Effect of calcified seaweed application on grazing preference by dairy cows

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ABSTRACT

An experiment was carried out to determine whether the application of calcified seaweed improved the preference of organic dairy cows for pasture. Two treatments were applied in May 2001; calcified seaweed applied at 625kg/ha (C+) or no application (C-). The number of cows grazing within individual plots was recorded in July and August 2001. A significantly higher number of cows were recorded in C+ plots than in C- plots. This effect could not be explained by changes in soil or herbage analysis. There may have been additional unknown effects of the C+ treatment on herbage palatability but the results may also have been influenced by external factors such as the location of water troughs.

Keywords: organic farming, dairy cows, grazing, preference, calcified seaweed

INTRODUCTION

Calcified seaweed is available commercially as a soil conditioner. It is a calcareous red algae (*Lithothamnium calcareum*) which grows detached in shallow waters and accumulates to form large beds of stone- or coral-like algae. The algal thallus is made up of successive layers of calcium and magnesium carbonates which may account for up to 80% of the wet weight. It is primarily a liming material, having a neutralising value of 53, similar to ground limestone or magnesian limestone, although it is more expensive per tonne. The main advantage of calcified seaweed over other liming materials is its relatively high content of trace elements. It is also claimed that it improves the palatability of herbage to grazing animals. However, no research on the possible effects of calcified seaweed on palatability of herbage has been published.

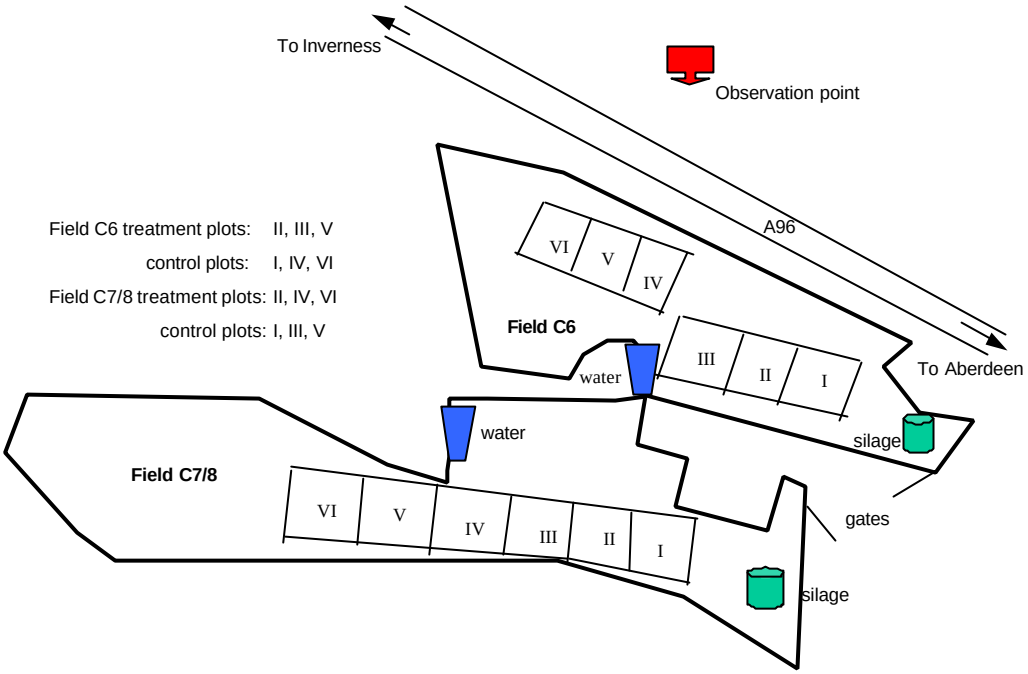
The objective of the study reported here was to determine the grazing preference of lactating dairy cows for grass/white clover pasture treated or not treated with calcified seaweed.

MATERIALS AND METHODS

The trial was conducted in May-August 2001 at the SAC organic dairy unit on Craibstone Estate, Aberdeen on two perennial ryegrass/white clover fields which had achieved full organic status in August 2000. The fields (Fields C6 and C7/8) were located adjacent to the farm steading and are on Countesswells Association soil, which is a free-draining, stony, sandy loam. Two treatments were compared:
CS+ Calcified seaweed applied at 625kg product per hectare

CS- Control; no calcified seaweed.
The calcified seaweed was broadcast on the sward surface on 28 May 2001 with a plate and flicker fertiliser distributor. There were three replicates of the two treatments in each field, making a total of six replicates in all. Plots were 50m by 50m, were not fenced but were marked at corners by white posts (Fig 1).

Figure 1. Layout of experiment.



The number of cows present within the trial plots in each field was recorded at hourly intervals between 1700 and 2100 hours inclusive on eight days each (i.e. a total of 16 days) between 24 July and 28 August 2001. Thus there were observations on each plot on 40 occasions (replication in time). Coupled with six replications in space there were, therefore, 240 data points for each treatment. In Field C7/8, observations were made from within the field, whilst for Field C6, observations could be made from a vantage point 300m away.

Soil samples were taken for analysis in late July 2001, eight weeks after application of the calcified seaweed. Ten cores were taken per plot. Cores from each treatment in each field were bulked, mxed and subsampled, giving two samples per treatment. These were analysed for major nutrients. Herbage samples were taken, again at ten locations per plot, and were similarly bulked and mixed for each treatment and each field, giving two samples per treatment. These were dried, milled and analysed for a range of major and trace elements.

RESULTS

There were no consistent differences between treatments in nutrient content of soils or herbages, the differences between fields being generally larger and more consistent than differences between the two treatments (Tables 1 and 2).

Table 1. Effect of calcified seaweed treatment on soil nutrient status.

	Field C6		Field C7/8	
Determination	CS-	CS+	CS-	CS+
pH	5.7	5.7	6.1	6.1
Extractable P (mg l^{-1})	23.0	20.6	11.0	12.3
Extractable K (mg l^{-1})	274	215	115	132
Extractable Mg (mg l^{-1})	174	173	129	129
Extractable Ca (mg l^{-1})	1280	1410	1510	1570

Table 2. Effect of calcified seaweed treatment on herbage mineral content.

		Field C6		Field C7/8	
Determination	Units	CS-	CS+	CS-	CS+
Dry matter	%	14.0	14.0	13.4	13.4
Phosphorus	%DM	0.46	0.44	0.50	0.53
Potassium	%DM	2.90	2.89	3.00	2.82
Magnesium	%DM	0.28	0.28	0.24	0.27
Calcium	%DM	0.92	0.96	0.67	0.84
Sodium	%DM	0.20	0.17	0.18	0.19
Sulphur	%DM	0.33	0.33	0.36	0.34
Iron	mg kg^{-1} DM	106	106	173	179
Copper	mg kg^{-1} DM	9.67	8.50	10.7	11.9
Manganese	mg kg^{-1} DM	132	124	86.4	74.8
Boron	mg kg^{-1} DM	10.0	11.5	9.14	12.1
Zinc	mg kg^{-1} DM	33.8	31.2	35.5	36.3

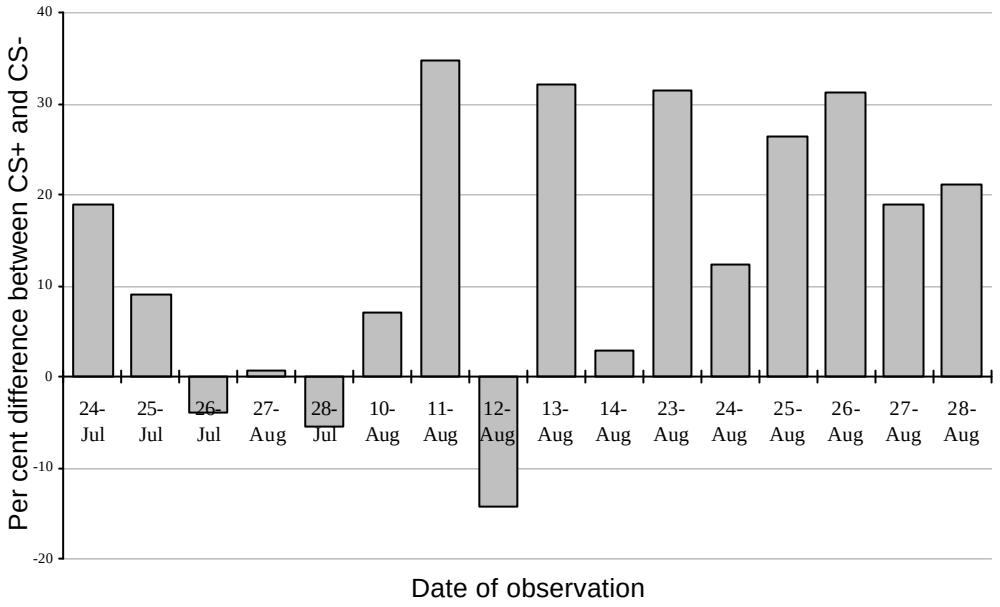
The preference of cows for each treatment is shown in Table 3 below.

Table 3. Total number of cows observed in CS- and CS+ plots over the observation period.

Field	**Plot**	**Treatment**		**Significance**
		CS-	CS+	
C6	I	154		
	II		155	
	III		199	
	IV	92		
	V		169	
	VI	122		
C7/8	I	96		
	II		103	
	III	103		
	IV		137	
	V	92		
	VI		110	
Total		658	865	***

Significantly more cows were observed in treated plots than on untreated plots, although there were large variations between replicate plots of both treatments. The differences between treatments tended to become more consistent, in favour of the CS+ treatment, as the period of observation progressed (Figure 2).

Figure 2. Percentage difference in daily cow numbers between treatments.



DISCUSSION

Herbage and soil analyses do not provide an explanation for the difference in the number of cows observed on each of the two treatments. In fact in this experiment there was a relatively short time period between application of the calcified seaweed and the start of the sampling and observation period. Previous work by Tye *et al* (2000) showed that soil pH increased by 0.3 pH units only after five months. These authors also showed relatively minor changes in herbage mineral content (mainly increased Ca content) after this period. Given the slow-acting nature of the material, this present study will need to be repeated in the 2002 season to determine the extent of the residual effect of calcified seaweed application. Whilst soil and herbage analyses do not appear to provide an explanation for the significant difference between treatments in this present study, nevertheless there may have been an effect on herbage palatability which cannot be determined from the analyses carried out.

There may be other reasons also. It is possible that the difference in cow numbers between treatments (and the variation between plots) was caused partly by the location of the plots in relation to water troughs and/or silage ring feeders. The latter appear to have had relatively minor influence since those plots which were nearest to ring feeders (Plot I on both fields) did not have particularly high cow numbers. In contrast, plots which were closest to the water troughs on each field (i.e. Plot III in Field C6 and Plot IV in Field C7/8) had the highest cow numbers observed on each

field. If these plots are removed from the analysis, a t-test shows no significant difference between the two treatments. However, examination of the relationship of daily temperature and rainfall with the percent advantage to CS+ plots shows no clear link between weather conditions and preference for CS+ plots. Nevertheless, the cows used in this experiment were high-yielding Holstein cows and in any case would have had a high daily water intake requirement.

The fact that the positive effect of the CS+ treatment appeared to increase as the experimental period progressed (Fig. 2) suggests either that the effect was indeed slow-acting and was beginning to become apparent, or that the cows had been undergoing a learning experience, i.e. that they had been developing a taste for either the herbage or the seaweed particles over time. It is possible that some of the calcified seaweed was actually ingested by the cows. Calcified seaweed particles could still be seen on the ground surface at the end of July.

Clearly this work can be regarded only as a preliminary study, and it highlights the importance of experimental design in grazing behaviour experimentation. There appeared to be a positive effect of calcified seaweed on grazing preference by dairy cows, but this could not be explained from the herbage and soil data available and the most likely explanation at present appears to be a bias caused by the location of the CS+ plots in relation to field water troughs. Observation over a longer period of time is necessary to take account of the slow-acting nature of the material, but further experimentation is also required on a new site where all possible bias from location of water troughs, etc can be eliminated.

REFERENCES

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