Evaluation of Seed Treatments on Various Pea Cultivars Using Multispectral Unmanned Aerial Vehicle (UAV)

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Abstract

Seed treatments were applied to two cultivars of spring peas, Hampton and PS171000022, and two cultivars of winter peas, MiCa and Klondike. The seed treatments were Bigfoot (mycorrhizae), X-seed (nutritional slurry), *Rhizobium leguminosarum*, and an untreated control. Multispectral cameras and sensors mounted on an unmanned aerial vehicle (UAV) were used to capture images at regular intervals. Images were stitched and orthorectified using Pix4D, and MATLAB was used to extract the normalized difference vegetation index (NDVI), as well as other relevant vegetation indices. Custom code scripts using Python were developed to create visual displays that assisted in recognizing trends and patterns in the data.

Introduction

- Optimizing crop resilience for increased yields is vital to feed the growing world population.
- It is crucial to explore options for superior plant varieties.
- Several products have been developed that when applied to the seeds may enhance plant growth and yield. This project evaluated 3 of these products on spring and winter peas.

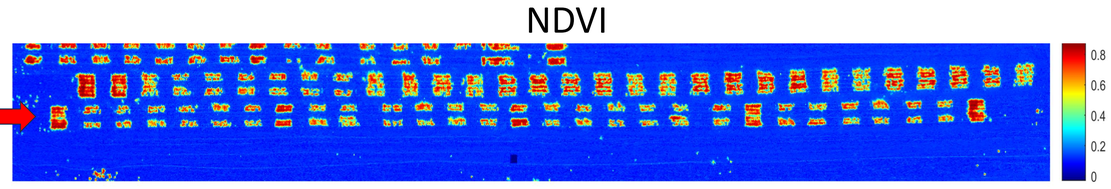
Materials & Methods

Germinated "seedlings"

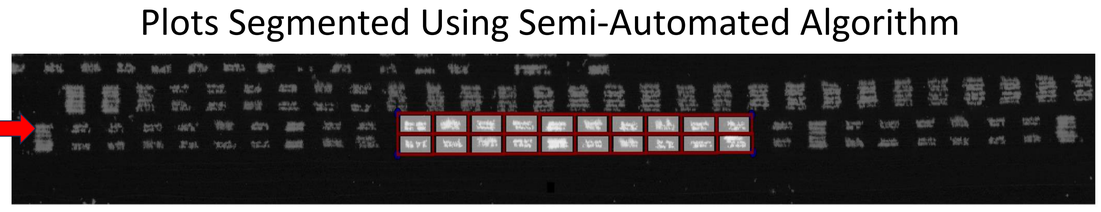
PS171000022, Klondike, Hampton, MiCa (counterclockwise from lower left) in the Bigfoot Treatment

UAV with multi-spectral camera

NDVI

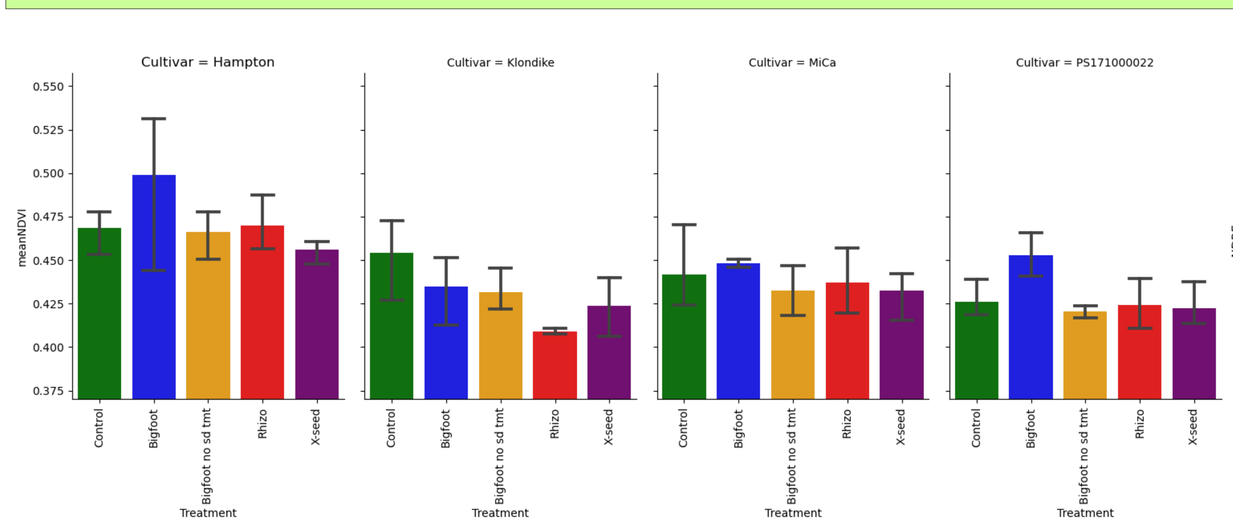


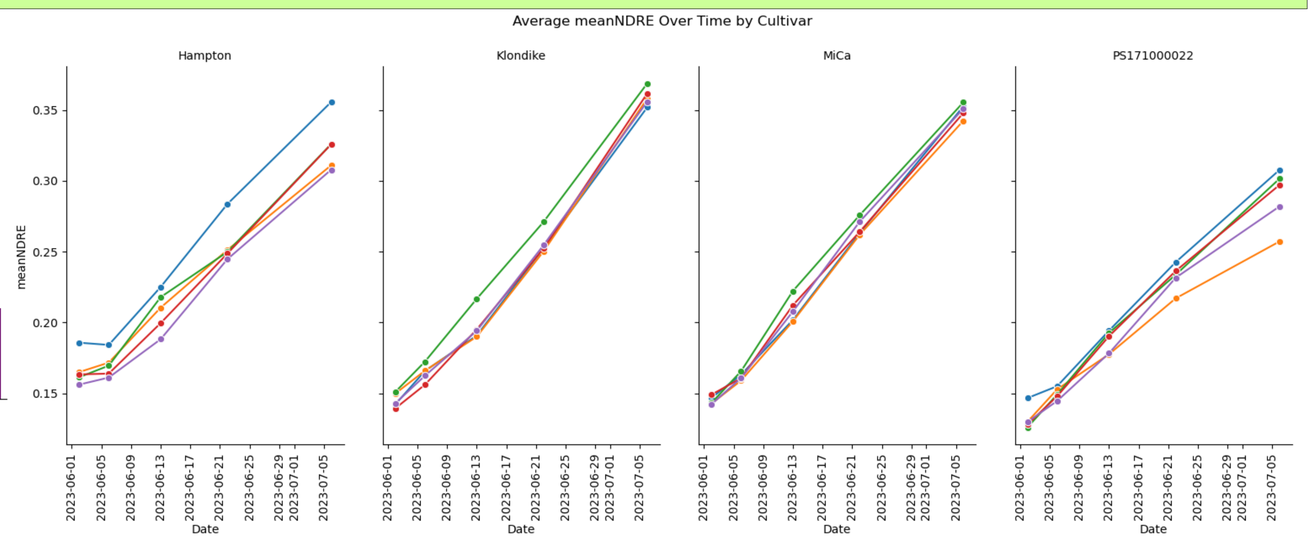
Plots Segmented Using Semi-Automated Algorithm



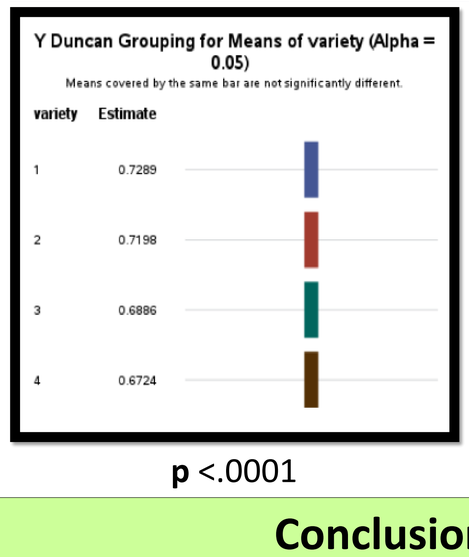
Processed images

Results



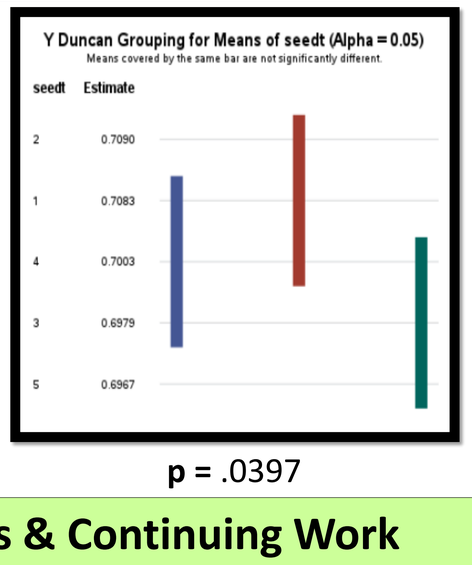


NDVI



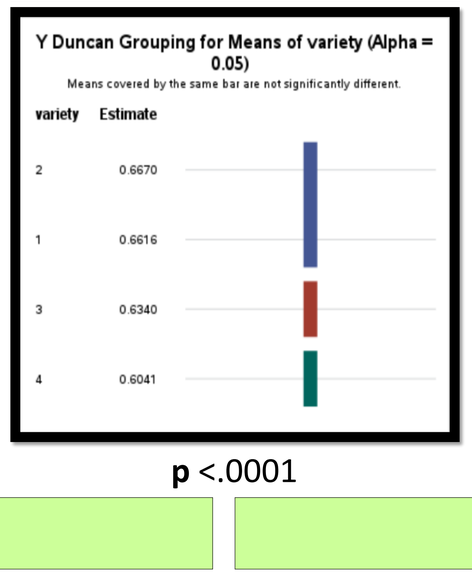
p <.0001

GNDVI

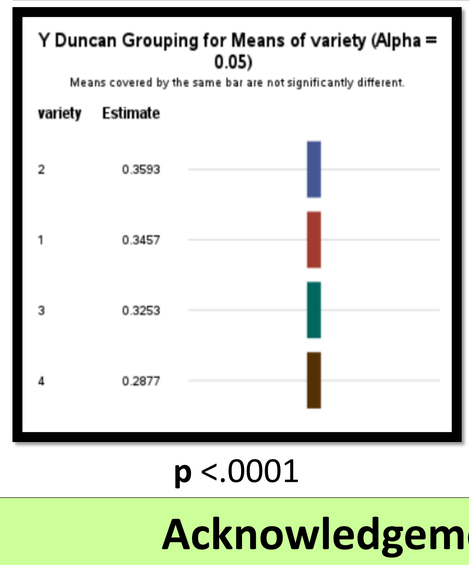


p = .0397

NDRE



p <.0001



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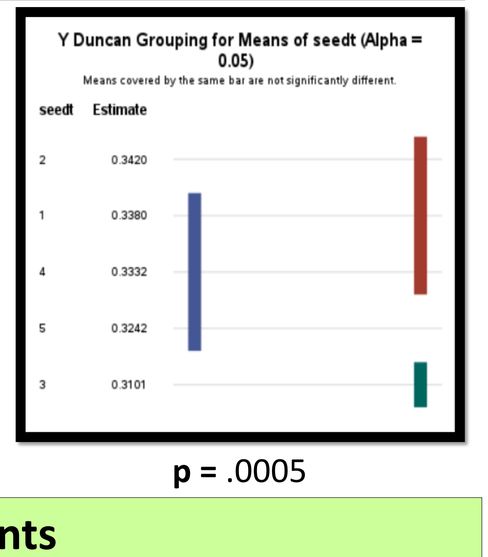

p = .0005

Conclusions & Continuing Work

- Significant differences were detected between genotypes, as well as seed treatments for NDVI and NDRE.
- There were no significant interactions between the genotypes and the seed treatments.
- When the plants reach physiological maturity, seeds will be harvested, agronomic data will be collected, and seeds will be analyzed for nutritional components (minerals, protein, carbohydrates, etc.)

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