THE EFFECT OF SLURRY AND DIRTY WATER APPLICATION TO SWARDS ON GRAZING BEHAVIOUR IN DAIRY COWS

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ABSTRACT
In preference tests using pairs of turves in boxes (treated and control), dairy cows were more averse to surface spread than shallow injected slurry and more averse to slurry than dirty water. Effects of slurry persisted for up to 6 weeks, with fewer bites and less herbage removed from treated swards compared to control swards. Aversion to slurry may be decreased by injection. Effects of dirty water persisted for only 14 days.

KEYWORDS
Slurry, dirty water, injection, surface spreading, dairy cows, swards, preference

Acronyms. SS = surface spread slurry, DW = surface spread dirty water, I = injected slurry, C = control, DM = dry matter, SSH = sward surface height

INTRODUCTION

Restrictions on rate and timing of spreading of cattle slurry and dirty water are recommended in the UK to minimise the risk of water pollution. Farmers should provide storage for waste for a minimum of 120 days (MAFF, 1991), and delay spreading onto land until spring. On dairy farms, this may result in waste being spread on pasture soon to be grazed, and so poses the risk of rejection of contaminated herbage. The effects of cattle dung patches and slurry, on herbage rejection by steers and heifers, are well documented (Collins, 1977). Rejection was observed up to 8 weeks following application of 100 m^3 ha^{-1} of slurry in a no-choice situation (Broom et al., 1974), and persisted for up to 13 weeks where there was a choice between clean and contaminated herbage. Injection of slurry, compared with surface spreading, gave 30% higher intakes of herbage when dairy cows grazed swards 9 weeks after application at a rate of 25 m^3 ha^{-1} (Pain and Broom, 1978).

The aim of this work was to use turves in boxes treated with either slurry or dirty water using different application techniques (Laws et al., 1996) to assess the preference by dairy cows for treated swards when offered with a clean sward. Dairy cows were used as they have a higher intake potential and are therefore less selective than dry or young animals.

METHODS

Perennial ryegrass (*Lolium perenne L*) turves in boxes (swards), 0.25 m^2 in area, were maintained by cutting and applying ammonium nitrate (120 kg N ha^{-1}). Swards were treated with either SS, DW or I, at a rate of 35 m^3 ha^{-1}. Shallow injection was simulated by cutting two slits in the sward (5 cm deep, 20 cm apart) and pouring slurry in. Slurry DM was 5.1% and dirty water DM 0.28%.

Twelve multiparous dairy cows were used in the tests. Four cows were allocated at random to the 3 treatments (SS, I and DW). They were held, 4 at a time in a pen, and each cow was allowed into a clean test arena to graze from pairs of swards sunk into the ground, before returning to the holding pen. There was no fasting. Treated (SS, I and DW) and C swards were paired and presented to cows 1 h, 24 h, 4, 14, 28 and 42 d after application of SS, DW and I. Ten minutes were allowed for each test; bite number, time spent investigating and grazing swards was recorded. Recording terminated when the animal was disinterested and resumed if grazing continued within the 10 minutes. Boxes were weighed before and after each test to assess intake. SSH was recorded before and after by taking 50 measurements at the point of first contact (Bircham 1981).

RESULTS AND DISCUSSION

Results are summarised in table 1.

Significantly more bites were taken on C when paired with DW and I than SS. Number of bites taken on treated swards was significantly greater on DW and I than SS. For the SS treatment pair 90% of bites were on the control box, compared to I (68%) and DW (63%). Six weeks after application, dairy cows could still differentiate between SS or I treated swards and C but aversion to DW was no longer detected 14 d after application. They were more averse to SS than I and overall more averse to slurry than DW. The number of bites taken on C was decreased by the physical presence of SS.

Significantly more time was spent investigating C when paired with SS than with I or DW. Time spent investigating treated swards was significantly greater for SS than I or DW. The presence of SS decreased total time spent grazing on C compared to C presented with DW or I. On the treated swards of each pair, significantly more time was spent grazing DW or I than SS. Negative effects of treatments were greatest at 24 h following application. This may be due to an increase in the emission of volatiles shown by Dohi et al (1991) to inhibit feeding behaviour. Emissions from slurry may be reduced by shallow injection techniques.

A significantly greater weight of herbage was removed from the treated sward of each pair for DW compared to SS or I. SSH removed (SSH pre - SSH post grazing) from C was significantly greater when paired with DW than SS or I. SSH removed on treated swards was significantly greater for DW than SS or I.

These results suggest that in a choice situation in the field, with no rainfall, cattle would still be averse to SS or I treated pasture after 6 weeks post application at a rate of 35 m^3 ha^{-1}. In comparison negative effects of DW are short-lived. More investigation is needed into the factors affecting rejection of herbage in the field following SS, I or DW application.

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Table 1
Summary of results with comparisons of treatments.

Treatment comparisons	Investigation time (s)		Grazing time (s)		Bites taken		Percentage of bites taken		SSH removed (mm)		Weight of herbage removed (g)	
	C	T	C	T	C	T	C	T	C	T	C	T
SS *vs* C mean values	33.0	18.2	81.9	17.6	66.0	12.5	90	9	69.4	18.6	242.0	48.0
I *vs* C mean values	15.7	12.6	97.3	60.7	99.8	51.8	68	32	64.8	50.5	195.0	125.0
DW *vs* C mean values	15.8	14.8	89.8	78.3	82.5	72.5	63	37	79.9	65.6	195.0	197.0
(SS *vs* C) *vs* (I *vs* C) F probability	***	NS	NS	***	***	***	***	***	NS	***	NS	**
(SS *vs* C) *vs* (DW *vs* C) F probability	***	NS	NS	***	*	***	***	***	**	***	NS	***
(I *vs* C) *vs* (DW *vs* C) F probability	NS	NS	NS	NS	NS	NS	NS	NS	***	NS	NS	*

C = control, T = treated, NS = not significant $P > 0.05$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.