Green Canopy Cover Percentage as a Method for Quantifying *Andropogon virginicus* (Broomsedge) Reduction Through Fertilizer Applications in a Cool Season Hay Production System

Jordyn A. Bush*, Jimmy C. Henning*, and Chris D. Teutsch†
*University of Kentucky; †University of Kentucky Research and Education Center

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**INTRODUCTION**

- *Andropogon virginicus* (broomsedge) is a warm season perennial weed that can be indicative of poor soil fertility
- If soil nutrition is not properly managed, broomsedge can easily invade hayfields due to constant removal of nutrients with harvest
- Warm season plants such as broomsedge go dormant and lose their green color during cooler temperatures while cool season plants, such as those prominent in Kentucky hayfields, remain green
- Because of the influence of temperature on color changes in these two different categories of grasses, the ability to detect their ratios will vary by season
- The color dichotomy between desirable cool season grasses and undesirable warm season weeds during cooler periods of the year is apparent in photographs (Fig. 1)

**HYPOTHESIS**

We hypothesize that due to the color differences between warm and cool season species during cooler parts of the year, we will be able to utilize visual imagery and green canopy cover (GCC) analysis software to quantify and monitor broomsedge presence in cool season hayfields and its response to fertilization.

**MATERIALS & METHODS**

- 0.3ha (0.8ac) hayfield in Powell County, Kentucky, USA monitored during 2020
- Heavy use of hayfield for 10 years with inconsistent soil nutrient management
- Significant infestation of broomsedge
- Thirteen treatments of N-P-K were applied (kg/ha): 0-0-0, 0-0-202, 0-0-404, 0-45-0, 0-45-202, 0-45-404, 202-0-0, 202-0-202, 202-0-404, 202-45-0, 202-45-202, 202-45-404, and 434-43-43.
- N applications were split between March, May, and August
- P applications in March
- K applications in March for 202kg/ha and split between March and August for 404 kg/ha treatments
- Imaging completed with Nikon D750 DSLR camera in January and April 2020, and a DJI Phantom Pro V2.0 drone in July and November
- Green Canopy Cover (GCC) was analyzed using Canopeo for MATLAB

**RESULTS**

<table>
<thead>
<tr>
<th>JAN</th>
<th>0-0-0</th>
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<tbody>
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<td>APR</td>
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Figure 1. Examples of the color change differences between the lowest average GCC and highest average GCC treatments across sampling times.

Figure 3. Average GCC by treatment and sampling time, and the annual GCC average.

Plots with lowest or no fertilizer input had the lowest average annual GCC values while plots with the highest fertilizer inputs had the highest average annual GCC values. GCC values have very little variance in July when temperatures are warm enough that both types of grass are green. April or November samplings are closest to average annual values.

**SUMMARY**

- Complete fertilizer treatments including N, P, and K increased average annual GCC values
- Increased GCC values may indicate a reduction in broomsedge due to its brown color for most of the year
- GCC measurements for broomsedge quantification are best recorded in April or November due to a strong color dichotomy between warm and cool season grasses during these cooler periods
- Yield and botanical composition was also recorded for each treatment for further analysis of response to treatment

**CONCLUSION**

This data supports our hypothesis that GCC values obtained from visual imagery may be useful in measuring the presence of warm season weeds in cool season hayfields, and for monitoring the change in ratio between these two categories in response to fertilization.

**ACKNOWLEDGEMENTS**

Authors appreciate the support of the Robinson Center for Appalachian Resource Sustainability and the cooperation of the study site, Dacha Farms.

**CONTACT**

Jordyn Bush jordynbush@uky.edu
Graduate Research Assistant, M.S. Student
University of Kentucky