GRAIN LEGUMES AS SUPPLEMENTS FOR GRAZING STEERS

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SUMMARY

In two experiments, yearling steers were fed various supplements whilst grazing perennial pasture in summer and autumn.

A supplement of 2.88kg/head/day whole oat grain plus 1.0kg/head/day whole Unicrop lupins produced maximum liveweight gains in both experiments (0.78 and 0.69kg/head/day respectively). A supplement of 4.0kg/head/day whole oats produced significantly lower liveweight gains in experiment one (0.50kg/head/day), but not in experiment two (0.64kg/head/day). Nil supplemented steers grew significantly slower than all other treatments in both experiments (0.00 and 0.32kg/head/day respectively).

In experiment two, there were no significant differences in liveweight gains of steers fed a supplement of either 4.0kg/head/day whole oats or 2.88kg/head/day whole oats plus 1.0kg/head/day whole grains of either Unicrop lupins, Hamburg lupins, Early Dun peas or line 41 field beans.

INTRODUCTION

Energy and protein supplementation during summer can result in enhanced liveweight gains of grazing beef cattle (Allden and Tudor 1976). Lupin grain (Lupinus angustifolius) as a combined energy and protein source (Gladstones 1970) can achieve a similar effect (Hawthorne 1980). However, a lupin grain supplement may supply protein in excess of animal requirements, and so some of the lupins could perhaps be replaced by cereal grains. As well, other grain legumes may be equally as effective as lupins as the protein source. This paper therefore reports two grazing experiments in which a supplement of oats and lupin grain is compared to either lupins, oats, or a mixture of oats plus various other grain legumes.

MATERIALS AND METHODS

The work was carried out in 1980 and 1981 at the Struan Research Centre, Naracoorte, South Australia. Average rainfall at the centre is 549mm with an effective growing season of 8½ months. Pastures and soils have been described by Hawthorne (1975). The cattle used in the experiments were yearling steers bred at the Research Centre, and the experiment periods commenced 2 to 3 months after weaning at 8 months of age. Steers were ranked on an initial 24-hour fasted live weight, and randomly allocated to treatment from within similar weight categories to ensure that initial weights were the same for each treatment. During the experiment period the steers were weighed at fortnightly intervals, directly from pastures at 0900 hours. At the conclusion of each experiment, steers were fasted for 24 hours and re-weighed.

Whole grain supplements of narrow leafed lupin, white lupin, field pea, field bean and oats were weighed and fed three times weekly (Monday, Wednesday and Friday). Steers were fed as groups with the grains being fed in troughs.

Pastures used in both experiments were composed of the sown species phalaris (Phalaris aquatica), Perennial ryegrass (Lolium perenne), Demeter fescue (Festuca arundinacea) and Strawberry clover (Trifolium fragiferum) plus volunteer annual Wimmera ryegrass (Lolium rigidurn). Narrow leafed Lupin grain (Lupinus angustifoliu-
Field bean (Vicia faba line 41), peas (Pisum sativum cv Early Dun) and White Lupin (Lupinus albus cv Hamburg) were purchased. Where oats were substituted for the grain legumes, quantities were adjusted to supply the equivalent energy intake.

Estimates of herbage available above 1.5 cm height were made during the course of the experiments, and samples of pasture and supplements were taken for determinations of nitrogen and in vitro digestibility of dry matter.

Supplementation studies commenced with mature herbage, but concluded with short green herbage when most animals were prime for slaughter.

Liveweight gains were estimated from the increase in fasted weight over the experiment period. Carcase weights were determined from the hot carcase, kidney fat and tails removed, less 3 percent. Statistical analyses within each experiment were by two-way classification analysis of variance.

**Experiment 1**

Forty yearling Hereford steers with a mean fasted weight of 219 ± 17 kg were randomized into five treatment groups of eight steers, and each group grazed set-stocked on 2.5 ha of pasture for 106 days from February 5, 1980. Three groups received either nil supplement (NIL), 3.5 kg/head/day Unicrop Lupins (UCL), or 4.0 kg/head/day Swan Oats (SO). The oats were introduced gradually over 14 days, whereas the lupins were fed ad lib until the daily allowance was being consumed (day 14). The remaining two groups each received a supplement of 1.0 kg/head/day Unicrop lupins plus 2.88 kg/head/day Swan Oats, but the groups were introduced to the mixture differently. One group was gradually introduced to the mixture over 14 days (SO/UCL), whereas the other group was introduced to ad lib lupins until 3.5 kg/head/day was being consumed (day 5), and then oats were substituted for lupins (days 6 to 18) until the desired mixture was achieved (UCL - SO/UCL).

Values for percentage nitrogen content and in vitro digestibility of dry matter were 4.71 and 80.1 for the Unicrop lupins; 1.45 and 68.2 for Swan Oats; 0.89 and 44.7 for pasture available (282 kg/ha) on day 24; and 1.99 and 40.6 for pasture available on day 106 (149 kg/ha).

**Experiment 2**

Seventy two Hereford and 12 Jersey x Hereford yearling steers with a mean fasted weight of 249 ± 22 kg were randomized within breed into six groups of 14 steers. Four of the groups were fed a supplement of 2.88 kg/head/day of Swan Oats plus 1.0 kg/head/day of either Unicrop lupins (SO/UCL), Hamburg lupins (SO/HL), Early Dun peas (SO/EDP) or line 41 field beans (SO/41B). The remaining two groups received either nil supplement (NIL) or 4.0 kg/head/day Swan oats (SO). The groups rotationally grazed so that each group grazed all six of the 7.0 ha paddocks once in the 84 days from February 5, 1981. All supplements were progressively introduced over 14 days.

Values for percentage nitrogen content and in vitro digestibility of dry matter were 5.20 and 79.3 for Unicrop lupins; 5.69 and 77.8 for Hamburg lupins; 4.03 and 76.8 for Early Dun peas; 4.41 and 73.0 for line 41 beans; 1.60 and 69.2 for Swan Oats; 0.85 and 42.3 for pasture available (1161 kg/ha) on day 24; and 1.99 and 40.6 for pasture available on day 106 (149 kg/ha).

+ Standard deviation of the mean
RESULTS

Experiment 1

The mean liveweight gain, carcase weight and fat thickness of the steers in experiment one are shown in table 1. There were no significant differences (p > 0.05) in the liveweight gains of steers fed supplements of either Unicrop lupin grain (UCL), oats plus Unicrop lupin (SO/UCL), or Unicrop lupins prior to oats plus Unicrop lupins (UCL - SO/UCL). However, steers fed oats (SO) gained significantly (p < 0.05) less live weight, but they still grew significantly (p < 0.05) faster than unsupplemented steers (NIL). Treatment effects on carcase weight and fat thickness at slaughter were similar to those of liveweight gain.

<table>
<thead>
<tr>
<th>Supplement</th>
<th>NIL</th>
<th>SO</th>
<th>UCL</th>
<th>SO/UCL</th>
<th>UCL-SO/UCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain (kg/head/day)</td>
<td>0.00a†</td>
<td>0.50b</td>
<td>0.67c</td>
<td>0.72c</td>
<td>0.78c</td>
</tr>
<tr>
<td>(0.05)†</td>
<td>(0.45)</td>
<td>(0.15)</td>
<td>(0.08)</td>
<td>(0.08)</td>
<td></td>
</tr>
<tr>
<td>Carcase Weight (kg)</td>
<td>114a</td>
<td>144b</td>
<td>150bc</td>
<td>161c</td>
<td>164c</td>
</tr>
<tr>
<td>(11)</td>
<td>(33)</td>
<td>(14)</td>
<td>(8)</td>
<td>(11)</td>
<td></td>
</tr>
<tr>
<td>Fat thickness (kg)</td>
<td>2.2a</td>
<td>3.4b</td>
<td>5.3c</td>
<td>4.7bc</td>
<td>5.6c</td>
</tr>
<tr>
<td>(0.5)</td>
<td>(2.0)</td>
<td>(1.6)</td>
<td>(2.1)</td>
<td>(1.9)</td>
<td></td>
</tr>
</tbody>
</table>

† Figures in rows with different subscripts differ significantly (p < 0.05)
‡ Figures in brackets are standard deviation of the mean

Experiment 2

The mean liveweight gain, carcase weight and fat thickness of the steers in experiment two are shown in table 2. There were no significant (p > 0.05) differences between any of the treatments fed grain, but the NIL treatment produced significantly (p < 0.05) lower liveweight gains, carcase weight and fat thickness.

<table>
<thead>
<tr>
<th>Supplement</th>
<th>NIL</th>
<th>SO</th>
<th>SO/UCL</th>
<th>SO/HL</th>
<th>SO/EDP</th>
<th>SO/41B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain (kg/head/day)</td>
<td>0.32a†</td>
<td>0.64b</td>
<td>0.69b</td>
<td>0.67b</td>
<td>0.71b</td>
<td>0.67b</td>
</tr>
<tr>
<td>(0.11)†</td>
<td>(0.15)</td>
<td>(0.15)</td>
<td>(0.11)</td>
<td>(0.12)</td>
<td>(0.12)</td>
<td></td>
</tr>
<tr>
<td>Carcase weight (kg)</td>
<td>135a</td>
<td>152b</td>
<td>159b</td>
<td>157b</td>
<td>160b</td>
<td>152b</td>
</tr>
<tr>
<td>(13)</td>
<td>(13)</td>
<td>(11)</td>
<td>(14)</td>
<td>(12)</td>
<td>(14)</td>
<td></td>
</tr>
<tr>
<td>Fat thickness (kg)</td>
<td>1.3a</td>
<td>4.1b</td>
<td>5.6b</td>
<td>5.3b</td>
<td>5.1b</td>
<td>3.9b</td>
</tr>
<tr>
<td>(0.6)</td>
<td>(2.6)</td>
<td>(1.8)</td>
<td>(2.6)</td>
<td>(2.0)</td>
<td>(2.2)</td>
<td></td>
</tr>
</tbody>
</table>

† Figures in rows with different subscripts differ significantly (p < 0.05)
‡ Figures in brackets are standard deviation of the mean
DISCUSSION

In experiment one, steer liveweight gains and carcase characteristics were improved by replacing some or all of an oat supplement with Unicrop lupins. This did not occur in experiment two, when only some of the oats were replaced. The greater pasture availability and summer rainfall at the commencement of experiment two may have influenced this result. Nil supplemented steers gained live weight in experiment two, but not in experiment one, and the gains reported are near the opposite extremes of those experienced in the area (Franklin 1956; Hawthorne 1980). As well, the gains of individual steers supplemented with oats in experiment one were more variable than other treatments, suggesting that feeding behaviour may also be involved.

Unicrop lupins, Hamburg lupins, peas and field beans as additives to oats were equally effective as energy supplements in experiment two where their addition to oats, compared to oats alone, was of no benefit to the steers. More information is required, however, in a situation where steers respond to the addition of a grain legume.

We can conclude that the addition of whole Unicrop lupins to a whole oat supplement for grazing steers may improve the consistency of liveweight gains obtained compared to feeding whole oats alone. Hamburg lupins, peas or field beans fed whole may well achieve the same effect.

ACKNOWLEDGEMENTS

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REFERENCES