The effect of grazing residual control methods on cow intake and milk production in late spring

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ABSTRACT

Mowing of pasture before grazing, topping of pasture after grazing, and regrazing of pasture were studied as methods to control post-grazing residuals at optimum levels for pasture quality and growth. The study was conducted over a 14-day period during November 2009 and the impact of each of these methods of residual control on cow intake and milk production was measured. Cows were split into eight herds of 15 cows and allocated to one of four treatments with two replicates. Compared to the control, topping pasture pre-grazing reduced (P < 0.01) cow intake by 2.3 kg DM/cow/day, milk yield by 2.9 L/cow/day (P < 0.05) and milk protein percent (P < 0.05). The pasture that was mown before grazing was significantly (P < 0.05) higher in neutral detergent fibre and significantly (P < 0.05) lower in metabolisable energy, than all other treatments. This study has indicated that pre-graze topping as a method of maintaining low pasture residuals during spring reduces milk production and cow intake.

Keywords: cow intake; dairy cow; grazing residual; milk yield; topping.

INTRODUCTION

In pasture based systems, seasonal variations in pasture can limit cow intake. Typically, temperate pastures change from a vegetative state to a reproductive state during spring. This results in an increase in the dry matter (DM) accumulation and lignification of grass tillers. Hughes et al. (1991) suggested that the structural strength of the pasture components would affect cow intakes and Tharmaraj et al. (2003) determined the bite fracture force (force required to break a bite from the canopy) increased down the sward profile. These factors combined can result in high post-grazing residuals that impact on pasture growth and milk production as shown by Holmes & Hoogendoorn (1983) in a study comparing severe (1000 kg DM/ha) and lax (1800 kg DM/ha) grazing. Lax grazing of pasture (high post-grazing residuals) led to decreased pasture and milk production compared with severe grazing (low post-grazing residuals). The review conducted by Fulkerson & Donaghy (2001) into a grazing management system highlights 50 mm as the optimal post-grazing residual to promote ryegrass growth and persistence. Lee et al. (2008) found that post-grazing residuals of 40-60 mm also resulted in improved pasture quality than higher residuals (≥80 mm). One of the challenges in grazing management is to maintain post-grazing residuals in the optimum range (4-6cm) during the period of rapid pasture growth in spring. Removing paddocks from the grazing rotation for fodder conservation is one strategy to aid pasture management during this time but there are often still paddocks within the grazing rotation that are left with above optimal post-grazing residuals. Kolver et al. (1999) looked at pre- and post-grazing topping of pasture to increase milk production during spring and summer with varying results. Holmes & Hoogendoorn (1983) also considered pre- and post-grazing topping in order to improve pasture quality and milk production. Their results showed a small increase in milk production from pre-topping and a larger increase from post-topping of pasture. Another strategy that is sometimes used by dairy farmers to maintain post-grazing residuals is regrazing of the pasture until the desired residual is reached. This regrazing is often carried out with dry, young or beef stock but occasionally also by the milking herd. This study aimed to quantify the effects that differing approaches to maintaining optimal grazing residuals has on milk production.

MATERIALS AND METHODS

The study was conducted at the Tasmanian Institute of Agricultural Research Dairy Research Facility, Elliott, Tasmania (41º05’S - 145º46’E) during early November, 2009. All procedures were approved by the University of Tasmania Animal Ethics Committee.

Four treatments investigated different approaches to managing grazing residuals, all aiming to achieve pasture residuals between 1400 and 1600 kg DM/ha. The residual control methods used were: mowing pasture 12-24 hours before being grazed by cows (Pre-top), mowing pasture within 12-24 hours after being grazed (Post-top), and returning the cows to the pasture to graze to a residual of between 1400 and 1600 kg DM/ha (Regraze). Mowing of the pasture was undertaken using a Berends EHD 210 slasher. The residual control methods were only implemented when the cows had not grazed pasture to target residuals. There was also a control treatment (Control) in which the cows were allocated their daily...
requirements and there was no implementation of any residual treatments. The study was undertaken for a period of 14 days. The residual control methods were implemented 28, 21 and 18 times (in 28 grazing events) for the PRE-TOP, REGRAZE and POST-TOP treatments respectively.

A group of 120 Friesian and Friesian X Aussie Red cows was selected from the main herd, and allocated to 8 treatment groups (4 treatments by 2 replicates) of 15 cows, balanced for breed, days-in-milk (76 ± 0.9 d), production-to-date (1423 ± 40.6 kg/cow), previous lactation 305d yield (5,625 ± 45.6 kg/cow) and current production (21.1 ± 0.34 kg/cow/day).

Pastures were grazed on a rotational basis and coincided with a regrowth of 2 to 3 leaves (Fulkerson and Donaghy, 2001). Each of the eight herds was grazed in the same paddock. Pasture was allocated by measuring the pre-grazing biomass using a calibrated rising plate meter (Earle and McGowan, 1979). The biomass was calculated using the equation:

\[
\text{Herbage mass (kg DM/ha)} = 250 \times \text{average height (cm)} + 500
\]

Target pasture allocations were 6-10 kg DM/cow/grazing with a daily pasture intake target of 15 kg DM/cow. The allocation calculations were based on a target grazing residual of 1400 to 1600 kg DM/ha. The cows also received 1.5 kg DM of grain supplement twice daily in the dairy at milking. Three of the treatment groups (CONTROL, PRE-TOP and POST-TOP) were offered a fresh allocation of pasture twice daily, immediately after milking. The REGRAZE treatment were returned to their previous allocation of pasture if they had not grazed to the target residual of 1400 to 1600 kg DM/ha. They remained on the old allocation until they had grazed to the target residual or for four hours, whichever came first, they were then moved to a fresh allocation in the paddock with the other treatment groups.

### Measurements

Daily pasture intakes for each herd were estimated using pre-and post-grazing measurements with a calibrated rising plate meter. For the PRE-TOP treatment, pasture biomass was measured before and after topping. Following grazing of the PRE-TOP treatment, 10 x 0.2m² quadrats were randomly selected and pasture samples collected for wastage estimation. Pasture quality samples were collected from each allocation. Samples were dried at 60°C for 48 hours and ground to pass through a 1-mm sieve and analysed for crude protein (CP), neutral detergent fibre (NDF), acid detergent fibre (ADF), digestibility of the dry matter (DMD), and digestibility of the organic dry matter (DOMD) by Near Infra-Red Spectroscopy (Corson et al., 1999). The ME content was derived from the predicted DOMD (AFIA, 2007) using the equation:

\[
\text{ME} = (0.203 \times \text{DOMD}%) - 3.001
\]

Individual cow milk samples were collected twice-weekly to determine yield, fat and protein. Milk samples were analysed using a Bentley B2000 Infrared Milk Analyzer (Bentley Instruments Inc, Minnesota, USA) to determine fat and protein. Treatment means were analysed using the one-way ANOVA procedure in Genstat and compared using least significant difference (LSD), as defined by Steel and Torrie (1960).

### RESULTS

Topping pastures pre-grazing reduced (P < 0.01) cow intake compared to all other treatments (Table 1). Daily energy (ME, MJ/day) intake was also significantly (P <0.05) reduced in the PRE-TOP treatment than all other treatments. There was no significant (P >0.05) difference between treatments in milksolids production or milk fat percentage but the PRE-TOP treatment did have a significantly lower milk yield (P <0.05) and milk protein percentage (P <0.05) than all other treatments. There was no significant (P >0.05) difference in intake and milk production between the POST-TOP,
REGRAZE and CONTROL treatments.

Topping pastures pre-grazing reduced the herbage quality, with increased (P <0.05) NDF and reduced (P <0.01) digestibility and ME content (Table 2). There was no significant (P >0.05) difference between treatments in the percentage crude protein of the pasture diet.

There was no significant (P >0.05) difference in the pasture biomass between treatments before grazing or topping (Table 2). There was a significant (P <0.05) difference between treatments in pasture residuals following either grazing or topping (Table 2). Both the POST-TOP and PRE-TOP treatments had a lower residual than the REGRAZE and CONTROL treatments (P <0.01).

### TABLE 2: Pre- and post-grazing biomass (kg DM/ha), dry matter content (DM, %) and pasture quality. ME = Metabolisable energy; DMD = Dry matter digestibility; CP = Crude protein; NDF = Neutral detergent fibre.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Pre-top</th>
<th>Post-top</th>
<th>Regraze</th>
<th>Control</th>
<th>LSD</th>
<th>F.pr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-grazing biomass</td>
<td>3256</td>
<td>3377</td>
<td>3354</td>
<td>3268</td>
<td>100.3</td>
<td>NS</td>
</tr>
<tr>
<td>Post-grazing biomass</td>
<td>1298</td>
<td>1364</td>
<td>1623</td>
<td>1665</td>
<td>42.45</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>DM, %</td>
<td>36.6</td>
<td>19.9</td>
<td>19.4</td>
<td>19.7</td>
<td>0.92</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>ME, MJ/kg DM</td>
<td>11.0</td>
<td>11.9</td>
<td>11.8</td>
<td>11.8</td>
<td>0.16</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>DMD, % of DM</td>
<td>73.2</td>
<td>77.9</td>
<td>78.5</td>
<td>77.8</td>
<td>0.87</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>CP, % of DM</td>
<td>15.6</td>
<td>16.2</td>
<td>16.5</td>
<td>16.3</td>
<td>0.81</td>
<td>NS</td>
</tr>
<tr>
<td>NDF, % of DM</td>
<td>50.8</td>
<td>48.6</td>
<td>48.0</td>
<td>48.8</td>
<td>1.22</td>
<td>0.01</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Pre-topping of pastures increased the DM percentage as was expected with it being left to wilt 12-24 hours before grazing. Dry matter increased by 17% over the CONTROL treatment which should have been sufficient to increase DM intake (John & Ulyatt, 1987) but intakes actually decreased by more than 2 kg DM/cow/day under this treatment. This is similar to the results from the trial conducted by Kolver et al. (1999) in which pasture intake of the pre-topping treatment in spring was reduced by 2.4 kg DM/cow/day. Kolver et al. (1999) suggested that these lower intakes may have been due to rainfall on the mowed pasture reducing palatability. In the current study, one of the contributors to reduced intakes was the incorporation of soil in the mowed pasture. Due to the undulating terrain where the study was conducted, the mower at times cut into the soil and it was noticeable that cows did not consume pasture where soil was incorporated. From casual observations of the different treatment groups, it also appeared that in the first few days of the experiment, the cows in the pre-topping treatment showed a preference for the mowed pasture but beyond that, when they were put into their allocation, they tried to reach under the fence for the non-topped pasture in preference to the topped pasture. This non-preference for the pre-topped pasture was also evident in the post-grazing residual. The average residual, before grazing, of the pre-topped pasture was 1460 kg DM/ha but the post-grazing residual was 1298 kg DM/ha showing that the cows were still harvesting standing pasture in preference to consuming all of the mowed pasture of which there was an average of 754 kg DM/ha left behind.

In addition to the lower pasture intakes, the herbage quality was also reduced in the pre-topping treatment. The ME (MJ/kg DM) was significantly reduced while NDF percentage was increased. Kolver et al. (1999) found pre-topping of pasture in spring reduced ME by 0.6 units which is consistent with the current study in which the pre-topping treatment was 0.8 MJ ME/kg DM lower than the CONTROL treatment. The lower DM intake and lower ME of the pre-topping treatment resulted in an overall lower daily energy intake for the pre-topping treatment. This led to lower milk yield and protein percentage but milksolids was the same for each of the treatments. Bryant (1982) reported an increase in milksolids from pre-topping of pasture in spring. Kolver et al. (1999) measured an increase in milksolids over summer but a reduction in milksolids during spring with pre-topping.

The REGRAZE treatment did not suffer any milk production losses despite the extra walking distance required (981 m/day compared to 707 m/day) in going back to a paddock to regraze to target levels. While initially, the cows did not like returning to a paddock to regraze the pasture and...
took 1-2 hours before they would begin grazing, they became accustomed to the practice within a few grazings and 90% of the cows would begin grazing upon entering the paddock. With no decrease in intakes or milk production, regrazing would be a viable option for achieving target post-grazing residuals with savings in both time and money compared to either pre-topping or post-topping.

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REFERENCES