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## Introduction

- Agriculture faces pressures to feed a growing population without causing more harm to the environment. To help understand this problem, we wanted to test how cover crops and soil amendments affected nutrient cycling and crop health.
- Can there be synergistic effects between cover crop residues and soil amendments that help lower fertilization rates?

## Hypothesis

- Nitrogen rich residues, such as cowpea and sunnhemp, will create a synergistic effect with soil amendments, releasing more nitrogen than each would individually.
- The manufactured organic fertilizer will release more nitrogen in this growing season than the other amendments.

## Methods

- 5 cover crop residues: Cowpea, sunnhemp, sorghum, millet, and control.
- 4 soil amendments: Charred chicken manure (Frye), composted chicken manure (Everlizer), manufactured organic fertilizer (NatureSafe), and control.
- Cover crops crossed with soil amendments (Fig. 1) to make 20 treatments with 5 replicates of each, n=100
- Mixed into neutral soil and kept in a climate-controlled and irrigated greenhouse.
- Soil was sampled once every 2 weeks (Fig. 2) and analyzed for NO<sub>3</sub><sup>-</sup> and NH<sub>4</sub><sup>+</sup> via colorimetry (Fig. 3).

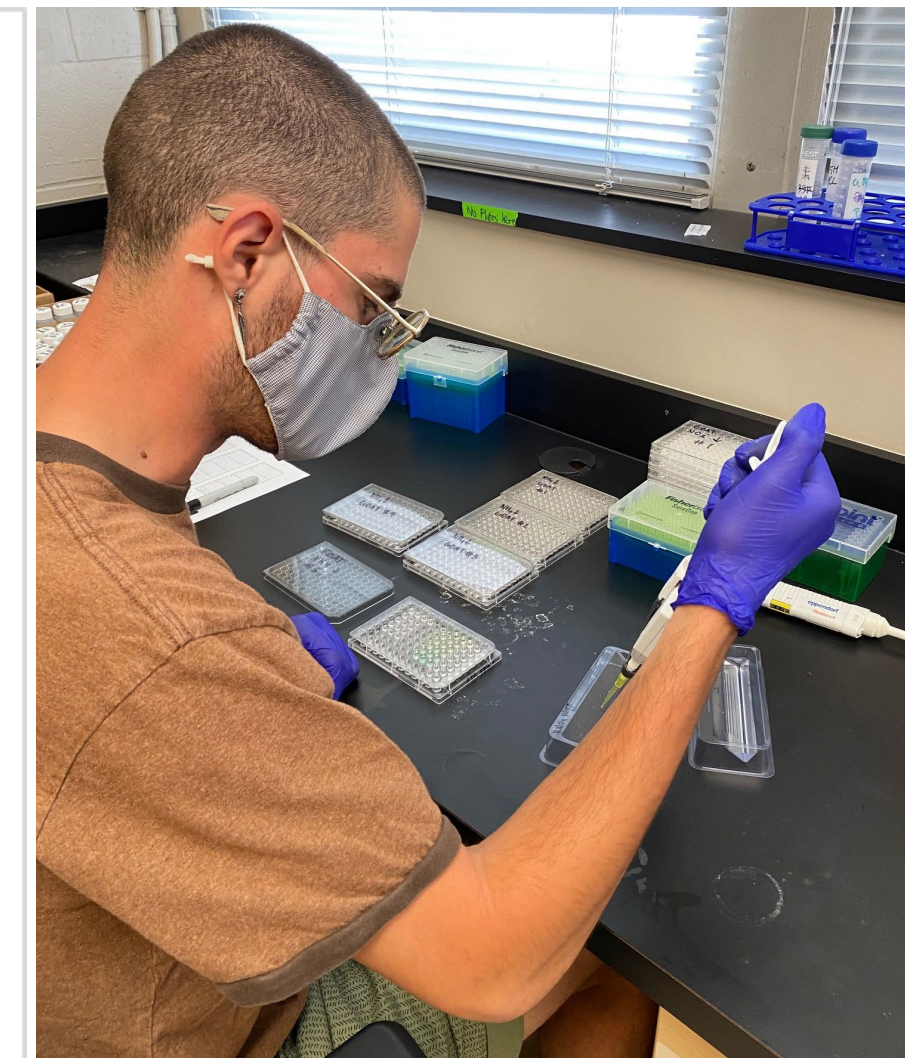
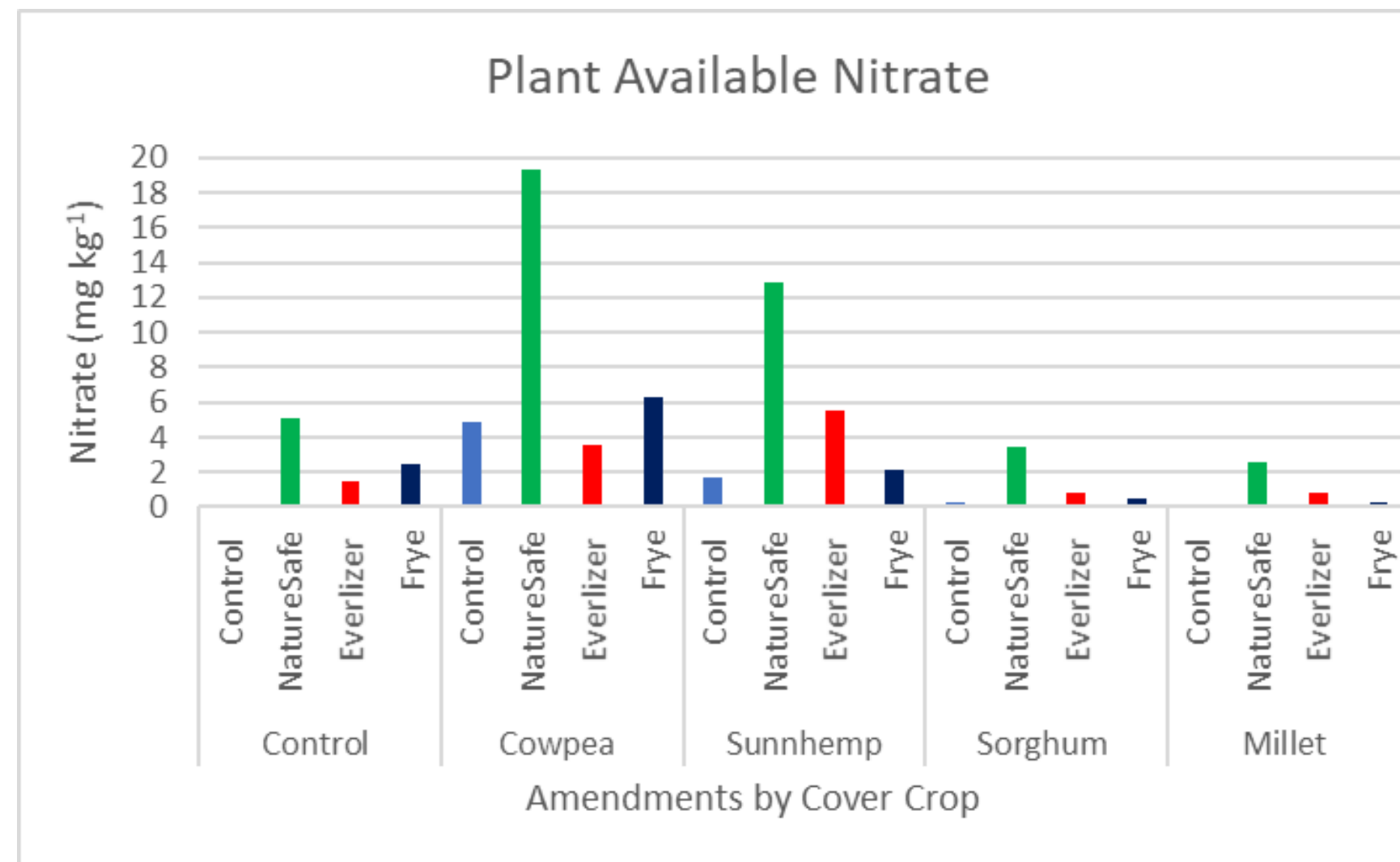


(Fig. 1) Cowpea residue and Everlizer prior to mixing and potting.

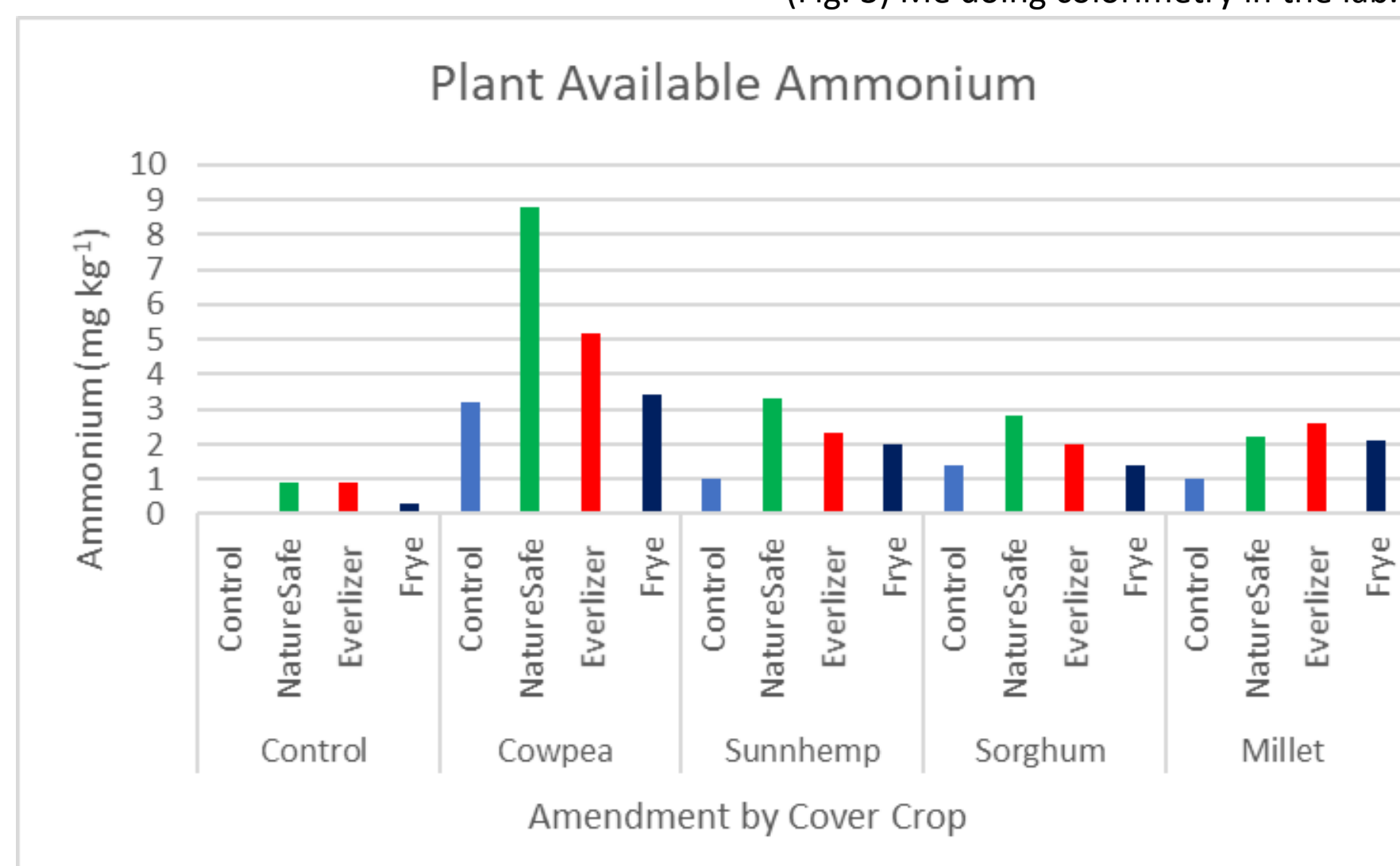


(Fig. 2) Miniature soil core sample.

The use of nitrogen-rich cover crop residues may provide more plant available nitrogen for future crops through synergistic effects with manufactured organic fertilizers.



(Fig. 3) Me doing colorimetry in the lab.



## Results

- It was observed that NatureSafe released more plant available nitrogen (PAN) compared to the other amendments, as hypothesized.
- Synergistic effects between cowpea and sunnhemp residues were most notable with NatureSafe but also occurred with other amendments.
- Antagonistic effects were also observed, most notably with nitrate in the sorghum and millet treatments.

## Discussion

- The synergistic effects observed could be the result of elevated microbe activity whereas antagonistic effects could be from nitrogen immobilization due to increased C:N ratios.
- Although the NatureSafe treatments had more PAN, the plants in the biochar treatments were larger and looked healthier. More research needs to be conducted to determine the cause of these differences.
- The two poultry-based fertilizers added more carbon to the system, potentially improving soil health in the long-term, but more research needs to be conducted to test this theory.
- The results from this experiment may be used to better manage fertilizer application in organic system that use cover crops, specifically to lower fertilization rates when using a nitrogen-rich cover crops.

## References

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