Effect of feeding poultry litter on growth and nutrients utilization in crossbred calves

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ABSTRACT

Eighteen crossbred male calves of 5-6 months of age were used in a randomized block design experiment to study the effect of feeding different levels of poultry litter through concentrate mixture on the utilization of nutrients and growth rate. Concentrate mixtures contained 0, 25 and 50% protein from poultry litter processed by dry heating at 135°C for 10 hr.

The digestibility coefficient values of dry matter, crude fibre, ether extract and nitrogen-free extract did not differ significantly when poultry litter was fed at different levels through the concentrate mixture. Nitrogen digestibility and nitrogen retention were, however, significantly (P < 0.01) lower in the groups fed poultry litter than in the control. The daily gains in body weights of animals fed control, and concentrate mixture with 25% protein from poultry litter were significantly (P < 0.05) higher than of animals fed concentrate mixture with 50% protein from poultry litter.

The present investigation was planned to determine the optimum level at which poultry (layer) litter can be included in the rations of growing crossbred calves. Earlier studies (Toro and Mudgal, 1983) clearly indicated the need for processing poultry litter by dry heating at 135°C for 10 hr so as to destroy the pathogens present in the litter. Hence, the poultry litter was heat processed and then incorporated in the ration.

MATERIALS AND METHODS

Eighteen crossbred male calves (Brown Swiss x Sahiwal), 5-6 months old, were divided into 3 groups on the basis of their body weight and allotted to 3 dietary treatments using a randomized block design. Treatment A was taken as

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control (no poultry litter). Treatments B and C had concentrate mixture containing 25 and 50% crude protein, respectively, from poultry litter. Poultry litter dried at 135°C for 10 hr was used. The proportion of different concentrate ingredients is given in Table 1.

Table 1. Ingredient composition of concentrate mixture (%)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Treatment</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundnut-cake</td>
<td></td>
<td>15</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>Maize</td>
<td></td>
<td>40</td>
<td>30</td>
<td>--</td>
</tr>
<tr>
<td>Wheat bran</td>
<td></td>
<td>42</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Poultry litter</td>
<td></td>
<td>--</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Starch</td>
<td></td>
<td>2</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>Mineral mixture</td>
<td></td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Salt</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Crude protein</td>
<td></td>
<td>16.04</td>
<td>16.09</td>
<td>19.90</td>
</tr>
</tbody>
</table>

Green fodder was given @ 5 kg per day to all the animals throughout the experiment. The amount of concentrate was adjusted every fortnight to meet the remaining protein requirement of calves as per NRC (1971) standards. Rest of the dry matter and TDN requirements were met through wheat straw. Body weights of the calves were recorded every fortnight during the experimental period of 180 days. After 12 weeks of experimental period a 7-day metabolic trial was conducted to study the nutrients utilization.

Samples of feeds and faeces were analysed for various proximate principles by the procedures of AOAC (1975). Urine was analysed as per AOAC (1975) for nitrogen content. Calcium was estimated according to the method of Talapatra et al. (1940). Phosphorus was determined by the colorimetric method of AOAC (1975). Statistical analysis was carried out according to Snedecor and Cochran (1968).

RESULTS AND DISCUSSION

Chemical composition of feeds and fodders

The ingredient composition of concentrate mixture is given in Table 1. The poultry litter contained 13.24% crude protein. The other ingredient values were 26.23, 0.89, 25.75, 33.89, 5.70 and 1.44%, respectively, for crude fibre, ether extract, nitrogen-free extract, ash, calcium and phosphorus.

Digestibility coefficients of various nutrients

The data on digestibility of nutrients are presented in Table 2. There was a significant (P < 0.01) decrease in the digestibility of crude protein with the increase in poultry litter level. This could be due to the high crude fibre content in the poultry litter (Tagari et al., 1976) and high temperature at which poultry litter was sterilized.

The digestibilities of dry matter, crude fibre, ether extract and nitrogen-free extract did not differ significantly among treatments (Table 2).

Nitrogen and mineral balances

Nitrogen retention decreased significantly (P < 0.01) with the increase in poultry litter level in the concentrate mixture. This reflects lower digestibility of protein in poultry litter, and apparently

Table 2. Average digestibility coefficients (%) for various nutrients

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dry matter</th>
<th>Crude protein</th>
<th>Crude fibre</th>
<th>Ether extract</th>
<th>Nitrogen-free extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>61.53 ± 2.31</td>
<td>64.40 ± 2.19</td>
<td>52.33 ± 3.34</td>
<td>69.30 ± 2.17</td>
<td>62.57 ± 1.66</td>
</tr>
<tr>
<td>B</td>
<td>59.47 ± 2.34</td>
<td>60.80 ± 2.06</td>
<td>50.31 ± 2.05</td>
<td>68.24 ± 2.10</td>
<td>61.60 ± 2.47</td>
</tr>
<tr>
<td>C</td>
<td>56.11 ± 2.50</td>
<td>54.43 ± 1.60</td>
<td>51.36 ± 2.80</td>
<td>66.69 ± 1.89</td>
<td>60.27 ± 2.46</td>
</tr>
<tr>
<td></td>
<td>NS</td>
<td>**</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS, Not significant; **, significant at P < 0.01.
low nitrogen intake and high faecal excretion in groups fed poultry litter. Urinary nitrogen excretion was similar in all the 3 groups.

Calcium balance was positive in all the groups. It increased significantly (P < 0.01) with the increase in poultry litter level. This may be attributed to the high calcium content (5.70%) in poultry litter. This confirms the observations of Soundara Rajan and Khan (1978). However, Mudgal and Kaur (1976) found that calcium retention in growing calves was not dependent on calcium intake.

The major pathway of calcium excretion was through faeces. Mudgal and Ray (1967) and Kishan and Husain (1977) were also of the same opinion.

Significantly higher (P < 0.01) retention of phosphorus was observed in the group C (Table 3). The effect of the other 2 treatments was not significantly different. The differences in the phosphorus balance among treatments may be explained on the basis of differences in the intake of the element.

Growth rate and feed conversion efficiency

The lower growth rate in growth C (Table 4) indicated less efficient utilization of dietary protein at higher level of poultry litter in the concentrate mixture. Furthermore, the intake of concentrate mixture, the major source of protein, was significantly lower (P < 0.01) in group C (1.270 kg/day) than in groups A (1.474 kg/day) and B (1.403 kg/day). However, lower dry-matter intake in poultry-litter groups was compensated by higher intake of straw resulting in similar dry-matter intake in all the groups. Dry-matter intake in groups A, B and C through straw was 0.554, 0.612 and 0.720 kg per day respectively. Low performance exhibited by calves in poultry-litter-fed groups may also be attributed to the high temperature treatment of the litter as suggested by El-Sabban et al. (1970).

Menawat and Sharma (1973) observed nonsignificant differences in body-weight gains on rations containing 0, 25 and 50% poultry litter. Goel and Pradhan (1978) obtained higher daily body-weight
gains in groups fed poultry litter than in those fed urea-molasses ration.

The amount of total dry matter required to attain 1 kg of live-weight gain was similar in groups A and B but increased significantly (P < 0.01) in group C (Table 4). It seems that poultry litter at a higher level (50% concentrate proportion) may not be conducive for better feed conversion efficiency for growth. The results are in agreement with those of Makkar et al. (1980) who observed that concentrate mixtures containing poultry litter at 37 and 60% were required more in quantity per unit weight gain in buffaloes than in control concentrate mixture. Tagari et al. (1976) also reported that the feed-conversion efficiency of fattening steers was impaired when the proportion of litter in the concentrate mixture exceeded 25%.

REFERENCES


