Impacts of Bermuda Grass on Northern Bobwhite Chick Mobility and Heat Exposure

James A. Martin¹, Jason Burkhart², Reggie Thackston³, and John P. Carroll²

¹Mississippi State University
²University of Georgia
³Georgia Department of Natural Resources
Field Borders
Bermuda Grass
Objectives

• Measure the effect of Bermuda grass density on northern bobwhite chick movements

• Compare ambient temperatures in areas dominated by Bermuda grass and NOBO friendly forbs

• Determine lethality curves for NOBO
Study Area

- Upper coastal plain of GA, USA
- Hot summers
- Dominated by agriculture
- Bermuda grass prevalent
Experimental Design

- Randomized complete block design
  - Treatments: “Low” Bermuda grass density (0-20%); “High” (>20 %); and a control of 0% Bermuda grass
  - “Trials” considered blocks (n=8)
Experimental Design

- Purchased 1-day old chicks
- Set-up a 2 m “race track” for chicks to complete
- Chicks put in groups of 8 chicks
- Randomly chose groups
- Groups not chosen provided stimuli for chicks in trial
Experimental Design/Analysis

- Trials conducted during morning and evening
- Chicks were used at 5 and 10 days old
- ANOVA used for analysis (alpha 0.05)
Temperature Comparison

• Paired design of forb dominated and Bermuda grass dominated plots within field borders
• HOBO® temperature data loggers placed in each plot (n=3); probes was placed at “chick level”
• Only daytime readings used in analysis
• $t$-test used to compare
Time-to-Death

where

• $t =$ time in seconds;
• $m =$ body mass in g;
• $s =$ specific heat (J/g/C); and
• $G =$ rate of heat gain (W/C)

Guthery (2000)
## Results: Time-to-Complete

<table>
<thead>
<tr>
<th>Chick Age</th>
<th>Bermudagrass Density</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (0%)</td>
</tr>
<tr>
<td>5 Days</td>
<td>0.77 (0.095)</td>
</tr>
<tr>
<td>10 Days</td>
<td>0.61 (0.052)</td>
</tr>
</tbody>
</table>
Temperature by Treatment

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**Temperature (°C)**

- **Day**
- **Bermudagrass**
- **Forb**

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**Day**

1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24  25  26  27  28  29
## Temperature Threshold (40° C)

**Table 2.** Temperature summary for bermudagrass and forb patches in Laurens County, Georgia during August 7 – September 6, 2001.

1. The threshold was set at 40 C, based on Guthery (2000). However, for chicks this temperature may be less.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Bermuda Mean</th>
<th>Bermuda SD</th>
<th>Forb Mean</th>
<th>Forb SD</th>
<th>Proportion Different</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Temperature (C)</td>
<td>34.51</td>
<td>2.71</td>
<td>31.58</td>
<td>2.31</td>
<td>0.08</td>
</tr>
<tr>
<td>Mean Max Temperature (C)</td>
<td>44.20</td>
<td>2.82</td>
<td>40.06</td>
<td>3.48</td>
<td>0.09</td>
</tr>
<tr>
<td>% Days &gt; Threshold(^1)</td>
<td>0.87</td>
<td>-</td>
<td>0.67</td>
<td>-</td>
<td>0.23</td>
</tr>
<tr>
<td>% Time &gt;Threshold</td>
<td>0.32</td>
<td>0.18</td>
<td>0.11</td>
<td>0.12</td>
<td>0.67</td>
</tr>
</tbody>
</table>
Time-to-Death

Graph showing the relationship between age (days) and time-to-death (minutes) for Bermuda and Forb species.
Discussion

• Bermuda grass density affected movement, but only at 5 days old
• Lack of effect at 10 days not surprising biologically
• Literature scant on thermodynamics of bobwhite chicks (Guthery et al. for adults)
Discussion

• We made assumptions that heat affects chicks similar to adults (perhaps our results are conservative)

• If there are not similar, do adult bobwhites select habitats for their optimal thermal environment or that of the chicks?
Conclusions

• Bermuda grass likely fragments landscape for NOBO because of thermal environment and increased risk from slowed movements

• Removal of Bermuda grass is warranted, but good luck!
Questions?