

Introduction

Nitrogen is the most important nutrient for crop yield, crop quality, and the environment. Urea accounts for 46% of the world's nitrogen fertilizer because of its efficiency, cost, and ease of transport. Globally, approximately 18% of applied nitrogen is lost through ammonia volatilization.

When urea is applied, it is hydrolyzed then decomposes into forms that are usable by plants. This process is facilitated by the urease. There are different factors that affect the rate of volatilization. Soil factors such as high pH, high moisture, high temperature, and high organic matter can increase the rate of volatilization and presence of urease.

There are two main cover crop management styles: tillage and surface application. Increased volatilization is seen in surface applications for a few reasons. The residue acts as a barrier between the fertilizer and the soil and creates the perfect soil conditions for increased losses.

Another manipulation of the cover crops lies in the timeline of adding treatment after cover crop termination. Studies have shown that urease activity in crop residue peaks around week 8. This increased activity can lead to increased volatilization.

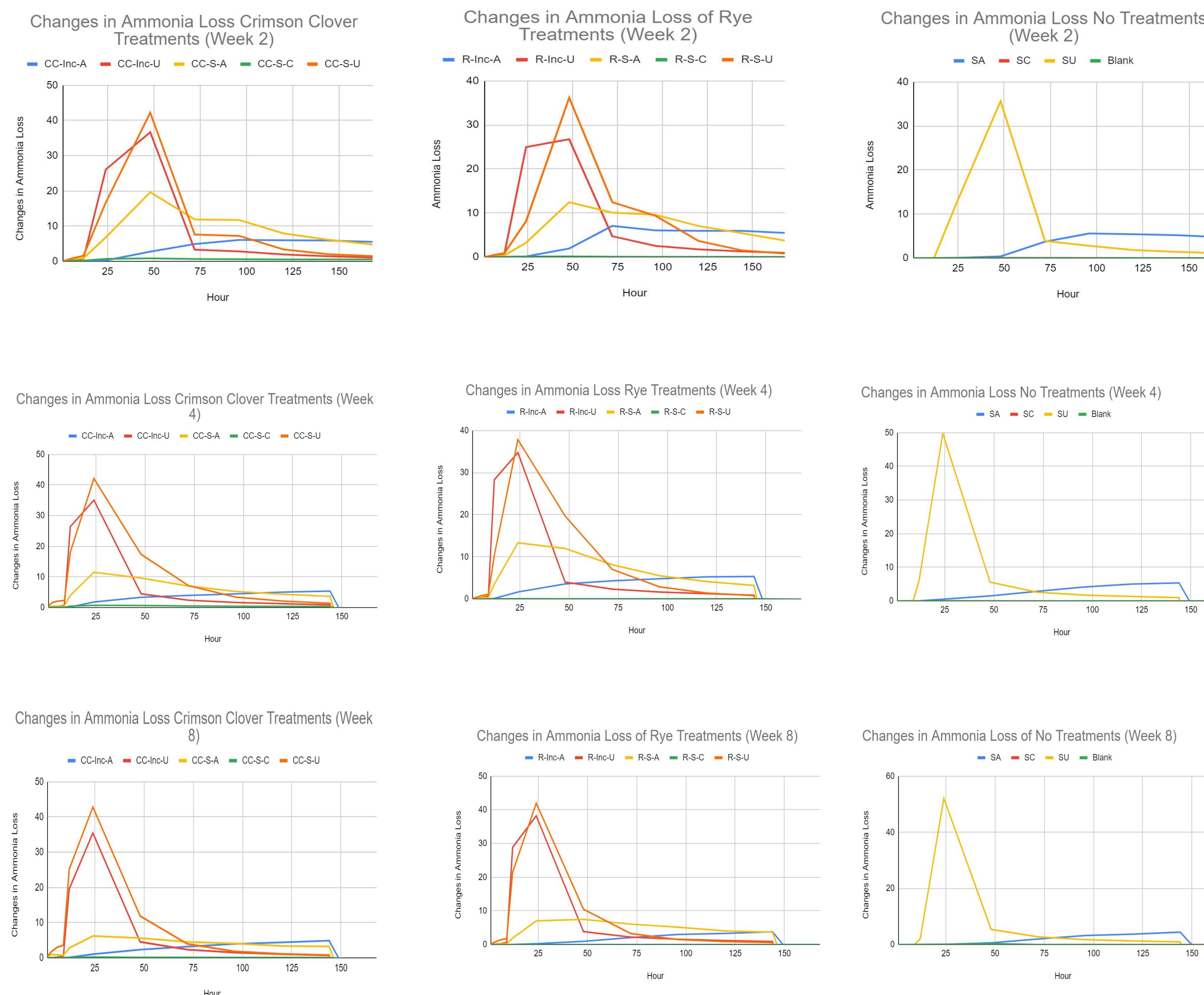
One way to reduce volatilization is by coating the urea in an inhibitor. ANVOL uses duromide and N-(N-Butyl) Thiophosphoric Triamide (nbpt) to inhibit urease. The nbpt uses nickel to block the active sites on urease and the duromide helps the nbpt withstand environmental factors that cause degradation.

Objective

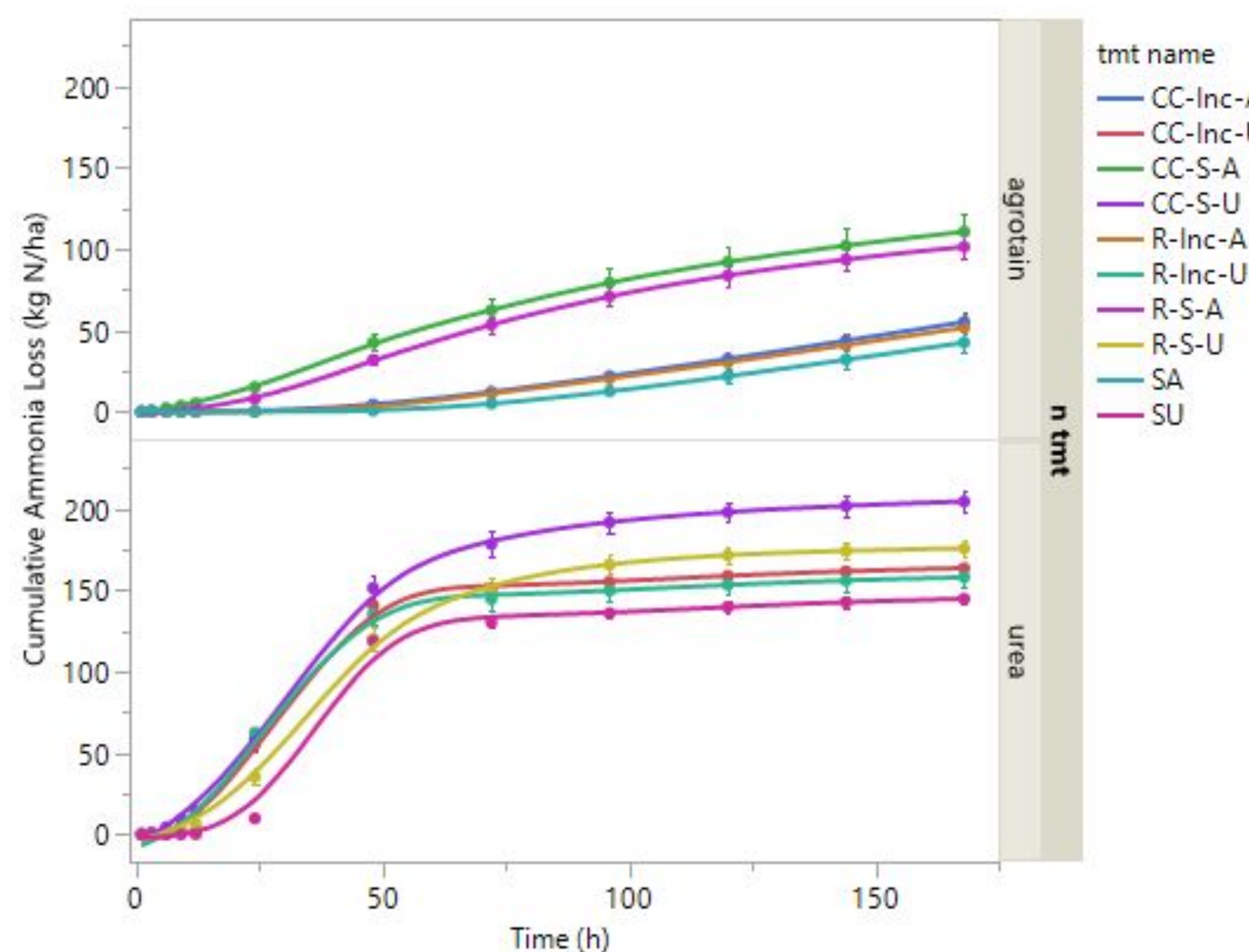
Examine the following effect on ANVOL as a urease inhibitor.

- Cover crop type
- Cover crop management
- Nitrogen treatment application time

Changes in Ammonias Losses

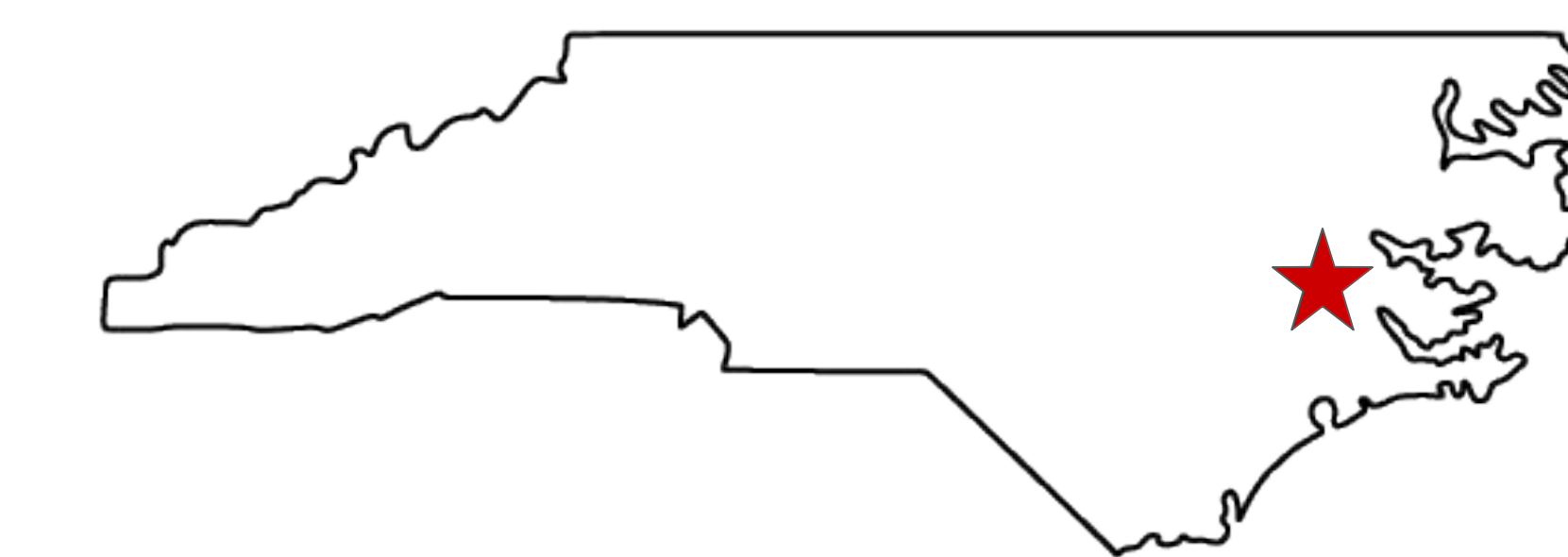


Ammonia Loss over Time



Materials and Methods

Collection: Bulk surface soil from conventionally managed Casswell Research Farm in Kinston, NC



Set Up: 12 arrangements of cover crop type (rye, crimson clover, and none), residue management (surface and tilled), and termination time (2, 4, or 8 weeks) were incubated in a randomized complete block design. 300g of soil was compressed to a bulk density of 1.2 g/cm³ and maintained at 70% water holding capacity.



Measurement: Before placement in the volatilization chamber, each incubation that needed treatment had bare urea or urea coated with ANVOL applied at a rate equivalent to 224 kg N/ha to the surface of the soil. The chambers were kept at a constant temperature, humidity and air flow for a week. The gasses from the chamber were caught in acid traps of diluted phosphoric acid that were changed at hours 1,3,6,9,12,24,48,72,96,120,144, and 168.

Results: The acid traps were diluted and ran through the Lachat for results.

Take Homes

- ANVOL had the highest efficacy when
 - Using incorporated cover crop management techniques
 - Using a non-leguminous cover
 - When applied longer after termination of the cover