THE EFFECT OF SUBSTITUTING MOLASSES FOR GRAIN IN HIGH LEGUME ROUGHAGE RATIONS FOR FATTENING CATTLE

P. N. THURBON* and L. WINKS†

Summary

Twelve groups, each of four Shorthorn steers, were group-fed on 12 rations for approximately 96 days and then slaughtered.

The roughage component of the ration was either green cowpea forage for the whole period, or cowpea forage followed by lucerne hay for the last 40 days of the experiment.

Grain or molasses was fed at the rate of 0 per cent, 10 per cent or 25 per cent of the ration. An additional treatment of 60 g of urea/head/day at the 25 per cent molasses level was also included.

The roughage source had no significant effect on liveweight gain, but the substitution of the green forage by lucerne hay resulted in a significant decline in the dressing percentage.

The liveweight gain of the roughage only groups (0.64 kg/head/day) was significantly lower than all other groups except those receiving 10 per cent grain. The mean liveweight gain in the groups receiving grain or molasses varied between 0.73 and 0.91 kg/head/day. The substitution of grain by molasses did not reduce either liveweight gain or dressing percentage, and the urea supplement had no effect on performance.

I. INTRODUCTION

The finishing of beef cattle in feedlots is undertaken in Australia only on a limited scale because of the doubtful economics of the practice. One of the basic factors involved is the high cost of conventional feedstuffs relative to returns. A possible means of reducing costs adjacent to the coastal cane growing areas of Queensland is the use of molasses as an energy substitute for grain. This paper presents the results of a lot feeding experiment using rations based on green cowpeas grown with natural rainfall or irrigation and supplemented with either molasses or gram.

II. MATERIALS AND METHODS

(a) Yards and Facilities

The project was undertaken at the Cattle Field Research Station, Ayr, North Queensland, utilizing yards and facilities described by Thurbon and Winks (1968).

(b) Feedstuffs

Malabar cowpea (*Vigna sinesis*) was planted at approximately weekly intervals.

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from January to mid-April. All except the final three plantings were grown without irrigation. No fertilizer was used on the crop. Row spacing was 0.6 m and planting rate was 22.5 kg/ha.

The *cowpea* forage was cut daily using a secondary cut flail type forage harvester. Generally, the length of cut was 2.5 to 7.6 cm. The grain was hammer milled through a 1 cm screen prior to mixing. The grain used during the experiment was a mixture of 50 per cent maize and 50 per cent sorghum.

The hay, molasses and grain were purchased as single consignments before the beginning of the experiment.

(c) **Chemical Analyses**

Samples of ration components for dry matter (D.M.) determination and crude protein analyses were taken prior to the experiment except in the case of *cowpea* forage where samples were taken daily, dried at 95°C and bulked for a weekly analysis. Methods of analysis were those of the A.O.A.C. (1960).

(d) **Method of Feeding**

The animals were group fed in pens and the supplements were fed with the roughage. Daily supplement allocation was based on the roughage consumption of the previous day.

(f) **Animals**

Forty-eight Shorthorn steers from the Charters Towers region of North Queensland were purchased for the project. These animals were approximately 30 months of age and 300 kg liveweight.

(f) **Liveweighting and Carcass Measurements**

Initial liveweights were the mean of three daily weighings obtained during the last 3 days of a 13 day preliminary period of *cowpea* feeding. Throughout the experiment, liveweights were recorded at weekly intervals prior to the morning feeding. Final liveweights were the mean of three daily recordings prior to slaughter.

At the conclusion of the experiment, the cattle were transported 80 km and held without feed and water for 12 h before slaughter. Cold carcass weights were determined after a 24 h chilling period. A mean dressing percentage based on cold carcass weight and final yard liveweight was calculated for all groups.

(g) **Experimental Design**

The cattle were allocated on the basis of initial liveweight (mean of three recordings) by stratified randomization into 12 groups to receive rations (on a D.M. basis) as follows:

Groups 1 and 7 — roughage 100 per cent.
Groups 2 and 8 — roughage 90 per cent, grain 10 per cent.
Groups 3 and 9 — roughage 75 per cent, grain 25 per cent.
Groups 4 and 10 — roughage 90 per cent, molasses 10 per cent.
Groups 5 and 11 — roughage 75 per cent, molasses 25 per cent.
Groups 6 and 12 — roughage 75 per cent, molasses 25 per cent and 60 g urea/head/day

Groups 7 to 12 received similar combinations to groups 1 to 6 respectively except that, after 57 days feeding, *cowpea* was replaced as the roughage component of the ration by lucerne hay. The duration of the feeding period was 94 days for groups 1 to 6 and 97 days for groups 7 to 12.
III. RESULTS

For the first 50 days, the mean D.M. and crude protein content of the cowpea forage was 23.4 per cent and 13.7 per cent respectively. For the remaining period of the trial, there was a marked improvement in the quality of the feed, the relevant values being 13.4 per cent D.M. and 20.7 per cent crude protein. The dry matter and crude protein contents of other ration constituent were lucerne hay — 90 per cent and 13 per cent; maize — 88.8 per cent and 9.8 per cent; sorghum -89.2 per cent and 11.2 per cent, and molasses — 77 per cent and 4.1 per cent, respectively.

Feed intake, liveweight gain and dressing percentage are shown in Table 1, and statistical analysis in Table. 2. Supplementing the basic roughage ration with either molasses or grain resulted in an increase in D.M. consumption, and increasing the grain supplement from 10 per cent to 25 per cent also increased the D.M. consumption (Tables 1 and 2).

The roughage source had no significant effect on liveweight gain. Generally, the effect of the supplements was to increase liveweight gain. There was a trend for increased gain with increased level of supplement, but the differences were not significant.

There was no significant effect of energy concentrate source (Tables 1 and 2).

The dressing percentages of animals fed lucerne hay in the last 40 days of the experiment were significantly lower than those of animals fed cowpea forage throughout. Significant differences in dressing percentages related to level of supplement were similar to those recorded for liveweight gain. (Tables 1 and 2).

On the 50th day, one of the animals in treatment 3 (roughage 75 per cent, grain 25 per cent) died, the cause of death being diagnosed as bloat.

IV. DISCUSSION

The weight gains on the high molasses rations approximated those obtained on the high grain rations. Since the dry matter intakes were similar, the molasses must have been utilized by the steers as efficiently as the grain. This has been reported by other workers (King 1937; Bray et al. 1945; Cowsert 1940; Edwards 1931; Kirk, Shealy and Crown 1941; Skinner and King 1915, 1938). Generally, these workers used complex rations and replaced portion of the grain with molasses. The level of molasses in these studies, with few exceptions, would not have exceeded 10 per cent of the ration.

The results of our experiment seem to disagree with those of Lofgreen and Otagaki (1960), who found a highly significant decrease in consumption when the molasses in the ration was increased from 10 per cent to either 25 per cent or 40 per cent. Lofgreen and Otagaki (1960) found that the weight of dry matter necessary to produce 454 g (1 lb) liveweight increased markedly as the molasses level increased. This was not found in our study. Furthermore, the weight gain/100 kg of feed, which they calculated as an efficiency measure, was markedly superior at the 25 per cent molasses level in this study in comparison with Lofgreen and Otagaki’s result (10.8 kg v. 8.7 kg).

The feed requirement/kg of liveweight gain found in our experiment is higher than that recorded by Morris and Gartner (1967) and Mawson and
TABLE 1

*Feed intake and growth rate in steers receiving differing percentages of molasses and grain with legume roughage*

<table>
<thead>
<tr>
<th>Roughage Source</th>
<th>Cowpea</th>
<th>Cowpea (57 days)</th>
<th>Lucerne (40 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Supplement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Molasses (%)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>(2) Grain (%)</td>
<td>—</td>
<td>10.2</td>
<td>25.0</td>
</tr>
<tr>
<td>(3) Urea (g)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Nett D.M. consumed /head/day (kg)</td>
<td>7.4</td>
<td>8.0</td>
<td>8.4</td>
</tr>
<tr>
<td>Mean daily D.M. consumption /100 kg liveweight (kg)</td>
<td>2.3</td>
<td>2.4</td>
<td>2.5</td>
</tr>
<tr>
<td>Growth rate (kg/head/day)</td>
<td>0.64</td>
<td>0.77</td>
<td>0.77</td>
</tr>
<tr>
<td>Efficiency of feed conversion (kg feed /kg liveweight gain)</td>
<td>11.8</td>
<td>10.7</td>
<td>11.0</td>
</tr>
<tr>
<td>Dressing % *</td>
<td>52.8</td>
<td>54.0</td>
<td>53.9</td>
</tr>
</tbody>
</table>

*Computed on cold carcass weight as a percentage of final yard liveweight.*
TABLE 2

Significant level of the difference between the treatments for each performance characteristic

<table>
<thead>
<tr>
<th></th>
<th>Liveweight Gain (kg)</th>
<th>Dressing %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Effect of roughage:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malabar cowpea —</td>
<td>75.5</td>
<td>53.44</td>
</tr>
<tr>
<td>groups 1-6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malabar cowpea and lucerne hay —</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groups 7-12</td>
<td>76.2</td>
<td>51.46</td>
</tr>
<tr>
<td>S.E. of difference</td>
<td>3.90</td>
<td>0.32</td>
</tr>
<tr>
<td>Level of significance</td>
<td>N.S.</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Effect of supplement:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. 100% roughage</td>
<td>61.2</td>
<td>51.06</td>
</tr>
<tr>
<td>2. 90% roughage + 10% grain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. 75% roughage + 25% grain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. 90% roughage + 10% molasses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. 75% roughage + 25% molasses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. 75% roughage + 25% molasses + urea 60 g</td>
<td>81.4</td>
<td>52.79</td>
</tr>
<tr>
<td>S.E. of difference between 2 treatments (not treatment 3)</td>
<td>6.68</td>
<td>0.55</td>
</tr>
<tr>
<td>Level of Significance</td>
<td>6.92</td>
<td>0.57</td>
</tr>
</tbody>
</table>

*P < 0.05
**P < 0.01
***P < 0.001

Arbuckle (1960). This reflects the higher energy rations fed by those workers (66 per cent to 90 per cent of their ration being grain) which resulted in higher weight gains from intakes which were similar to those recorded in our work.

The ineffectiveness of the urea supplement suggested that the factor limiting increased weight gains was the energy concentration in the ration rather than the nitrogen content.

V. ACKNOWLEDGMENTS

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VI. REFERENCES


