



A trial to investigate the reactions of sheep to goose droppings on grass

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Any study of the interaction of wildfowl and agriculture is likely to encounter the farmers' complaint that cattle and sheep actively avoid land fouled by goose droppings. Kear (1963) reviewed what was then known on the subject: that grazing stock certainly avoid their own faeces and those of other mammals, but that there was no experimental evidence that showed the same reaction to the droppings of birds which look, smell and taste (to humans) quite different. Indeed, a few reports from farmers had indicated a totally different response, that domestic animals sometimes eat goose droppings selectively. It was suggested by Kear (1963) that these cases might have the factor of soil mineral deficiency in common and occur only in areas where soil and vegetation are short of some element which is obtained by the geese as grit elsewhere. Two examples from parts of Scotland where phosphate levels are known, or assumed, to be low were mentioned and since 1963 three others have been reported. A farmer interviewed in Iceland recalled that he had seen sheep eat Greylag Goose *Anser anser* droppings on poor ground. Another farmer on Islay (P. D. Pearce, *in litt.*), an island notoriously short of phosphate, reported that 80% of his cattle herd were picking up Greylag and Barnacle Goose *Branta leucopsis* droppings between January and

April. Cabot (in prep.), in a study concerned with Barnacle populations on the Inishkeas, islands off Ireland, stated that cattle and donkeys eagerly devoured droppings there, the cattle picking them up at an average rate of 100 droppings every five minutes.

There seemed no doubt, however, that these instances of coprophagia were unusual and that the animals involved were to some degree suffering from a pathological condition. A study was required that would investigate in a precise manner the reactions of 'naive' but normal stock to goose-contaminated turf. Therefore a trial was designed (by J.K.) to test these reactions and the factors that might be involved if avoidance occurred.

Method

The work was carried out (by J.B.A.R.) at the research station of the Department of Agriculture and Fisheries for Scotland at East Craigs, Edinburgh.

Four yearling Blackface sheep (two castrate males and two females) were housed individually in 10 feet \times 7 feet pens in a hay shed with an earth floor, and with the east side open. The only fresh grass offered to the sheep was that used in the tests; hay and water were continuously available, and a concentrated dry feed was given after each day's trial had been completed.

Grassy turves, measuring 12 inches \times 18 inches, were cut fresh each day, and a uniform sward of about 3 inches depth was maintained by clipping with shears. Turves were treated before being offered to the sheep in one of four ways:

- A. Left plain (untreated).
- B. Four imitation goose droppings were spaced approximately evenly over the surface.
- C. Four real goose droppings were placed as in B.
- D. Four goose droppings were smeared over the grass and then removed.

It can be seen that turf C had visual and any chemical (taste and smell) elements of fouling, turf B had visual signs only, and turf D chemical components alone. It is also possible that tactile stimuli were involved in B and C. The spacing of the droppings was equivalent to the highest density of fresh droppings (three per square foot) found on a natural pasture grazed by geese.

Greylag droppings were obtained initially from the feral flock at Lochinch, Wigtownshire, but, as these deteriorated somewhat in the post, the majority were collected fresh in Holyrood Park, and stored in a deep-freeze until required. The imitation droppings were made to a recipe of two parts by weight of flour to one of plaster of paris, with finely chopped sisal being added to give a fibrous nature. The mixture was worked to a clayey consistence with water, moulded to shape, and allowed to dry before painting with Reeves 'Co-polymer' paint to simulate the green vegetable and white urate elements of the real droppings. This paint is more durable than poster paints, and does not leave the smell of the oil-based kinds. Imitation droppings were re-used after washing in plain water.

In the choice tests, each sheep was presented, once a day, with a pair of turves and its preference noted. The four turf treatments gave six paired combinations which were presented in a randomised sequence of 24 tests. Position preference was controlled by offering each turf type an equal number of times to the left and right. Tests were run consecutively so that the choice of one sheep did not affect that of its neighbour. Ideally the 24 tests would have been presented on consecutive days; however, staff and weather problems intervened and seven isolated days were missed. The breaks in routine had no obvious effect

on the sheep at the resumption of tests.

The two turves were placed one foot apart at the east end of the pen and, at the beginning of the experiment, the time a sheep spent on each during ten minutes of feeding, was noted. The turf with the greatest aggregate time was then scored as 'first choice'. However, as it soon became obvious that a sheep could graze the grass from its first choice very rapidly and spend the greater part of its ten minutes grazing more hesitantly on the second choice, the total time was reduced to five minutes. In practice the choice was usually obvious from the comparative appearance of the turves or the sheep's behaviour, and the timing test was relied on only in case of doubt. One turf might be repeatedly sampled and rejected, the sheep returning to graze the alternative until it was quite bare, while the rejected turf remained green.

Results and discussion

The results obtained are set out in Table I. A chi-square test indicated that there were no significant differences in the performances of individual sheep; similarly no bias to left or right was found. However, the data indicate that significant differences did exist in the number of times different turf types were chosen. Turves without any contamination by real droppings were preferred and A and B were not discriminated ($P = 0.5$). Turf C, with the real droppings, was first choice significantly less often than A ($P = 0.02$) and turf D was the least attractive ($P = 0.001$). It seems therefore that goose droppings do repel sheep and that the repellent factor is mainly chemical, either taste or smell, but that the sight of strange objects alone (the imitation droppings) does not deter. The sheep used were unfamiliar with goose fouling at the start of the experiment and tests showed that they did not acquire experience during its course; that is, they did not avoid more at the end than at the beginning.

On turf C the real droppings were never eaten, but were often grazed around. Imitation droppings on turf B were nosed aside and frequently found on the ground after the test. Turf D was contaminated over its whole surface and had no clean grass, but even this obviously most repellent turf was usually grazed after the alternative had been stripped bare. The sheep would sample very delicately the tips of the blades of grass, quartering the whole surface to find clean grass in a manner which suggested extreme dis-

Table I. The preference of sheep for various pasture treatments.

Sheep No.	Turf A	Turf B	Turf C	Turf D
	untreated	with imitation droppings present	with goose droppings present	smear- ed with goose droppings
1	11	6	5	2
2	10	10	4	0
3	8	9	5	2
4	7	10	5	2
<i>Total first choices</i>	36	35	19	6

taste, but normal grazing usually followed. Of course, the conditions of turf D are not found in the wild, but they may not be altogether different from pasture frequented by large numbers of geese over a long period (for example on a roost where the density of droppings may also be higher than that used here).

Although the results strongly suggest reduced palatability of fouled pasture, it

cannot be assumed that such grass is 'lost'. The repellent factor may be unstable and soluble and disappear rapidly in normal weather conditions. Further experiments to investigate this, and the reactions of unpenned stock are required; possibly the severely limited supply encouraged the penned sheep to consume grass which would have been unacceptable in the field.

Summary

A trial is described that investigates the validity of farmers' contentions that stock will not graze on pasture fouled by geese. 'Choice tests' on penned sheep, with turves treated in various ways to simulate the properties of pasture contaminated with goose droppings, indicated that palatability is lowered by fouling, but that fouled pasture may still be grazed in some circumstances. Either smell or taste, or both, appeared to be the repellent factors involved; no response to the visual component of goose droppings could be detected.

Reference

KEAR, J. 1963. The agricultural importance of wild goose droppings. *Wildfowl Trust Ann. Rep.* 14 : 72-77.

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