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USING A HANDHELD DIGITAL CAMERA TO MONITOR BT AND NON-BT COTTON VARIETIES WITH DIFFERENT LEVELS OF NITROGEN AND POTASSIUM

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Introduction

Changes in the chlorophyll content of leaves can be indicators of plant vigor. These changes could be used to monitor plant health and increase the efficiency of fertilizer use. By applying only the amounts required, off site effects would be minimized while maintaining productivity. By the time that these changes are visible, however, yield potential has been lost. It has been speculated that Bt cotton may have a higher fertility requirement due to a faster boll set.
Conventional use of leaf and soil sampling are frequently cumbersome and have a slow turnaround time at the laboratory. A method that could be used in field situations to detect these changes in time to correct problems is desirable.

Several optical methods have been utilized over the past years to determine vegetation indices including the Dycam Agricultural Digital Camera™ (ADC). The camera is adapted to take pictures of vegetation in the red and near infrared spectra. These images are computer processed to yield vegetative indices developed by NASA.

The purpose of this experiment was to determine if the ADC could be used by cotton farmers to determine optimum levels of soil fertility based on the optical properties of chlorophyll in leaf tissue.

- Determine if normalized red/infrared differential (NDVI) or infrared percentage (IPVI) is correlated with nitrogen or potassium levels in the leaves.
- Determine if varieties (Bt vs. Conventional) differ in their requirements for Nitrogen (N) or Potassium (K).
- If a correlation is present between NDVI and IPVI and nitrogen and potassium levels, model the correlation to predict these levels for future use.

Materials and Methods

Two closely related varieties of cotton: DPL NuCotn 35B™(Bt) and DPL 5690™(Conventional) were planted in split-plots on an existing long-term fertility experiment at the Prattville Agricultural Research Unit in central AL.

Fertility treatments were annual rates of 0-100-100 (Treatment 1); 60-100-100 (Treatment 3); 120-100-100 (Treatment 4); and 90-100-0 (Treatment 11). Insecticides were applied to all plots as determined by scouting and IPM recommendations. Leaf tissue samples and digital photographs were taken weekly from early bloom for 4 weeks, then every two weeks until defoliation. Tissue samples were analysed by the AU Soil Analysis Laboratory. Three years of data will be presented.

Conclusions

Although soil fertility affected yields, there was no interaction of variety (Bt vs. Conventional) with fertility. Therefore, there is no reason to recommend different fertility levels for Bt cotton vs. conventional varieties.

Although NDVI and IPVI were highly correlated with each other, neither were good predictors of nitrogen or potassium status in the leaves tested.