Glycerol as a Supplemental Energy Source for Meat Goats


Introduction

The by-product from biodiesel-diesel, glycerol, has potential for the use as a supplement for ruminant animals. Limited research has reported that glycerol was fermented rapidly in the rumen and increased proportions of propionate but decreased DM intake (DeFrain et al., 2004). Our objective was to determine the impact of supplemental glycerol on intake and digestibility of a medium-quality crabgrass/goosegrass hay basal diet by meat goats.

Experimental Procedures

Twenty wether meat goats (51.7 ± 1.6 lb) were allocated randomly to one of four crabgrass/goosegrass hay treatments. Treatments consisted of a basal diet of medium-quality crabgrass/goosegrass hay (15.9% CP, 66.5% NDF) with 0.5% trace mineralized salt offered individually at free-choice consumption with 1) no supplemental glycerol (CON), or with either 2) glycerol at 5% of the total diet (G5), 3) glycerol at 10% of the total diet (G10), or 3) liquid molasses at 10% of the total diet (M10). Diets were offered twice daily at 0800 and 1400 h. Liquid supplements were top-dressed over the hay and trace mineral salt (0.5% of total diet) was mixed into each feeding. Goats were allowed a 10-d dietary adaptation period followed by a 5-d collection period. Goats were fitted with fecal collection bags, and total feces were collected for 5 d. Total DM intake did not differ (P = 0.33) among treatments. Digestibility of DM was greater (P = 0.04) for G5 compared with CON, but other treatments were not different. Therefore, the levels of glycerol that were tested did not negatively impact forage intake and may be used to increase digestibility of medium-quality forages. Nutritionists and managers should be cautioned that “crude glycerin” from the manufacture of biodiesel may contain methanol that is harmful to animals.

Results and Discussion

Initial weight, final weight, and ADG did not differ (P ≥ 0.90) among treatments (Table 1). Total DM did not differ (P = 0.33) among treatments and averaged 1.3% of BW. No differences were detected for hay DM intake (P = 0.81) among treatments. Hay DM intake as a percent of BW did not differ among treatments (P = 0.67). Digestibility of DM was greater (P = 0.04) for goats offered G5 compared with those offered CON, but digestibility of DM did not differ between G10 and M10 and the other treatments (Table 1). Even if the glycerol were 100% digestible, the 10% improvement in total DM digestibility indicates an advantage to supplying the readily fermentable supplement. Glycerol and molasses supplementation produced similar results at the 10% level of supplementation. While not harmful to the digestibility of the total dietary DM, there

1 All authors are associated with the Department of Animal Science, Fayetteville.
may have been a slight decline in digestibility of hay when 10% glycerol was added. This effect of supplementation is typical with medium- or high-quality hay (Titgemeyer et al., 2004), but natural protein was needed with molasses to benefit beef cows that were fed low-quality hay (Pate et al., 1990). Therefore, lower levels of glycerol may be used to increase digestibility of medium-quality forages without negatively impacting forage intake.

Biodiesel is an alternative diesel fuel that is gaining interest in the United States. It is a non-toxic and biodegradable fuel, which can be made from animal fats or vegetable oils, for example soybeans. Glycerol is an end-product from the transesterification reaction, where methanol is added to triglycerides (oils) and catalyzed to produce biodiesel and glycerol (National Renewable Energy Laboratory). Excess methanol is sometimes used to ensure the completion of the reaction, which can be harmful to animals (National Renewable Energy Laboratory).

**Implications**

Based on these results, supplementing meat goats with glycerol at 5% of the total diet could prove beneficial to producers when feeding medium-quality hay. The energy supplement could potentially increase profitability, by allowing producers to feed hay that is somewhat lower in quality. However, further evaluations are needed to determine potential economic and carcass quality benefits of supplementing glycerol.

**Literature Cited**


**Table 1. Intake, gain and digestibility by meat goats offered a crabgrass/goosegrass basal diet and supplemented with glycerol or molasses.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Control</th>
<th>5% Glycerol</th>
<th>10% Glycerol</th>
<th>10% Molasses</th>
<th>Contrasts&lt;sup&gt;a&lt;/sup&gt;</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial BW, lb</td>
<td>51.9</td>
<td>51.5</td>
<td>51.9</td>
<td>51.7</td>
<td>0.72</td>
<td></td>
</tr>
<tr>
<td>Final BW, lb</td>
<td>50.5</td>
<td>49.1</td>
<td>51.1</td>
<td>50.5</td>
<td>0.81</td>
<td></td>
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<tr>
<td>ADG, lb</td>
<td>-0.1</td>
<td>-0.2</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Hay DM intake, g</td>
<td>271</td>
<td>332</td>
<td>231</td>
<td>259</td>
<td>35.4</td>
<td></td>
</tr>
<tr>
<td>DMI % BW</td>
<td>1.15</td>
<td>1.43</td>
<td>0.95</td>
<td>0.10</td>
<td>1.312</td>
<td></td>
</tr>
<tr>
<td>Total DM, digestibility, %</td>
<td>58.7</td>
<td>65.9</td>
<td>61.0</td>
<td>61.6</td>
<td>C</td>
<td>2.32</td>
</tr>
</tbody>
</table>

<sup>a</sup> Significant contrasts: A = mean of control vs. means of supplements, B = mean of glycerol vs. mean of molasses, C = mean of 5% glycerol vs. mean of control