Partial Preference of Grazing Cattle for Contrasting Legume Swards

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PARTIAL PREFERENCE OF GRAZING CATTLE FOR CONTRASTING LEGUME SWARDS

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ABSTRACT
Yearling heifers in groups of 3 grazed 405 m^2 plots made up of alternating 2.4m wide strips of white clover/birdsfoot trefoil (WC+BT) or red clover (RC) in the proportions of 80:20, 67:33, 33:67 and 20:80 for periods of 3 days over four replicates in time, balanced for effects of previous treatment. Observation of the distribution of grazing activity and biting rate were made over 3 hour periods each evening. Biting rates were consistently higher on (WC+BT) than RC (52.3 vs 46.3 ± 0.59 bites.min^{-1} P(0.0001). Animals initially showed partial preference for the minor sward component in each treatment but regression of the proportion of grazing activity on proportion of total area for (WC+BT) approached unity with time, indicating the development of essentially neutral behaviour as herbage on minority strips was depleted.

KEYWORDS
Selective grazing, partial preference, biting rate, white clover *(Trifolium repens),* red clover *(Trifolium pratense)*, birdsfoot trefoil *(Lotus corniculatus)*

INTRODUCTION
Parsons et al. (1994) used monospecific swards of white clover *(Trifolium repens* L.) and perennial ryegrass (*Lolium perenne* L.) to investigate the partial preference of grazing sheep, and demonstrated that the proportionate distribution of grazing time could be influenced by the relative area of alternative swards available and by the previous experience of the animals. Temporal patterns of variation in partial preference have also been observed (Parsons et al., 1994). These studies involved relatively large blocks of individual pasture. The objective in this study was to evaluate the impact of the relative areas of alternative simple swards on the demonstration of partial preference by cattle, in circumstances where the physical distribution of the alternative swards minimized the requirement for animal movement.

METHODS
The experiment was carried out in spring 1995 at AgResearch Flock House Research Station, New Zealand, (40° 16'S, 175° 17'E), on a pasture formed by alternate 2.4m wide strips of white clover (*Trifolium repens* L.)/birdsfoot trefoil (*Lotus corniculatus* L.) (52% white clover, 20% birdsfoot trefoil , 28% other species: (WC+BT)) and red clover (*Trifolium pratense* L.) (92% red clover, 8% other species: (RC)). Individual plots of 405 m^2 were fenced to provide four treatments involving proportions by area of 80:20, 67:33, 33:67 and 20:80, each grazed for three days by groups of 3 yearling Friesian heifers of approximately 260 kg LW. Treatments were replicated over four successive periods of measurement, with one extra treatment in each period to provide a design balanced for the effect of previous treatment, and were allocated at random within blocks of five plots in each period.

One replicate was carried out each week, allowing time for measurement of herbage mass (three 0.1 m^2 quadrats cut to ground level from each sward type per plot) and sward height (40 measurement of surface height per sward type per plot using a sward stick (Bartham, 1986)) before and after grazing. Additional measurements of sward height were made on day 2 of grazing. Bulked samples of herbage from each sward type per plot were hand-separated for species and morphological components. Animals grazed together on an adjacent area of the same pasture for one week before the experiment and in the 4-day periods between replicate measurements. During experimental grazing, the distribution of grazing activity between strips of (WC+BT) and RC was recorded manually for three hours before dusk on each day at intervals of 10 minutes. Estimates of biting rate during grazing were made at the same time, using the 20- bite method of Jamieson and Hodgson (1979).

Statistical analysis of the data was based on plot mean values balanced for previous treatment and incorporating repeated measures analysis for day effects (SAS, 1979). Subsequent analyses were carried out within days to examine the relationship between the proportion of time devoted to grazing (WC+BT) and proportion of either area or herbage mass available on (WC+BT) strips, using a model fitting linear regression and residual treatment effects.

RESULTS AND DISCUSSION
Herbage mass and sward surface height were consistently greater for RC than for (WC+BT) strips (Table 1). The reduction in herbage mass over the grazing period was greater for (WC+BT) than for RC in both absolute and proportionate term. The proportion of live material was high on both sward types. Bite rates were consistently higher on (WC+BT) than on RC swards over all three days of measurements (52.3 vs 46.3 (0.59 bites.min^{-1} P(0.0001). There were significant effects of treatment on the proportion of grazing activity on (WC+BT) strips for all three days ($Propn_G$, Table 2), with no indication of significant carry-over effects between periods. Within days, variation in the distribution of grazing activity was linearly related to the proportionate area of (WC+BT) available ($Propn_A$, P(0.01), with no significant residual treatment effects (P>0.05).

On Day1 the animals allocated grazing activity preferentially to the minor sward component on each treatment, and the regression constant of PropnG on PropnA was correspondingly low (Table 2). However, in Days 2 and 3 the regression did not differ significantly from a 1:1 relationship, implying neutrality of choice. Regression based on the proportions of herbage DM available on (WC+BT) strips (PropnDM) showed similar trends over time. Milne et al. (1982) also found evidence of preference for the minor components of mixed perennial ryegrass/white clover swards in short term observations. Parsons et al. (1994), working with monospecific swards of perennial ryegrass and white clover in large blocks, observed initial preference for clover in both minority and majority combinations, but preference for the grass developed over time in the majority clover (80:20 by area) treatment.

These results provide further evidence for the influence of opportunity on the preferential behaviour of grazing animals. They also demonstrate the rapid adjustment of partial preference in response to the depletion of the preferred component of the diet. Future studies will examine the effects of relative changes in sward structure and maturity in more detail.

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Table 1
Characteristics of white clover plus birdsfoot trefoil (WC+BT) and red clover (RC) strips before and after grazing

	WC+BT	RC	SEM
Herbage mass (kg DM/ha)			
pre-grazing	3940	4570	115**
post-grazing	2380	3340	103***
Sward height (cm)			
pre-grazing	19.1	27.7	0.95***
after 1 day grazing	12.4	21.9	0.62***
post-grazing	7.5	13.3	0.25***
Proportion of live material			
pre-grazing	0.96	0.91	0.007***
post-grazing	0.91	0.84	0.009***

** = P < 0.01; *** = P < 0.001

Table 2
Treatment effects on the proprotion of grazing time devoted to white clover plus birdsfoot trefoil

Propn. of plot in (WC +BT)	Proportions of grazing activity on (WC +BT) Day 1	Day 2	Day 3
80%	0.66	0.80	0.79
67%	0.61	0.70	0.65
33%	0.46	0.27	0.20
20%	0.36	0.14	0.10
SEM	0.057*	0.025***	0.051***
Regression of:			
$Propn_{GT}$ on $Propn._{A}$ [1]	0.4±0.11***	1.1±0.06***	1.2±0.09***
$Propn_{GT}$ on $Propn._{A}$	0.5±0.12***		1.2±0.09***

[1] See text for explanation
* = P< 0.05; ** = P < 0.01; *** = P< 0.001