THE PRACTICABILITY AND LEVELS OF PRODUCTION ACHIEVABLE FROM FEEDING GRAIN AND VIRGINIAMYCIN TO GRAZING CATTLE

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SUMMARY

In 3 on-farm supplementary feeding trials and 2 ad-lib feedlot trials, cattle were fed cereal grain and virginiamycin with no introduction period and achieved profitable rates of production. A response of 8.9 and 9.65 g liveweight gain/MJ ME for oats and barley respectively was established for up to 53 MJ ME/day of supplement. This was comparable to the response of 10 g LWG/MJ ME for the same range of supplements previously established in a pen trial. A growth rate of 1.2 1 kg/hd.day for cattle on ad lib grain and virginiamycin and grazing dry pasture was not significantly different to that of steers provided with a fully milled and mixed feedlot ration. Liveweight gains of cattle fed with ad lib wheat, barley and oats on dry pasture were 1.21, 1.26 and 1.39 kg/hd.day.

Keywords: grain, virginiamycin, supplement, feedlot, cattle

INTRODUCTION

Flexibility of production methods and the ability to adapt production strategies according to the variability of livestock and grain prices and the season is an important part of profitable cattle production. This flexibility applies to both supplementary feeding and feeding to market specifications. In many situations it is desirable to feed supplements to weaner cattle. This particularly applies in drought conditions, to achieve a saleable weight within a desirable market period or for calving of heifers at 2 years of age. Effective supplementation should also fill any gaps in the nutritional balance of the animals.

Cereal grains are easier to store and distribute than other supplements; however their use is normally limited by producers’ fear of acidosis. Virginiamycin (Stafac, Pfizer Animal Health) is a feed additive which has an inhibitory effect on the lactic acid producing organisms in the rumen (Streptococcus bovis and Lactobacillus spp) (Nagaraja et al. 1987). By applying virginiamycin to cereal grain, it has been shown that it is possible to safely supply a limited amount of grain to grazing cattle on a weekly basis, feed grain to cattle without an introductory period, and feed grain separate from roughage (Zorilla-Rios et al. 1991, Zorilla-Rios et al. 1994a, Zorilla-Rios et al. 1994b). This work showed that there were significant differences in liveweight gain response between daily grain supplementation, and weekly grain and virginiamycin supplementation in pens. It was therefore important to establish a response curve for weekly supplementation with grain and virginiamycin under herd grazing conditions.

The practicality of feeding grain separately from roughage on an ad lib basis was tested under commercial conditions in order to validate the results obtained under experimental pen feeding conditions. These experiments are a summary of a number of ‘on-farm’ trials examining the practicality and levels of production achievable when feeding grain to grazing cattle using virginiamycin.

MATERIALS AND METHODS

A production response to 3 levels of weekly supplementation with cereal grain and virginiamycin

The effect of supplementing weaners weekly with the equivalent of 1.5, 3 and 4.8 kg/d barley and 1.8, 3.6 and 5.4 kg/d oats to supply an additional 17, 34 and 52 MJ ME/day MJ ME/day was studied at 3 sites in the Esperance district: Limestone (1%) and 1-1.5% urea were added to the milled barley. Virginiamycin was included at 40 ppm for the first week of supplementation and 20 ppm thereafter. The ryegrass/clover pasture supplied an estimated 7.1 MJ ME/kg dry matter (range 6.4 - 7.7) and CP of 7.8 % (range 5.2 - 10.4%). The feed on offer initially averaged 4.09 t/ha with the lowest plot at 1.84 t/ha. The weaners were weighed, stratified and randomized between treatments and non-supplemented controls. All sites and plots were stocked at 1.25 steers/ha and supplemented for 84 days. The 3 sites were:

West Lort River: The 6 groups of 23 Hereford steers used had an initial average liveweight of 234 kg. They were supplemented with 0 or 3 levels of whole oats with virginiamycin.
Mt Howick Station: Four groups of 50 Hereford steers of an average liveweight of 270.9 kg were allotted to 4 plots. The steers were supplemented with 0 to 3 levels of milled barley with virginiamycin.

Young River Station: Five groups of 20 HerefordxAngus weaner steers with an initial average liveweight of 273.4 kg were allotted to 2 control plots and 3 supplement levels of milled barley and virginiamycin.

Grain finishing with virginiamycin

Morawa Agricultural District High School: One hundred and twenty and 74 Bos indicus x Shorthorn steers from Eneabba and Midland saleyards were stratified on origin and liveweight and randomly allocated to 3 treatments within strata. The 3 treatments were:

1. A sudden introduction to a milled and fully mixed ration in the feedlot (SM)
2. A sudden introduction to milled grain separate to unchopped hay in the feedlot (SH)
3. A sudden introduction to milled grain fed to cattle grazing available dry pasture (SG)

The milled and mixed ration was formulated to contain 14% crude protein and 11.6 MJ of ME/kg DM. The grain only rations had the same proportion of lupins and barley as the milled and mixed diet, without the hay, and contained 15.1% CP and 11.9 MJ ME/kg DM. All rations contained a mineral vitamin mix. Cattle were weighed at 3 week intervals. They were slaughtered after 83 and 105 days on feed, chilled carcasses were assessed by AUSMEAT standard (Anon. 1987) and the incidence of liver abscess was recorded.

Keaney College: 123 Hereford, Devon and Simmental or Saler cross steers and heifers were stratified on sex, breed and liveweight then allocated to treatments within strata. The 3 treatments were:

1. A sudden introduction of milled wheat to grazing heifers fed some hay (WSG)
2. A sudden introduction of milled barley to grazing heifers fed some hay (BSG)
3. A sudden introduction of whole oats to grazing heifers fed some hay (OSG)

Cattle were rotated between paddocks and weighed at approximate 3 week intervals. Total feed consumption was recorded. The CP content of the wheat, barley and oats was 10.6, 13.2 and 12.5 % respectively. The corresponding ME values were 12.4, 11.6 and 9.7 MJ ME/kg DM. Wheat and barley were milled and oats was fed whole. The crude protein content of the pastures at commencement of the trial ranged from 6.8 to 8.8%. The pasture MEs were similar; ranging from 7.3 to 7.4 MJ ME/kg DM.

RESULTS

A production response to 3 levels of weekly supplementation with cereal grain and virginiamycin

The absolute rates of liveweight gain at different sites were significantly different (P<0.05) within a supplement level (Table 1). A significant regression line could be fitted to both the West Lort River and Young River liveweight gain responses. The response slope for these 2 sites was 8.9 and 9.7 g/day of liveweight gain/MJ ME/day respectively. At these 2 sites the liveweight gain supported by pasture was only 0.13 and 0.16 kg/day respectively.

West Lort River: There was 1 mortality in the initial 72 hours after commencement of the trial in the highest supplementation group. No official post mortem examination was carried out; however the cause of death is thought to be either enterotoxaemia (no vaccination was carried out) or lactic acidosis. The regression relationship between the level of supplementation (MJ ME/day) (x) and liveweight gain (g/day) (y) can be described by the linear equation y = 96.8 + 8.9x (r² = 0.74).

Mt Howick Station: A poor liveweight (LW) gain response was evident in the groups supplemented with 1.5 and 3 kg/day, which has been unexplainable through pasture sampling. The average daily intake rates were measured at week 9 of supplementation. Those supplemented with 1.5 kg/day consumed their weekly supplement within 24 hours. Those provided with 3 kg/day had a daily average intake of 10.8, 5.5 and 4.3 kg/day to complete their supplement at day 3. The 4.5 kg/day supplement averaged 16.1 and 14.8 kg/day to complete their supplement in 2 days. The blood protein levels were measured after 84 days on feed and this group had a significantly lower level than those fed 4.5 kg/day (P<0.05).

Young River Station: A very good linear response was apparent. The regression relationship between the level of supplementation (MJ ME/day) (x) and liveweight gain (g/day) (y) can be described by the equation y = 148.23 +9.65x (r² = 0.98).

Grain finishing cattle using virginiamycin

Morawa Agricultural District High School: There was an initial incidence of scouring, bloat or laminitis in several steers, particularly in cattle in the SM treatment group. Average growth rates were 1.13, 1.26, and 1.21 kg/day for the 3 treatments SM, SH and SG respectively. Fat depth, meat colour and fat colour were
not significantly different between any of the treatments. All cattle from all treatments had an AUSMEAT score of 0 for fat colour and, except one IC from the SH treatment, all had a meat colour score of 1 B. There was a large difference in growth rates of cattle from the two saleyards (Table 2). Within these groups the 3 methods of grain feeding produced little differences in growth rate. There was a trend for a higher incidence of liver abscess in the cattle from Eneabba, particularly those fed grain whilst grazing.

Table 1: Liveweight gain (kg/hd.day) and standard error for three levels of weekly supplementation of weaner steers with grain and virginiamycin at three sites and the slope of the response

<table>
<thead>
<tr>
<th>Site</th>
<th>Supplement</th>
<th>Supplement (MJ ME/day)</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>West Horsham</td>
<td>Whole Oats</td>
<td>0.13^a</td>
<td>0.14^a</td>
</tr>
<tr>
<td>Mount Howick</td>
<td>Milled Barley</td>
<td>0.26^c</td>
<td>0.14^a</td>
</tr>
<tr>
<td>Young River</td>
<td>Milled Barley</td>
<td>0.16^c</td>
<td>0.30^d</td>
</tr>
</tbody>
</table>

* Means in the same row with different superscripts are significantly different (P<0.05).

Table 2: Growth rate, carcass characteristics and rate of liver abscess of cattle from 2 sources given a sudden introduction to a complete milled and mixed ration, grain separate to hay in the feedlot or grain while grazing pasture

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Sudden intro/mixed</th>
<th>Sudden intro/separate</th>
<th>Sudden intro/grazing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin</td>
<td>Midland</td>
<td>Eneabba</td>
<td>Midland</td>
</tr>
<tr>
<td>Number</td>
<td>25</td>
<td>39</td>
<td>24</td>
</tr>
<tr>
<td>Growth rate (kg/day)</td>
<td>1.67^c</td>
<td>0.78^c</td>
<td>1.64^c</td>
</tr>
<tr>
<td>P8 Fat depth (mm)</td>
<td>8.9</td>
<td>8.9</td>
<td>8.2</td>
</tr>
<tr>
<td>Liver abscess</td>
<td>1/7</td>
<td>2/26</td>
<td>0/11</td>
</tr>
</tbody>
</table>

* Means in the same row with a different superscript are significantly different (P<0.05).

Keany College: Cattle fed on oats gained liveweight at a significantly faster rate than on either barley or wheat (Table 3). Carcase gain of those fed oats was actually lower than of those fed barley due to a significantly lower dressing percentage.

Table 3: Initial liveweight, growth rate, average feed conversion ratio (FCR), dressing percentage and carcase gain of cattle fed ad lib wheat, barley or oats while grazing available pasture

<table>
<thead>
<tr>
<th>Source</th>
<th>Wheat</th>
<th>Barley</th>
<th>Oats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial liveweight (kg)</td>
<td>275.3</td>
<td>276.8</td>
<td>277.9</td>
</tr>
<tr>
<td>Growth rate (kg/day)</td>
<td>1.21^c</td>
<td>1.26^c</td>
<td>1.39^c</td>
</tr>
<tr>
<td>Average FCR (kg DM/kg)^a</td>
<td>5.2</td>
<td>4.6</td>
<td>5.2</td>
</tr>
<tr>
<td>Dressing %</td>
<td>53.0^a</td>
<td>54.1^a</td>
<td>51.9^a</td>
</tr>
<tr>
<td>Carcase gain (kg/day)</td>
<td>0.61</td>
<td>0.69</td>
<td>0.65</td>
</tr>
</tbody>
</table>

* Means in the same row with a different superscript are significantly different (P<0.05).

DISCUSSION

A production response to 3 levels of weekly supplementation with cereal grain and virginiamycin

At all sites, weaner steers were successfully supplemented with oats or barley on a weekly basis, with only 1 possible case of acidosis from 302 grain supplemented weaners. A varied liveweight gain at different levels of supplements is to be expected, as all supplements must be taken in the context of the basal diet available. However the change in liveweight gain in response to the supplements appears to be more predictable.

Previous work with cattle of similar maturity and liveweight supplemented in pens with up to 28 kg/week (4 kg/day) of barley grain and virginiamycin (Zorilla-Rios et al. 1994) indicated weight responses described
by equation $y = 376 + 10x (r^2 = 0.87)$ where $y$ is liveweight gain (g/d) and $x$ is supplement level (MJ ME/d). This is a comparable level of response to the Young River barley-supplemented steers and slightly higher than the oats-supplemented West Lort River steers. This may be explained by the lower level of crude protein of the oats supplement. The differences in intercept between the trial sites are attributable to the differences in roughage quality. The hay supplied as basal diet in the pen trials had an average crude protein content and ME value 5.1% and 2.1 MJ/kg DM higher than the available pasture in the field trials. The poor response to the 3 kg/day supplement at Mt Howick is partly reflected in the comparatively low rate of intake of this supplement and the lower blood protein levels. This suggests that the roughage selected may have been of poorer quality than indicated by pasture sampling.

This relationship provides a basis for determining the amount of supplement to be offered to achieve a desired level of production using a cereal grain and virginiamycin supplement fed on a weekly basis. It can be concluded that level of supplementation should depend on the performance desired and the quality of the roughage available. However it has been shown that a limited amount of cereal grain fed on a weekly basis is a safe and viable option to achieve a moderate level of production.

Grain finishing cattle using virginiamycin

**Morawa Agricultural District High School:** The scouring and laminitis is thought to have been caused by virginiamycin separating out through the shade cloth feeders. The large difference in performance in cattle from Midland and Eneabba saleyards could be partly attributed to a high worm egg count found toward the end of the trial in the poorly performing Eneabba cattle and possibly some compensatory growth in the Midland cattle. It is important to note that the car-cases produced by feeding grain to grazing cattle are the same AUSMEAT assessed quality as those produced in the feedlot on a fully mixed ration (Table 1).

**Kooney College:** The lower carcase gain of the cattle fed on wheat and oats could be expected considering the low energy content of the oats and low protein wheat. This is also reflected in the better FCR in cattle fed barley compared with wheat or oats. This trial shows that good liveweight gains can be achieved when feeding grain to cattle grazing poor quality standing roughage in autumn.

These on farm commercial trials of a range of systems of feeding cereal grain and virginiamycin to grazing cattle have demonstrated that it is a practical way of supplementing whilst utilising poor quality feed and producing high quality beef at a low capital cost.

REFERENCES


