Incorporating Legume Species into Teff as an Emergency Source of Forage

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ABSTRACT

Teff (Eragrostis tef (Zucc.) Trotter) is an annual warm-season grass that is known for its rapid seedling and tolerance to dry conditions. The grass’s ability to produce high forage yields over a short period during the summer months has led to its use to meet livestock nutrient requirements when the growth of a producer’s primary sources of forage may unexpectedly become limited (i.e. an emergency crop). Interseeding legume species into grasses is widely known to increase forage yields and improve forage quality. Although high in quality for a warm-season grass, teff will likely benefit from the addition of legumes. There is limited knowledge of utilizing forage legume species during these occasional emergency situations when supplementing livestock is required, especially when included into mixtures with teff. The objective of this study was to compare the forage production and nutritive values of teff interseeded with various annual and short-lived perennial species of forage legumes.

RESULTS AND DISCUSSION

Teff and Legume Establishment:

- In June and July of 2013, Lexington, KY received higher than normal amounts of precipitation (57.7 and 86.1% higher than the 30 year average for the site) and contributed to the rapid development of teff seedlings.
- Teff accounted for 85% of the ground cover when estimated 10 days after seeding of the legumes and did not differ (P > 0.10) between treatments.
- The percent of ground cover of the legume species (9.95%) and bare soil (5.1%) were consistent (P > 0.10) between treatments.
- The visual estimates of legume emergence also confirm that the development of each of the legume species was slower than teff, but there were differences among species (P < 0.05).
- Approximately 40% of cow pea, Korean lespedeza, and mamsloth red clover seedlings were emerged one week after seeding.
- Less than 20% of crimson clover seedlings had emerged at this, while teff had progressed to having 3-4 leaves fully emerged.
- Although this appears to indicate that the presence of legumes was low, there is evidence the growth of a few of these species increased during the season and remained competitive with teff interseeded legumes species.

Table 1. Species, varieties, and rates of legumes interseeded into teff on June 16, 2013.

<table>
<thead>
<tr>
<th>Species</th>
<th>Variety</th>
<th>Seeding Rate (kg PLS acre⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrowleaf Clover</td>
<td>‘Apache’</td>
<td>11</td>
</tr>
<tr>
<td>Ball Clover</td>
<td>‘AU Don’</td>
<td>3.5</td>
</tr>
<tr>
<td>Cow Pea</td>
<td>‘I/gu angustifolia (Wals.) Wals.’</td>
<td>34</td>
</tr>
<tr>
<td>Crimson Clover</td>
<td>‘Dixie’</td>
<td>28</td>
</tr>
<tr>
<td>Korean Lespedeza</td>
<td>‘Maher’</td>
<td>34</td>
</tr>
<tr>
<td>Mammoloth (Single-cut)</td>
<td>Red Clover</td>
<td>‘Kendall’</td>
</tr>
<tr>
<td>Medinum (Double-cut) Red Clover</td>
<td>‘Primus’</td>
<td>11</td>
</tr>
<tr>
<td>Striate Lespedeza</td>
<td>‘Kobe’</td>
<td>34</td>
</tr>
<tr>
<td>Sunn Hemp</td>
<td>‘Constance’</td>
<td>11</td>
</tr>
</tbody>
</table>

Figure 1. Forage yields (kg DM ha⁻¹) for teff interseeded with various species of legumes. Error bars refer to ± SED. Differences in bar color indicate treatment is significantly different (* = P < 0.10 & ** = P < 0.05) than the control (i.e. red = lower; green = greater).

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Figure 2. Crude protein (g kg⁻¹) of teff interseeded with various species of legumes. Error bars refer to ± SED. Differences in bar color indicate treatment is significantly different (* = P < 0.10 & ** = P < 0.05) than the control (i.e. red = lower; green = greater).

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Figure 3. Acid detergent fiber (g kg⁻¹) of teff interseeded with various species of legumes. Error bars refer to ± SED. Differences in bar color indicate treatment is significantly different (* = P < 0.10 & ** = P < 0.05) than the control (i.e. red = greater; green = lower).

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Forage Nutritive Value:

- In contrast with red, the interseeding of legumes had more of an impact on the nutritive value of the available forage:
- Medium red clover (160 g kg⁻¹) and sunn hemp (171 g kg⁻¹) increased (P < 0.01) forage CP concentrations compared to the controls (130 g kg⁻¹; Fig. 2).
- This provides some evidence that there was appreciable amounts of red clover in this treatment that may have suppressed growth of teff (Fig. 1).
- Forage NDF concentrations were similar (P > 0.20) between treatments (584 g kg⁻¹).
- Interseeding sunn hemp decreased (P < 0.01) forage ADF concentrations (273 g kg⁻¹) compared to the control (299 g kg⁻¹), while ADF concentrations of the available forage increased (P = 0.06) for crimson red clover treatments (356 g kg⁻¹; Fig. 3).
- The later maturity and limited regrowth of this type of red clover may have lowered the amount of vegetative red clover shown present within these stands, with the larger proportion of reproductive shoots increasing the ADF content.
- Sunn hemp also increased (P < 0.05) the relative feed value of the forage (112) compared to monocultures of teff (104; Fig. 4).

Figure 4. Relative feed value for teff interseeded with various species of legumes. Error bars refer to ± SED. Differences in bar color indicate treatment is significantly different (* = P < 0.10 & ** = P < 0.05) than the control (i.e. red = lower; green = greater).

SUMMARY

- Teff’s aggressive nature and rapid seedling development made it incompatible with most of the interseeded legumes species.
- The high amount of precipitation received during the summer of 2013 contributed to the competitiveness of teff, and current trends will be evaluated under additional growing seasons.
- Medium red clover and sunn hemp did show some promise for being incorporated with teff as an emergency source of forage.
- Medium red clover increased the crude protein content (CP) concentrations when interseeded with teff, but also reduced forage yields.
- Although it did not increase forage yields, the addition of sunn hemp consistently improved all estimated parameter of forage nutritive value (i.e. CP, ADF, and relative feed value (RFV), with exception of neutral detergent fiber (NDF)).
- Sunn hemp is currently used primarily as a summer crop, but additional research may be needed to further evaluate its value as a forage, especially when used as an emergency crop.