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Effect of allowance and the rate of adaptation of weaned calves to two brassica types

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ABSTRACT

Groups of 10 Friesian bull calves averaging 142 kg were offered Winfred forage brassica (62% leaf) at allowances of 3, 6, 9, 12 or 15% of bodyweight (BW) for 6 weeks. Similarly, groups of 8 Friesian bull calves averaging 150 kg were offered Wairoa forage brassica (67% leaf) at allowances of 3, 5, 7, 9, and 12% of bodyweight. Calves were weighed weekly and offered fresh allowances each week. The two experiments were conducted between January and March of the same year but were not run concurrently.

There was a significant effect (P < 0.01) of allowance on liveweight gain for calves offered Winfred, with calves on the lowest allowance (3% of BW) growing at 0.90 kg/day, compared to 1.20 kg/day for calves grazing the other four allowances. Calves grazing the low allowance (3% of BW) utilized 77% of the total crop, but only 43% of the stem. On the other hand, calves grazing the low allowance of Wairoa utilized 90% of the total crop and 72% of the stem without suffering a liveweight penalty. There was no effect of allowance of Wairoa on calf growth rate and overall, calves on Wairoa grew at an average of 1.03 kg/day. Choice of a leafy type of brassica maybe important if the objective is a high degree of utilisation coupled with good animal performance. Alternatively, on "stemmy" brassicas, calves should not be forced into a "clean up" role on brassicas if the objective is to maximise liveweight gains.

The period of adjustment to brassicas appeared to take four weeks. Over the first four weeks, calves grazing Winfred grew at 1.06 kg per day and calves grazing Wairoa grew at 0.54 kg per day. Over the final two weeks, the pattern reversed and calves grew at 1.50 and 1.94 kg per day on Winfred and Wairoa, respectively. Rate of adaptation to brassica may be an important consideration if short term grazing/finishing periods are desired.

Keywords: allowance; calves; brassica; Winfred; Wairoa.

INTRODUCTION

Brassicas have high digestibility and metabolisable energy concentrations (Milne and Burnett, 1984) yet in lambs, intakes are relatively low in relation to these digestibility values and this has been attributed to the effect of non protein bound, sulphur-containing amino acids in brassicas (Barry and Drew, 1978; Hodgson et al., 1985). A large number of studies in New Zealand and overseas have indicated that the performance of lambs can vary between brassica types (Nicol and Barry, 1980; Fitzgerald, 1983) and with degree of utilisation of the crop and method of grazing (Armstrong et al., 1984).

New Zealand is relatively unique in its use of calves of dairy origin which are artificially reared for subsequent bull beef production. In drier areas of the country there are difficulties in maintaining summer growth rates of weaned calves and summer brassicas provide a useful high quality feed when pasture quality is limiting. There are, however, no data on the growth rate of young, weaned calves on brassicas.

This experiment examined the effect of forage allowance on calf growth rate of two brassicas cultivars commonly grown as summer feed, Winfred and Wairoa. Data are provided on the rate of adjustment of calves to brassicas, apparent differences between cultivars and the effect of allowance on calf growth rate.

MATERIALS AND METHODS

Two experiments were conducted. In Experiment 1, Winfred forage brassica (sown 20 Oct 1993) was used. Fifty Friesian bull calves were allocated to 5 treatment groups and grazed at 5 allowances (3, 6, 9, 12, 15% of bodyweight) over a 6 week period from 17 January to 1 March 1993. Wairoa forage brassica (sown 2 Dec 1993) was used in Experiment 2, with forty Friesian bull calves averaging 150 kg being allocated to 5 allowances (3, 5, 7, 9, 12% of bodyweight) for a 6 week period from 1 February to 23 March. Calves had been weaned for at least 4 weeks prior to commencing the experiment and no calves had any previous experience of brassicas. Allowances were based on the data of Armstrong et al., (1984) and Fitzgerald (1983) which showed that allowances in excess of 7% are required to maximise lamb growth rates. However liveweight gains measured during Experiment 1 indicated that allowances could be lower for calves and the allowances used in Experiment 2 were adjusted downwards prior to commencement of the experiment.

In both experiments sufficient feed was only available for a 42 day feeding period and it was intended that the first 14 days would be an adjustment period followed by a 28 day experimental feeding period. Calves were weighed weekly in order to calculate weekly herbage allowances and were also weighed following overnight fasting both at the beginning and end of the pre-feeding period and at completion of the experiment.

Pre and post-grazing herbage mass for each allowance were determined by hand cutting five sites per allowance to ground level. The area taken for each cut was 6 rows, each 60 cm long within a quadra 900 cm x 600 cm. The harvesting sites within each allowance were pre-determined using a semi
stratified technique. The site of each cut was representative of the crop within the particular harvest site. For each cut, plant numbers were recorded and divided to two components: leaf plus petiole and stem. Each component was weighed in the field and sub-samples taken to form a composite sample for standard dry-matter determination. The same technique for measuring pre-grazing yields was used for post-grazing assessments, although harvesting sites were two metres from pre-grazing sites to avoid localised stock camping and trampling.

Liveweight gain data were analysed by standard analysis of variance techniques with covariate adjustment for initial liveweight.

RESULTS

Brassica yields and utilisation

Pre-grazing dry matter yields averaged 4726 and 3265 kg DM/ha for the Winfred and Wairoa, respectively. The proportion of leaf was greater in the Wairoa than in the Winfred (67% versus 62%). The summer of 1993/94 was typically dry in Hawkes Bay and there was a clear trend for leaf senescence to occur, with percentage leaf deteriorating through the experiment, from 79% to 65% and from 66% to 53% for Wairoa and Winfred, respectively. There appeared to be a small difference in dry matter content between the stem and leaf of Winfred (17.9% versus 21.4%) but not in the case of Wairoa (21.7% versus 21.1%).

Leaf senescence and variation in the number of plants between quadrats and before and after grazing made accurate calculation of intake data difficult. The level of utilisation decreased as the allowance increased (Table 1). Overall levels of utilisation were lower on the Winfred than on the Wairoa; e.g. on the low allowance, levels of utilisation were 77% and 90%, respectively (Table 1). Of the calves grazing Winfred, only those grazing the low allowance consumed significant amounts of stem whereas all calves grazing Wairoa appeared to consume significant amounts of stalk (Table 1), irrespective of allowance.

TABLE 1: Total crop dry matter, percentage leaf and degree of utilisation of weaned calves fed 5 allowances of either a) Winfred or b) Wairoa forage brassica.

<table>
<thead>
<tr>
<th>Allowance (% BW)</th>
<th>DM on offer (kg DM/ha)</th>
<th>% Leaf</th>
<th>% Total utilisation</th>
<th>% Leaf utilisation</th>
<th>% Stem utilisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4867</td>
<td>60</td>
<td>77</td>
<td>100</td>
<td>43</td>
</tr>
<tr>
<td>6</td>
<td>4538</td>
<td>63</td>
<td>64</td>
<td>92</td>
<td>0</td>
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<td>4678</td>
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</tr>
<tr>
<td>12</td>
<td>4663</td>
<td>63</td>
<td>43</td>
<td>66</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>4878</td>
<td>62</td>
<td>32</td>
<td>62</td>
<td>0</td>
</tr>
</tbody>
</table>

b) Wairoa (Experiment 2)

<table>
<thead>
<tr>
<th>Allowance (% BW)</th>
<th>DM on offer (kg DM/ha)</th>
<th>% Leaf</th>
<th>% Total utilisation</th>
<th>% Leaf utilisation</th>
<th>% Stem utilisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3106</td>
<td>67</td>
<td>90</td>
<td>100</td>
<td>72</td>
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<tr>
<td>6</td>
<td>3514</td>
<td>61</td>
<td>71</td>
<td>100</td>
<td>30</td>
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<td>9</td>
<td>3346</td>
<td>67</td>
<td>68</td>
<td>87</td>
<td>22</td>
</tr>
<tr>
<td>12</td>
<td>3576</td>
<td>67</td>
<td>60</td>
<td>56</td>
<td>25</td>
</tr>
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</table>

Liveweight gain

Level of allowance had a significant effect (P < 0.01) on liveweight gain in calves grazing Winfred, with calves on the low allowance (3% of bodyweight) growing at 0.93 kg/day, compared with an average growth rate of 1.22 kg/day for calves on the other four allowances (Table 2). There was no statistically significant effect of allowance on liveweight gain of calves grazing Wairoa and growth rates averaged 1.03 kg/day over all 5 allowances. When the fastest liveweight gains were examined, there was still a significant effect of allowance on liveweight gain for the calves grazing Winfred (P < 0.05). However there was relatively little difference in overall fastest liveweight gain between the two brassica types (0.75 and 0.68 kg/d for the Winfred and Wairoa, respectively).

Rate of adaptation to brassica

It appears that calves did not adjust fully from pasture to brassicas for at least four weeks (Fig 1), as there was a significant increase in liveweight gain (P < 0.0001) in calves on both brassica types between weeks 0 to 4 and weeks 4 to 6. Calves grazing Winfred rape grew at 1.06 kg/d and 0.56 kg/d on Wairoa over the first 4 weeks (Fig 1). Over the final two weeks calves on Winfred grew at 1.50 kg/d and 1.94 kg/d on Wairoa.

FIGURE 1: Rate of adaptation of weaned calves to Winfred and Wairoa forage brassicas.

DISCUSSION

At an allowance of 3% of bodyweight, calves grazing Wairoa were able to graze 90% of the total crop and 72% of the stem without penalty. By contrast, the calves on the same allowance of Winfred grazed only 77% of the total crop and 43% of the stem, but were unable to maximise liveweight
TABLE 2: Liveweight gain of weaned calves fed 5 allowances of either a) Winfred or b) Wairoa forage brassica.

a) Winfred (Experiment 1)

<table>
<thead>
<tr>
<th>Allowance (%) of BW</th>
<th>17/1 Prefeeding</th>
<th>2/2 Start Trial</th>
<th>15/2</th>
<th>2/3 End Trial</th>
<th>Total LWG (kg)</th>
<th>LWG (kg/d)</th>
<th>Fasted LWG (kg/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>141.8</td>
<td>158.5</td>
<td>164.2</td>
<td>180.7</td>
<td>38.9</td>
<td>0.90</td>
<td>0.58</td>
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<tr>
<td>6</td>
<td>142.7</td>
<td>157.7</td>
<td>171.8</td>
<td>190.9</td>
<td>50.2</td>
<td>1.17</td>
<td>0.76</td>
</tr>
<tr>
<td>9</td>
<td>141.9</td>
<td>158.9</td>
<td>172.5</td>
<td>192.3</td>
<td>50.4</td>
<td>1.17</td>
<td>0.80</td>
</tr>
<tr>
<td>12</td>
<td>142.9</td>
<td>158.3</td>
<td>169.9</td>
<td>194.3</td>
<td>53.9</td>
<td>1.25</td>
<td>0.72</td>
</tr>
<tr>
<td>15</td>
<td>140.4</td>
<td>156.3</td>
<td>169.9</td>
<td>194.1</td>
<td>51.2</td>
<td>1.19</td>
<td>0.72</td>
</tr>
</tbody>
</table>

Significance
SED
NS NS

b) Wairoa (Experiment 2)

<table>
<thead>
<tr>
<th>Allowance (%) of BW</th>
<th>7/2 Prefeeding</th>
<th>22/2 Start Trial</th>
<th>9/3</th>
<th>23/3 End Trial</th>
<th>Total LWG (kg)</th>
<th>LWG (kg/d)</th>
<th>Fasted LWG (kg/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>152.1</td>
<td>158.4</td>
<td>167.9</td>
<td>193.9</td>
<td>41.8</td>
<td>0.97</td>
<td>0.61</td>
</tr>
<tr>
<td>5</td>
<td>148.8</td>
<td>158.5</td>
<td>167.3</td>
<td>199.1</td>
<td>50.3</td>
<td>1.17</td>
<td>0.79</td>
</tr>
<tr>
<td>7</td>
<td>150.9</td>
<td>159.3</td>
<td>167.2</td>
<td>196.4</td>
<td>45.5</td>
<td>1.06</td>
<td>0.73</td>
</tr>
<tr>
<td>9</td>
<td>150.5</td>
<td>159.7</td>
<td>166.2</td>
<td>190.1</td>
<td>39.6</td>
<td>0.92</td>
<td>0.62</td>
</tr>
<tr>
<td>12</td>
<td>150.4</td>
<td>158.6</td>
<td>167.3</td>
<td>195.3</td>
<td>44.9</td>
<td>1.04</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Significance
SED
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Significance
SED
NS NS

Liveweight gains of weaned calves fed 5 allowances of either a) Winfred or b) Wairoa forage brassica.

The apparent differences between cultivars in rate of adaptation may be due to differences in initial grazing preference/palatability which has previously been observed in lambs (Armstrong et al., 1984). The catch-up observed in the calves grazing Wairoa over weeks 4 to 6 suggests that calves had fully adjusted to the crop at this stage. Nevertheless it would seem that type of brassica is important, particularly if short term grazing periods are envisaged.

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REFERENCES


