COMPARATIVE PERFORMANCE OF BUFFALOES AND CATTLE ON RATIONS BASED ON ROUGHAGE OR CONCENTRATE

D. FFOLKES and D. SMITH

Dept of Primary Industry and Fisheries, Berrimah Agricultural Research Centre, Berrimah, N.T. 0828.

SUMMARY

The extent to which differences in digestive function between buffaloes and cattle affects performance and feed utilisation of diets based on hay or grain was investigated in 2 experiments. In experiment 1, overall performance was significantly poorer for cattle than buffaloes on rations containing 65% chaffed hay or 65% cracked maize, due to the cattle experiencing more initial digestive problems with the grain. Feed conversions (kg DM intake/kg liveweight gain) by buffaloes and cattle were 7.9 v. 10.0 ($P < 0.01$) and 6.8 v. 8.8 ($P < 0.01$) for roughage and grain diets respectively. In experiment 2, production responses to a diet of 80% long hay were similar between species, whereas cattle gained 39% more liveweight ($P < 0.01$) than buffaloes with an 80% concentrate diet. There were no species differences in feed conversion within diets, values being 16.0 and 10.3 for roughage and grain respectively. It was concluded that there was no economic advantage in feeding more than 35% concentrates in buffalo rations.

Keywords: buffalo, cattle, feedlot rations, feed efficiency.

INTRODUCTION

The buffalo industry in the Northern Territory aims to capture a potentially lucrative market for lean and tender buffalo meat for table consumption. Ffoulkes and Lemcke (1988) suggested that under feedlot conditions, ration formulations to achieve this objective should be aimed at reducing feed costs by exploiting the apparent advantage in digestive function of buffalo over cattle. Kennedy et al. (1992a) described this advantage as the superior ability to break down and propel digesta from the reticulo-rumen if accelerated passage results in enhanced protein flow to the intestines. Any species differences in the utilisation of these feeds will be important in the formulation of least cost rations for a buffalo finishing operation.

The studies reported here investigated the extent to which feedlot performance and feed efficiency were affected by the apparent differences in digestive function between buffalo and cattle when fed rations based on hay or concentrate.

MATERIALS AND METHODS

Two pen feeding trials were conducted at Berrimah Agricultural Research Centre (12°30’S lat., 131°00’E long.) near Darwin. Experimental animals were housed in yards each containing an automatic drinker and a feed trough. The feeding area was covered and had a concrete floor.

Experiment 1

Twenty-four swamp buffalo heifers (Bubalus bubalis) and 24 Brahman heifer crossbreds (approximately 3/4 Bos indicus, 1/4 B. taurus) with mean (±s.d.) fasted liveweights of 215 ± 14.1 kg and 189 ± 16.5 kg respectively were stratified by liveweight within species and randomly assigned to 2 groups of 4 pens (6 heifers/pen) in a 2 species x 2 diets factorial design. Dietary treatments were either based on roughage (65% pangola hay (Digitaria decumbens), 30% cracked maize, 5% meat meal) or grain (65% cracked maize, 30% pangola hay, 5% meat meal). The hay was chaffed coarsely and mixed with the concentrates. Diets were fed to appetite after an adaptation period of 10 days. Liveweight changes (based on fasted weights) and feed intakes were measured over a 65-day feeding period (including the adaptation period) during the Wet season (Nov.-Jan.). Blood samples taken at the end of the experiment were analysed for plasma urea-N concentration.

Experiment 2

Twenty-four buffalo heifers and 24 3/4 Brahman heifer crossbreds, with mean (±s.d.) liveweights of 252 ± 18.5 kg, and 264 ± 14.3 kg respectively, were randomly assigned to 8 pens (6 heifers/pen) in a 2 species x 2 diets x 2 periods Latin square design with 2 replicates. Treatment groups were rotated at weekly intervals between pens during each feeding period of 65 days, and there was a break of 7 weeks between periods when animals grazed pangola pasture. The study was carried out during the dry season (May-Oct.).

Diets were either based on roughage (80% pangola hay, 12% cracked sorghum grain, 8% meat meal)
or concentrate (72% cracked sorghum grain, 20% pangola hay, 8% meat meal). Animals were adapted
to dietary treatments over a 10-day period and then fed to appetite. The hay for the roughage based diet was fed long in separate racks suspended over the trough and was chaffed and mixed into the high
concentrate diet. Sodium bicarbonate (25 g/head/day) was added to the diets and animals had access to
salt based mineral lick-blocks. Fasted liveweights and feed intakes were recorded. Blood samples were
collected at the end of each feeding period for analysis of plasma urea-N concentration.

RESULTS

Experiment 1

The protein content of the diets was 8.8% and 10.6% DM respectively for rations containing 65%
roughage or 65% grain. Both species adapted poorly to the diets at the start of the experiment. During
the first 17 days of feeding, cattle lost weight whereas buffalo maintained weight (8 v. 0 kg (unfasted
basis); \( P < 0.02 \)). The experimental results are shown in Table 1. Over the whole experimental period,
weight gains were similar between diets within species and buffaloes had higher liveweight gains than
cattle (46 v. 36 kg; \( P < 0.001 \)). However, between days 17 and 65, growth rates were better on the grain
than roughage diet (0.76 v. 0.66 kg/day; \( P < 0.05 \)). Feed intakes were less for buffaloes than cattle
(2.27 v. 2.58 kg DM/100 kg liveweight; \( P < 0.01 \)) and less on the concentrate diet than on the roughage
diet (2.33 v. 2.52 kg DM/100 kg liveweight; \( P < 0.01 \)). Feed conversion was better in buffaloes than cattle
(7.4 v. 9.4 kg DM intake/kg liveweight gain; \( P < 0.001 \)) and lower with concentrate than
roughage based diets (7.8 v. 9.0 kg; \( P < 0.01 \)). Blood urea levels were higher in buffalo than cattle after 9
weeks of feeding, and there was a significant (\( P < 0.05 \)) interaction between species and diets with
cattle on roughage and grain diets exhibiting lower and higher concentrations of blood urea respectively
compared with buffaloes (Table 2).

Table 1. Comparative performance of swamp buffalo and cattle (Brahman cross) heifers fed rations containing
65% coarsely chaffed pangola hay (roughage) or 65% cracked maize (grain) for a period of 65 days.

<table>
<thead>
<tr>
<th></th>
<th>Buffalo Roughage</th>
<th>Buffalo Grain</th>
<th>Cattle Roughage</th>
<th>Cattle Grain</th>
<th>Signif. of effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liveweight change (kg)</td>
<td>45b</td>
<td>48b</td>
<td>35a</td>
<td>37a</td>
<td>*** n.s.</td>
</tr>
<tr>
<td>Growth rates (kg/day)(^A)</td>
<td>0.67</td>
<td>0.77</td>
<td>0.66</td>
<td>0.76</td>
<td>n.s.  *</td>
</tr>
<tr>
<td>(days 17–65)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed intake (kg DM/100 kg LW)</td>
<td>2.36b</td>
<td>2.17a</td>
<td>2.67d</td>
<td>2.50c</td>
<td>** **</td>
</tr>
<tr>
<td>Feed conversion (kg DM intake/kg LW gain)</td>
<td>7.7b</td>
<td>6.7a</td>
<td>9.8d</td>
<td>8.7c</td>
<td>*** **</td>
</tr>
</tbody>
</table>

\(^*p < 0.05\), \(^**p < 0.01\), \(^***p < 0.001\); n.s., not significant.
\(^A\)By regression analysis of weekly unfasted liveweights.

Table 2. Blood urea concentrations (mg N/L) of buffalo and cattle taken after feeding for 9 weeks
on roughage or concentrate diets.

<table>
<thead>
<tr>
<th></th>
<th>Buffalo Roughage</th>
<th>Buffalo Conc.</th>
<th>Cattle Roughage</th>
<th>Cattle Conc.</th>
<th>Signif. of effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expt 1</td>
<td>196c</td>
<td>179c</td>
<td>108a</td>
<td>140b</td>
<td>*** n.s.</td>
</tr>
<tr>
<td>Expt 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Period 1</td>
<td>206b</td>
<td>148a</td>
<td>173a</td>
<td>206b</td>
<td>n.s. n.s.</td>
</tr>
<tr>
<td>Period 2</td>
<td>196ab</td>
<td>175a</td>
<td>170a</td>
<td>232b</td>
<td>n.s. n.s.</td>
</tr>
</tbody>
</table>

\(^tP < 0.1\), \(^***P < 0.001\); n.s., not significant.
Experiment 2

The protein content of the diets was 8.1 and 12.5% DM respectively for concentrate/roughage ratios of 20:80 and 80:20. No digestive problems were encountered with feeding of high levels of cracked sorghum grain. Table 3 gives the results of this experiment. There were no species differences in live weight change on the roughage diet, although grain-fed cattle gained 39% more live weight ($P < 0.05$) than buffaloes on the same ration. With both rations, cattle had higher feed intakes than buffalo (2.15 vs. 1.83 kg DM/100 kg live weight; $P < 0.001$). Intakes of the concentrate diet, particularly by cattle, were greater than for roughage (2.14 vs. 1.85 kg DM/100 kg live weight; $P < 0.001$), and feed efficiency was increased by 35% for concentrate compared with roughage diets, no species difference was evident. There was no species differences in urea concentration in blood taken after each feeding period, however a significant ($P < 0.05$) a species x diet interaction was evident (see Table 2).

Both species tended to eat more ($P < 0.05$) in the second period. A species x period interaction ($P < 0.05$) occurred with live weight change, with buffalo gaining more in the second period than in the first, and *vice versa* for cattle. This pattern was reflected in an interaction with feed conversion ($P < 0.05$).

Table 3. Comparative performance of buffalo and cattle on rations containing 80% pangola hay fed long (roughage) or 72% cracked sorghum (concentrates)

<table>
<thead>
<tr>
<th></th>
<th>Buffalo</th>
<th>Cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Roughage</td>
<td>Conc.</td>
</tr>
<tr>
<td>Liveweight change (kg)</td>
<td>20a</td>
<td>31b</td>
</tr>
<tr>
<td>Feed intake (kg DM/100 kg LW)</td>
<td>1.77a</td>
<td>1.92bc</td>
</tr>
<tr>
<td>Feed conversion (kg LW gain)</td>
<td>15.2b</td>
<td>10.3a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Roughage</th>
<th>Conc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liveweight change (kg)</td>
<td>21a</td>
<td>43c</td>
</tr>
<tr>
<td>Feed intake (kg DM/100 kg LW)</td>
<td>1.90b</td>
<td>2.38d</td>
</tr>
<tr>
<td>Feed conversion (kg LW gain)</td>
<td>16.8b</td>
<td>10.3a</td>
</tr>
</tbody>
</table>

Means within rows with different letters are significantly different at ($P<0.05$)

**DISCUSSION**

**Buffalo v. cattle**

Intakes by cattle fed both pangola hay or grain diets were higher than for buffalo. Kennedy *et al.* (1992a, 1992b) reported that intakes of Rhodes grass (*Chloris gayana*) were greater by cattle than buffalo, whereas diets of rice straw and spear grass were consumed more by buffalo. Feeding of unchaffed hay in experiment 2 was associated with reduced intakes of the roughage diet by both species.

In experiment 1, weight losses in grain-fed cattle at the start of feeding did not recover sufficiently to offset the poor performance and feed conversion value relative to buffalo. Although production responses to high levels of concentrate fed in experiment 2 were significantly greater for cattle than buffalo, cattle consumed more which resulted in similar feed efficiencies between species.

Once animals were adapted to the roughage based diet containing 30% cracked maize fed in experiment 1, there were no differences in growth rates between buffaloes and cattle. Likewise, both species responded similarly when given 80% long hay in experiment 2. This suggests that protein levels of 8.1–8.8% of dietary DM were not sufficiently limiting in these diets to demonstrate the digestive advantage of buffalo over cattle.

Buffaloes in experiment 1 had elevated blood urea concentrations compared with cattle (see Table 2). This is associated with higher blood urea levels generally found in buffaloes relative to cattle when fed low protein roughage diets, as was found in these studies, and may be reflective of enhanced nitrogen flow to the intestines and higher protein to energy in nutrients absorbed by the buffaloes compared with cattle observed by Kennedy *et al.* (1992a).

**Roughage v. concentrate for buffaloes**

In experiment 1, there was a slight improvement (13%) in feed utilisation by buffaloes given the high concentrate diet over the roughage based diet (6.7 v. 7.7 kg DM intake/kg live weight gain) but
liveweight gains were similar. At the higher concentrate level used in experiment 2, the relative performance of buffaloes in terms of production and feed conversion was poorer than on the roughage based diet in experiment 1. Thus maximising the efficiency with which buffaloes utilize feedlot rations appears to be more a function of their poor intake response to high levels of concentrate rather than the exploitation of a superior digestive function over cattle when given low protein roughage diets.

Charles and Johnson (1975) found that buffaloes under 30 months of age have a low tendency to fatten on high grain diets and represented an extreme of late maturity when compared with cattle. Taking this and the relative cost of roughage and grain into consideration, these studies suggest that there is no economic advantage in feeding concentrate levels in buffalo rations of more than 35%.

ACKNOWLEDGMENTS

These studies were part of an AMLRDC funded project. The assistance of many of the staff at the Berrimah Agricultural Research Centre is gratefully acknowledged.

REFERENCES


