Effects of Feeding Condensed Distillers Solubles With and Without Oil Extraction on Growing Cattle Performance

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Summary

A growing study compared the effects of condensed distillers solubles (CDS) with and without corn oil removal at 20 and 40% inclusion in a grass hay diet and 40% inclusion in wheat straw or grass diets. Steers responded positively to increasing levels of CDS. Fat content had no effect on ending BW, DMI, or ADG but impacted F:G. Steers fed normal fat CDS had 13.6% greater F:G at 20% inclusion but only 1% greater F:G at 40% inclusion than de-oiled CDS. Normal CDS had greater value at 20% inclusion but at 40% inclusion, oil content likely hindered fiber digestion.

Introduction

Two recent studies conducted at the University of Nebraska–Lincoln have shown that condensed distillers solubles (CDS), which is typically added back to distiller grains, can be the sole byproduct in forage diets. Beets solubles (CDS), which is typically a byproduct for the livestock industry. The objectives of this study were to: 1) evaluate CDS with (normal) and without (de-oiled) corn oil at 20% and 40% inclusion; and 2) compare normal fat and de-oiled CDS in a grass diet to a wheat straw diet on growing performance.

Procedure

An 84-day growing trial utilized 60 crossbred steer calves (BW = 530 ± 31 lb) that were individually fed using the Calan gate system. Prior to initiation of the trial, steers were limit fed to minimize gut fill, and then weighed on three consecutive days to determine initial BW. Based on initial BW, steers were stratified and assigned randomly to one of seven treatments within strata. Of the seven treatments (Table 1), five of the treatments were designed as a 2x2+1 factorial comparing de-oiled and normal fat CDS with different forage bases of either wheat straw or the GRASS diet in the previous treatments with 40% de-oiled or 40% normal CDS.

The six treatments containing CDS consisted of 8 steers per treatment with the control diet containing 12 steers. All diets were formulated to meet metabolizable protein requirements using the 1996 NRC model. Feed refusals were sampled weekly, weighed, and then dried in a 60°C forced air oven for 48 hours to calculate DMI. At the conclusion of the trial, steers were limit fed for five days receiving the 50% wet corn gluten feed and 50% grass hay diet. Steers were weighed on three consecutive days and averaged to determine ending BW. All diets were formulated to provide 200 mg/steer daily of monensin.

Data were analyzed using MIXED procedures of SAS as a completely randomized design with animal serving as the experimental unit. The 2x2+1 factorial design was analyzed for a fat (de-oiled, normal) by CDS level (20, 40) interaction, and using orthogonal contrasts for a fat (de-oiled, normal) by CDS level (20, 40) interaction, and using orthogonal contrasts of either wheat straw or the GRASS diet to a wheat straw diet on growing performance.

Table 1. Diet composition on a DM basis fed to growing steers.

<table>
<thead>
<tr>
<th>Ingredient, % of DM</th>
<th>Control</th>
<th>De-oiled CDS</th>
<th>Normal CDS</th>
<th>De-oiled WS</th>
<th>Normal WS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>20</td>
<td>40</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Brome Hay</td>
<td>77.1</td>
<td>59.6</td>
<td>42.2</td>
<td>59.6</td>
<td>42.2</td>
</tr>
<tr>
<td>Sorghum Silage</td>
<td>19.3</td>
<td>14.9</td>
<td>10.5</td>
<td>14.9</td>
<td>10.5</td>
</tr>
<tr>
<td>Wheat Straw</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>55.2</td>
</tr>
<tr>
<td>CDS: De-Oiled</td>
<td>0</td>
<td>20</td>
<td>40</td>
<td>—</td>
<td>40</td>
</tr>
<tr>
<td>CDS: Normal Fat</td>
<td>0</td>
<td>—</td>
<td>20</td>
<td>40</td>
<td>—</td>
</tr>
<tr>
<td>Supplement²</td>
<td>3.7</td>
<td>5.5</td>
<td>7.3</td>
<td>5.5</td>
<td>4.8</td>
</tr>
<tr>
<td>CGM³</td>
<td>2.0</td>
<td>3.4</td>
<td>4.8</td>
<td>3.4</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Analyzed Composition, %

| Ingredient         | 1.47    | 2.39        | 5.15       | 3.23       | 8.83     | 2.91    | 8.42   |

1CDS = Condensed Distillers Solubles; WS = Wheat Straw.  
2Formulated to provide 200 mg/steer daily of Rumensin.  
3Corn gluten meal increases in supplement as CDS inclusion increases in diet.
Results

The fat contents of the de-oiled and normal CDS were 6.3% and 20.1%, respectively. Crude protein was slightly greater in the de-oiled CDS (28.0%) than in the normal fat CDS (26.4%), suggesting CP or nutrient concentration may slightly increase when corn oil is removed. The sulfur content for the de-oiled and normal fat CDS was 0.99% and 0.83%, respectively. The DM content of de-oiled and normal fat CDS was 27.0 and 27.5%, respectively.

Level of Solubles

Ending BW, DMI, and ADG increased linearly with increasing levels of CDS (P < 0.01), but fat content of CDS did not impact (P > 0.21) these variables (Table 2). There was a tendency (P = 0.14) for an interaction between solubles level and oil content for F:G. Feed conversion was 13.4% improved for normal CDS than de-oiled CDS when both were fed at 20% of the GRASS diet. When fed at 40% of the GRASS diet, feed conversion differed only 1%. When analyzed including the control, the de-oiled level response was linear (P < 0.01) while the normal CDS level response tended to be quadratic (P = 0.10). We conclude that a biological interaction exists due to a negative impact of dietary oil on fiber digestion at high inclusions of CDS in the diet. Past research has shown that unsaturated fat such as corn oil, is toxic to fiber digesting bacteria.

Forage Type

Analyzing the 2x2 factorial for forage type and oil content, an interaction was observed (P = 0.06) for DMI, tended to for ADG (P = 0.13), and no interaction for BW or F:G (P > 0.43) (Table 3). Dry matter intake was not different (P = 0.43) between de-oiled and normal fat CDS in GRASS treatments, but was lower (P = 0.06) for normal fat CDS compared to de-oiled CDS in wheat straw diets. Steers fed GRASS diets had greater DMI than either wheat straw treatment (P < 0.01). Ending BW was greater for steers fed GRASS diets compared to steers fed wheat straw due to greater ADG. Even though DMI was greater for GRASS diets, F:G was better (5.67) for GRASS fed steers than steers fed wheat straw (6.85). At 40% inclusion, fat content of CDS had no impact on F:G (P > 0.40) in either type of diet.

Growing calves fed CDS had greater ending BW and ADG with increasing inclusions of CDS. Fat content of CDS impacted F:G with steers fed the normal fat being 13.4% more efficient (P < 0.01) than steers fed wheat straw (6.85). At 40% inclusion, fat content of CDS had no impact on F:G (P > 0.40) in either type of diet.