IMPACT OF DEFOLIATION HEIGHT ON CROWN AND SOIL TEMPERATURE

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Introduction

- In 2018, global temperatures were 1.42°F higher than the 20th-century average
- Higher summer temperatures in the transition zone of the U.S. may make cool-season grasses less well adapted, especially under poor management
- Increased defoliation height may moderate crown and soil temperature leading to enhanced persistence



Figure 6. Plots were defoliated to 1.0 and 4.5 inches using a lawnmower with a bagging attachment.







Figure 1. Global temperature trends from 1880 to 2016 (https://www.ncdc.noaa.gov/cag/).

Objective

To evaluate the impact of defoliation height on soil and crown temperatures in an established tall fescue stand

Materials & Methods

Date and Time (GMT

Figure 2. Crown temperature of the tall fescue plant measured at 15 minute intervals from June 19 to August 27, 2020.



Figure 3. Impact of defoliation regime on the minimum, maximum, and average daily crown temperature.



Figure 7. HOBO MX2303 data loggers with two external temperature sensors (Onset, Bourne, MA) were installed to measure crown and soil temperature.

Summary

• 1.0 inch defoliation height increased daily maximum crown and soil temp (Figs. 2, 3, 4, 5)

- During periods of high temperature, the difference between a defoliation height of 1 and 4.5 inches often exceeded 10°F
- After approx. one month of close and frequent defoliation (1 inch weekly), crabgrass became the dominate grass species (Fig. 8)
- Close and frequent defoliation negatively impacts photosynthesis, transpiration and energy reserves in cool-season grass plants • Modifying microclimate at and below the soil surface could impact soil moisture (not measured in this study)

- Conducted at UK Research and Education Center located near Princeton, KY
- Experimental design was a RCB with four reps
- Plot size was 10 x 10 ft
- An established tall fescue sod was utilized
- Plots were defoliated weekly to 1.0 and 4.5 inches and monthly to 4.5 inches (Figs. 6 and 7)
- Crown and soil temperature were measured at 15 minute intervals using HOBO MX2303 loggers
 - Crown: sensor placed in the crown of plant
 - Soil: sensor placed at a soil depth of 4 inches
- A pivot table was used to calculate daily minimum, maximum, and average temperatures
- Daily data were analyzed using the General Linear Model procedure (SAS Institute, Cary, NC)
- Figure 4. Soil temperature at 4 inches measured at 15 minute intervals from June 19 to August 27, 2020.



- Rotational stocking could moderate crown and soil temperatures in pastures
- Maintaining a defoliation height above 4.5 inches may help cool-season grasses persist during hot summers



Figure 8. After approximately one month, crabgrass dominated plots that were defoliated to 1 inch on a weekly basis (right). On the left is a plot defoliated to 4.5 inches.



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Figure 5. Impact of defoliation regime on the minimum,

maximum, and average daily soil temperature at 4 inches.

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