Introduction

• Maximizing grazing availability is important to all organic dairy farmers, and particularly for grain-free “grassmilk” producers.

• Many producers in the Northeast are utilizing annual forage crops to provide supplemental grazing when perennial pasture is less productive (e.g., early spring, mid-summer).

• Cool season perennial forage species are known to diminish in content of fatty acids (FA), particularly alpha-linolenic acid (ALA) as they mature, (Glasser et al., 2013).

• Annual forages are known to quickly diminish in nutritive quality as they mature, as well as in content of ALA (unpublished data).

• ALA from forage is a key feedstock to, and driver of, the milk FA profile.

• This study aimed to evaluate the reductions in FA content and nutritive quality of cool season and warm season annual forages of increasing maturity, in regards to both pseudostem and leaf blade fractions, and their summation on a whole plant basis.

Method

• Overwintered cereal rye (Secale cereale) and June planted pearl millet (Pennisetum glaucum) were sampled over the course of 9 and 19 days of grazing, respectively.

• Rye was harvested at 5 cm height and pearl millet at 15 cm height. All samples were divided to “leaf” (lamina) and “pseudostem” ("stem"; petiole + culm) components.

• Pearl millet pseudostem portion from 1st sampling was composited across replications by necessity.

• Forage nutritive quality was determined from near-infrared reflectance spectroscopy (NIRS) and FA determined by gas-liquid chromatography of fatty acid methyl esters.

• Milk/hectare and milk/tonne forage DM) calculated using the MILK spreadsheet (Schwab and Shaver, 2001; Undersander, 1993).

Results

• Nutritive quality and FA content declined with advancing maturity on an entire plant basis.

• The proportion of ALA in leaf and pseudostem components remained largely stable.

• On an entire plant basis, decreases in ALA proportion relative to total FA content was due primarily to the increase of pseudostem dry matter yield as the plants matured, for both species.

• The dry matter yield, nutritive quality, and fatty acid content of leaf components changed minimally over the span of the grazing cycle.

• Sugar content of pearl millet pseudostem components appears to have been influenced by both maturity stage, and time of harvest (time data not shown).

Table 1 Rye nutritive quality, sampled at 5 cm

<table>
<thead>
<tr>
<th>Day of grazing</th>
<th>Height</th>
<th>Component</th>
<th>Crude Protein (g kg⁻¹ of DM)</th>
<th>NDF (g kg⁻¹ of DM)</th>
<th>NDFD48 (g kg⁻¹ of DM)</th>
<th>NDFD48 (g kg⁻¹ of DM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>5/24/16</td>
<td>Entire plant</td>
<td>136</td>
<td>452</td>
<td>360</td>
<td>796</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leaf</td>
<td>204</td>
<td>440</td>
<td>354</td>
<td>805</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stem</td>
<td>196</td>
<td>459</td>
<td>363</td>
<td>790</td>
</tr>
</tbody>
</table>

Results, continued

Conclusions

• Whole plant analysis may underestimate the quality and fatty acid content that is actually consumed from grazed annual forages.

• Management that allows for grazing selectivity may ameliorate some of the quality decline of maturing annual forages, as well as the content of fatty acids, particularly ALA, by maintaining a steady leaf intake relative to pseudostem.

• Quality decreases associated with later maturity are resultant from both declines in the nutritive quality of stem and leaf components, and a greater amount of pseudostem material relative to the total.

Table 2 Pearl millet nutritive quality, sampled at 15 cm

<table>
<thead>
<tr>
<th>Day of grazing</th>
<th>Height</th>
<th>Component</th>
<th>Crude Protein (g kg⁻¹ of DM)</th>
<th>NDF (g kg⁻¹ of DM)</th>
<th>NDFD48 (g kg⁻¹ of DM)</th>
<th>NDFD48 (g kg⁻¹ of DM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>7/21/16</td>
<td>Entire plant</td>
<td>184</td>
<td>573</td>
<td>409</td>
<td>715</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leaf</td>
<td>175</td>
<td>569</td>
<td>393</td>
<td>681</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stem</td>
<td>190</td>
<td>608</td>
<td>431</td>
<td>679</td>
</tr>
</tbody>
</table>

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This study evaluates the fatty acid decline in annual forages, and their constituent components, as they mature.