BRIEF COMMUNICATION: Variation in diet preference between sheep

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INTRODUCTION

Herbivores show preferences for some dietary components over others (Cosgrove & Edwards, 2007). The consequence of diet selection is that preferred components of the sward risk depletion and sustainability of sward composition is compromised. Species such as cattle that are less capable of discriminating between components of the sward (Grant *et al.,* 1985) and maintain a higher intake on poorer quality swards (Collins & Nicol, 1986) are useful in combating the more selective grazing behaviour of sheep.

Sheep with less strong dietary preferences might also assist in sustaining sward composition. There is some evidence for variation in diet preferences between individual animals within overseas sheep breeds fed concentrate (Sahin *et al.,* 2003*)* or range (Winder *et al.*, 1995) diets and these differences have a genetic basis (Winder *et al.* 2003; Snowder *et al.,* 2001) but this has not been confirmed for commercial sheep in a pastoral environment.

This paper reports the results of studies designed to test variability between sheep in dietary preferences.

METHODS

In the first trial, 40 Coopworth ewe hoggets randomly selected from a mob of 150, were penned (2 x 1.5 m) indoors for 10 days and offered a lucerne chaff diet (80:20 leaf:stem) *ad libitum* and ranked on the composition of their feed residue in terms of leaf and stem using visual templates representing ratios of stem to leaf of 80:20, 60:40, 40:60, 20:80. From this group, the six hoggets with the highest % stem in their feed residue were retained as More selective and those with the lowest % stem as the Less selective groups and offered diets of lucerne chaff, chaffed meadow hay and lucerne balage in random order for 10-day periods. The proportion of the stem and leaf consumed was estimated from the respective weight and leaf:stem ratio of the feed offered and refused. A selection index (SI) was calculated for each sheep as the percentage of the component in diet consumed divided by the percentage of the component in the diet offered.

In the second trial 12, one-year-old (2-tooth) Coopworth ewes (11 of the same sheep as for Trial 1) were used in a preference trial in which pairs of turves of grass of 13 cm sward height and clover of 13, 9 or 5 cm sward height, each with an area of 0.1 m^2, were offered side by side in pens. Each sheep was offered each sward contrast twice with one contrast offered per day in addition to a basal chaff diet. The proportion of the diet selected from the two pasture species was calculated from the change in weight of the turves before and after a one minute grazing session.

In a third experiment, 16 twin-reared Coopworth hoggets comprising eight with a More and eight with a less Less selective grazing behaviour were screened from a group of 40 sheep using the methods in Trial 1 and their SI for the leaf of lucerne chaff established. The full sibs and dams of these 16 sheep were subsequently identified and their SI determined by the same protocol.

RESULTS

In the first trial, the overall mean SI for leaf was significantly ($P < 0.05$) higher for More (1.06) than Less (1.03) selective groups. The difference was greater for lucerne chaff (1.10 and 1.05) than for chaffed hay (1.04 and 1.02) and non-existent for lucerne balage (1.02 and 1.02) for the More and Less selective groups respectively. The difference in SI for lucerne chaff reflected a leaf:stem ratio of 6.6:1 and 5.2:1 for More and Less selective groups respectively. There was no significant difference between groups in mean daily dry matter intake.

In the second trial, the More selective ewes selected on average 51.2% of their diet from clover compared with only 33.5% selected by the Less selective ewes. The proportion of clover in the diet of More selective ewes decreased as the height of the clover declined (0.558, 0.515 and 0.464 for 13, 9 and 5 cm clover heights respectively) but there was no similar trend for the Less selective ewes.

In the final trial, the eight More selective hoggets had a significantly ($P<0.001$) higher (1.10) SI for lucerne chaff (85% leaf) than the mean SI of the Less selective group (1.06) representing a leaf:stem ratio in the diet consumed, of 13.9:1 and 9.4:1 respectively. The equivalent values for full sibs and dams, which were also significantly different ($P < 0.001$), were 1.10 and 1.07, and 1.09 and 1.06 for the More and Less selective groups respectively. In this study the mean live weight of the More selective hoggets was significantly lower

(44.0 kg) than that of the Less selective hoggets (50.8 kg) although there was no significant difference in the mean live weight of the two groups of adult ewes.

DISCUSSION

In combination these results support the thesis that variation in dietary preference exists between individuals in commercial sheep populations and that these are repeatable over time and across a generation. At first sight, differences in SI of around 0.4 (from 1.10 to 1.06) seem small and thus somewhat surprising that they be significantly different and strongly repeatable. However in a diet such as lucerne chaff where leaf constitutes 80 to 85%, the maximum SI achievable, if 100% of the feed residue, assuming 15% feed refusal, was stem, is around 1.17. Thus values of 1.10 are towards the upper end of possible outcomes. That quite large differences in diet preference between More and Less selective groups exist is reinforced by the large difference between the groups in the leaf:stem ratio in the diets consumed.

There is evidence in this work to further support the impact of the dietary environment on diet selection. For example in Trial 1, there was no difference between the SI for two groups of sheep when lucerne balage was offered compared with a significant difference with lucerne chaff. Unlike with chaff, where the stem and leaf have been disassociated in the chaffing process, the leaf had remained attached to the stem in the balage making it very difficult for selection of leaf to take place. The decrease in clover proportion of the diet of More selective ewes as the height of the clover declined is similar to the effect of sward morphology on the diet preferences of sheep and goats shown by Concha and Nicol (2001).

The difference in SI between More and Less selective groups was remarkably consistent between the original selection of hoggets in Trial 3 and their sibs and dams. In this case of a maternal-half sib comparison, we cannot rule out Llearning by offspring from dam (Lynch & Bell, 1987) as a major contributor to this effect. Cross-suckling experiments are required to resolve the relative contribution of environmental and genetic effects.

That More and Less selective sheep co-exist in the same commercial sheep flock suggest that both strategies are sustainable in terms of animal productivity. In Trial1 there was no significant difference in daily DM intake; in Trial 2, the short term intake rate of More selective ewes was greater than that of Less selective ewes and in Trial 3, the average daily DM intake was higher for Less selective sheep. This suggests that the net benefit of grazing to More and Less selective sheep will vary with the grazing environment.

All these studies have been relatively short term and dietary preferences are known to vary in the short term due to previous history (Parsons *et al.*, 1999) and prevailing environment (Clark & Harris, 1985). Whether the differences in preference and selection detected in these studies have a long term effect on the composition of grazing pastures is yet to be determined. Until then, these between sheep differences in diet preference remain of academic interest.

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