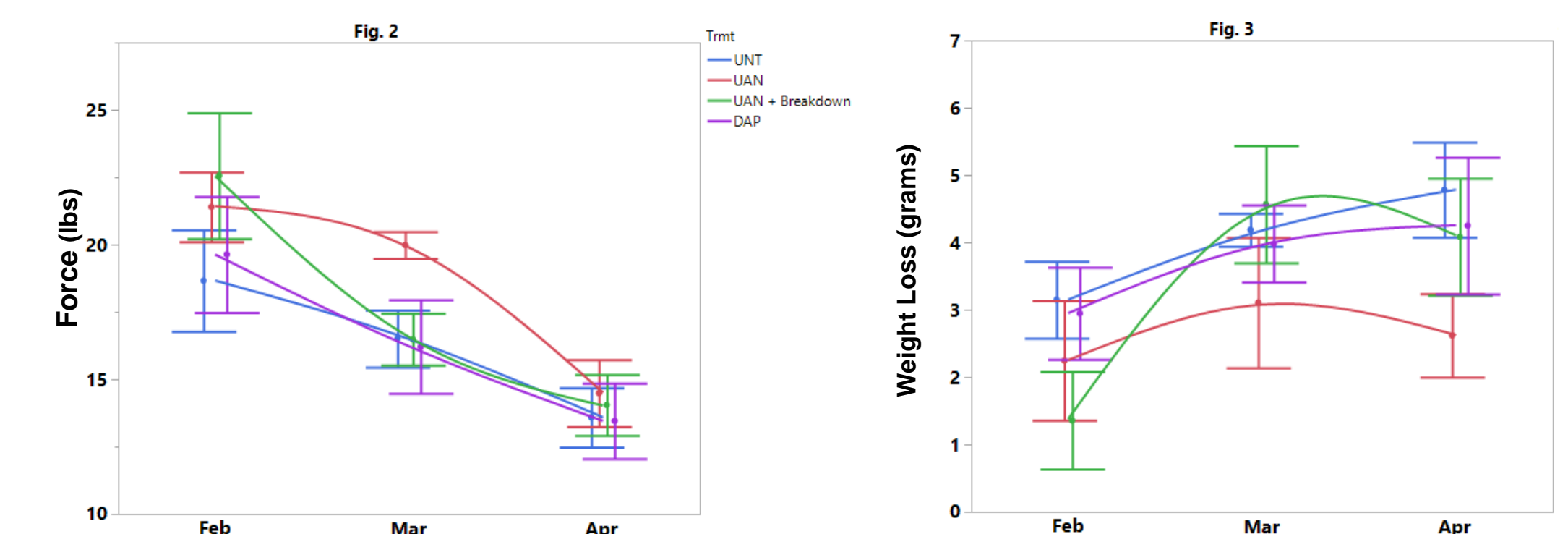
- Each of the residue samples was collected the following spring, weighed, and compared to the starting weight to evaluate degradation.
- Stalks were then crushed to evaluate integrity.



Results

Breakdown Over Time

Stalk integrity decreased (Fig. 2) and weight loss increased (Fig. 3) over time. However, there was no significant difference in stalk integrity or weight among treatments at any point in time.



Breakdown by Soil Type

Though sites differed in decomposition rates, no results between treatments were found at any site.



Discussion

- Results of this study indicate that the nitrogen from fall-applied DAP was not available to the crop the following spring. Instead, the nitrogen was likely leached beyond the root zone.
- DAP, UAN, and UAN + Breakdown treatments did not increase residue breakdown beyond the control.

Additional Research

- An additional set of litterbags was deployed in Cape Girardeau in conjunction with the SEMO Department of Agriculture, Dr. Indi Braden, and Duncan Ross. Their conclusions were consistent with the findings of this study.
- GROWMARK is continuing to test the bacterial agent Breakdown to determine the commercial fit for this product.

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