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BRIEF COMMUNICATION: Preference of lambs for novel pasture herbs

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INTRODUCTION

There is strong evidence that sheep show a preference for some plant species over others (Parsons *et al.*, 1994; Concha & Nicol, 2000; Foster *et al.*, 2002; Rutter, 2006; Corkran, 2009). Differences among ruminant species in forage selectivity, offers a unique opportunity to manipulate utilization of pastures. Recently, increased milk yields and higher weaning weights of lambs have been shown to occur, when grazing a mixed herb sward containing chicory (*Cichorium intybus*), red and white clover (*Trifolium pratense* and *T. repens*) and plantain (*Plantago lanceolata*) (Golding, 2008). These results showed the potential for mixed swards to increase animal performance on New Zealand sheep farms. However, when designing an “optimal” sward mix it is important to not only incorporate the agronomic characteristics of the plant type such as, yield, growing season, and quality, and the potential level of animal production they can sustain, but also to take into account the level of animal acceptance and voluntary intake, or preference. Increased understanding of variations in herbage preference may assist farmers when designing a sward mix to maximise animal performance and sward sustainability.

This Brief Communication reports the results of a study designed to assess the variation in intake rate and preference of weaned lambs for novel New Zealand pasture herbs (chicory and plantain), legumes (lucerne (*Medicago sativa*) and red clover (*Trifolium pratense*) and ryegrass (*Lolium perenne*), grown and offered during the summer (February/March).

MATERIALS AND METHODS

Twenty weaned male lambs of similar live weight (29.3 ± 0.6 kg) were placed in individual indoor pens and monitored during a one week acclimatisation period. During this period all lambs were offered a basal diet of 0.5 kg lucerne chaff/d and 0.5 kg sheep pellets/d (crude protein 15.1% DM and metabolisable energy 11.7 MJ/kg DM) and their feed intake and refusals measured daily. A subset of ten lambs were selected and used to quantify the intake rate and relative preference value of daily

fresh cut chicory, plantain, lucerne, red clover and ryegrass pasture.

After the acclimatisation period, intake rates (g/min) for all herbage offered individually were determined for each lamb in triplicate. Each lamb was offered 200 g of all herbage, split over two adjacent feed bins, for a period of five minutes. Intake rate was measured in triplicate for each lamb. The intake rate for individual herbage was calculated as the amount of fresh herbage (g) consumed per minute. All herbage were offered to all lambs.

The term “preference” implies a behavioural trait exhibited by an animal whereby it selects something preferentially over another. An animal’s feed preference can be determined by monitoring their selection and voluntary feed intake when presented with different feedstuffs simultaneously. Four days after intake rate measurements, the lambs underwent preference testing to determine relative short-term preference. Each lamb was offered two different herbage simultaneously, 200 g of each in two adjacent feed bins, for a period of five minutes. The intake of each herbage was determined by weighing feed offered and feed remaining. The preference of each herbage was calculated as the percentage of total fresh intake of that herb. Preference tests were repeated in triplicate for each lamb with a minimum of 30 minutes between tests. The side each herbage was presented on was alternated for each preference replicate. All herbage were preference tested in pairs against all others and herbage pairs were preference tested with all lambs.

At the completion of testing each day, all lambs received a basal diet of 0.5 kg lucerne chaff and 0.5 kg sheep pellets overnight to satisfy their daily nutritional requirements. This study was conducted with the approval of the Massey University’s Animal Ethics Committee. Intake rate and preference for each plant species offered against all others and the average preference for each plant species were verified as having a normal distribution using the Anderson-Darling normality test function in the statistical software package Minitab[®] (Version 15.1.0.0, Minitab Inc., Cary, North Carolina, USA). The effect of herbage species

TABLE 1: Mean intake rate \pm standard error (g/min) of sheep fed plantain, chicory, ryegrass, red clover and lucerne.

Herbage species	Number of lambs	Intake rate (g/min)
Plantain	10	26.3 \pm 3.88 ^a
Chicory	10	43.7 \pm 6.60 ^b
Ryegrass	10	21.4 \pm 3.16 ^a
Red Clover	10	40.8 \pm 2.60 ^b
Lucerne	10	44.2 \pm 1.77 ^b

^{a, b} Different superscripts within columns indicate values that differ significantly ($P < 0.05$)

on intake rate and preference were analysed using an analysis of variance in Minitab[®]. Differences were deemed significant at the 95% confidence interval.

RESULTS AND DISCUSSION

The intake rates of the different pasture species are reported in Table 1. Herbage species had a significant ($P < 0.001$) effect on intake rate. The intake rate of ryegrass did not differ ($P > 0.05$) from that of plantain. The intake rates of red clover, chicory and lucerne were similar ($P > 0.05$) but significantly greater ($P < 0.05$) than the intake rate of either ryegrass or plantain.

Herbage species had a significant ($P < 0.001$) effect on preference. The average preference of chicory did not significantly differ ($P > 0.05$) from that of plantain or ryegrass but all three were of a significantly ($P < 0.05$) lower average preference than red clover and lucerne (Table 2). The average preference of lucerne and red clover did not significantly differ ($P > 0.05$). Overall red clover and lucerne had the highest average preference.

Although much of the previous work in this area has focussed on grass and clover species, this study supports evidence that sheep show a wide variety of preferences for different pasture species (Parsons *et al.*, 1994; Concha & Nicol, 2000; Foster *et al.*, 2002; Rutter, 2006; Corkran, 2009). The high preference of red clover compared to ryegrass and the ability of the lambs to consume chicory at a rate approximately twice that of ryegrass may help explain recent experimental evidence that mixed swards of chicory, red and white clover and plantain, increased milk yields and resulted in higher weaning weights of lambs compared to ryegrass/white clover pasture (Golding, 2008). The preference of lambs for red clover and lucerne, observed here with an average preference of 78% and 80% respectively, is similar to previously reported clover/legume preferences of approximately 70% (Parsons *et al.*, 1994; Harvey *et al.*, 1996, 2000). Lamb preference for plantain was lower than the majority of forages tested here and consistent with similar observations of plantain selection against chicory and red clover (Corkran, 2009). There are a large number of factors that can influence feed preferences but general consensus is that preferences are strongly related to the nutritive value and chemical composition of the feed and subsequent post-ingestive feedback (Provenza, 1995). Further studies are currently underway to relate the preferences observed here to the nutritive and chemical characteristics of the plant species used in this study. In addition, plants selected by grazing livestock have been reported to change diurnally (Orr *et al.*, 1997) and seasonally (Swainson & Hoskin, 2006; Corkran, 2009). Further studies are being conducted to investigate seasonal changes in plant characteristics and their relationship with preference.

The authors acknowledge that these preference tests were made with cut-and-carried fresh forage

TABLE 2: Average preference values (%) for sheep fed plantain, chicory, ryegrass, red clover and lucerne, and the relative feeding preference (%) of each of the herbage species when offered against each other (\pm standard error).

Preference	Pasture herb				
	Plantain	Chicory	Ryegrass	Red clover	Lucerne
Average preference	18.4 \pm 4.6 ^a	28.0 \pm 5.4 ^{ab}	45.5 \pm 6.3 ^b	77.7 \pm 4.2 ^c	80.3 \pm 3.8 ^c
Preference vs plantain	-	56.2 \pm 12.1 ^y	75.5 \pm 9.0 ^y	96.2 \pm 1.8 ^y	98.6 \pm 0.4 ^y
Preference vs chicory	43.8 \pm 12.1 ^y	-	74.0 \pm 10.8 ^y	80.3 \pm 8.6 ^y	89.7 \pm 5.0 ^y
Preference vs ryegrass	24.5 \pm 9.0 ^{xy}	26.0 \pm 10.8 ^{xy}	-	88.9 \pm 5.9 ^y	78.5 \pm 8.8 ^y
Preference vs red clover	3.8 \pm 1.8 ^x	19.7 \pm 8.6 ^x	11.1 \pm 5.9 ^x	-	54.6 \pm 4.9 ^x
Preference vs lucerne	1.5 \pm 0.4 ^x	10.3 \pm 5.3 ^x	21.5 \pm 8.8 ^x	45.4 \pm 4.9 ^x	-

^{a, b, c} Different superscripts with in rows indicate values that differ significantly ($P < 0.05$)

^{x, y} Different superscripts with in columns indicate values that differ significantly ($P < 0.05$)

and may not match observations made under grazing scenarios. However, rather than the relatively restricted grazing available on monocultures of ryegrass pasture, mixed swards may allow livestock to display more selective grazing behaviour whereby animals may preferentially select from a variety of different plant species and plant parts to better meet their nutrient requirements.

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