

# THE RELATIONSHIP BETWEEN FAECAL NITROGEN AND HERBAGE DIGESTIBILITY UNDER GRAZING CONDITIONS

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## Summary

The relationship between faecal nitrogen and herbage digestibility was examined with grazing sheep by estimating herbage digestibility with an *in vitro* technique, on samples collected from sheep fitted with oesophageal fistulae. These values were related to faecal nitrogen by regression analysis using faeces collected from bagged sheep grazing with the fistulated sheep. Sward comparisons were made between ryegrass, tall fescue and cocksfoot grown with and without white clover. Regressions of faecal nitrogen on organic matter intake factor were significantly linear, and differed significantly between grass species. The intake factor from cocksfoot swards was 0.65-0.85 units lower than that from the other two grasses at similar levels of faecal nitrogen. Separate equations for swards with and without white clover did not differ significantly.

## I. INTRODUCTION

Faecal nitrogen is the most common index of herbage digestibility used in estimating the intake of grazing animals. This paper reports further on the relationship between these factors under field conditions, using an *in vitro* method for estimating herbage digestibility.

## II. MATERIALS AND METHODS

Data presented here were obtained from a grazing trial in which the following grasses were grown with and without white clover (*Trifolium repens* L.):

N.Z. "Grasslands" cocksfoot—*Dactylis glomerata* L.

N.Z. Perennial ryegrass—*Lolium perenne* L.

Demeter tall fescue—*Festuca arundinacea* Schreb.

Each pasture was replicated four times in ½ acre plots, which were subdivided into three for rotational grazing. The pastures were mown to 3-4 inches before the experiment and maintained at or below this level throughout. In each of the months September, October and November 1964, total faecal collections were made over a four day period, using one sheep to each plot. Concurrently, herbage samples were collected from sheep fitted with oesophageal fistulae, of which there was one on each plot.

Faecal samples were dried at 100°C for 24 hours in a forced draught oven and bulked for each sheep at the end of collection periods. Sub-samples were

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milled through a 1 mm screen and analysed for nitrogen, using the micro-Kjeldhal method of Ma and Zuazaga (1942).

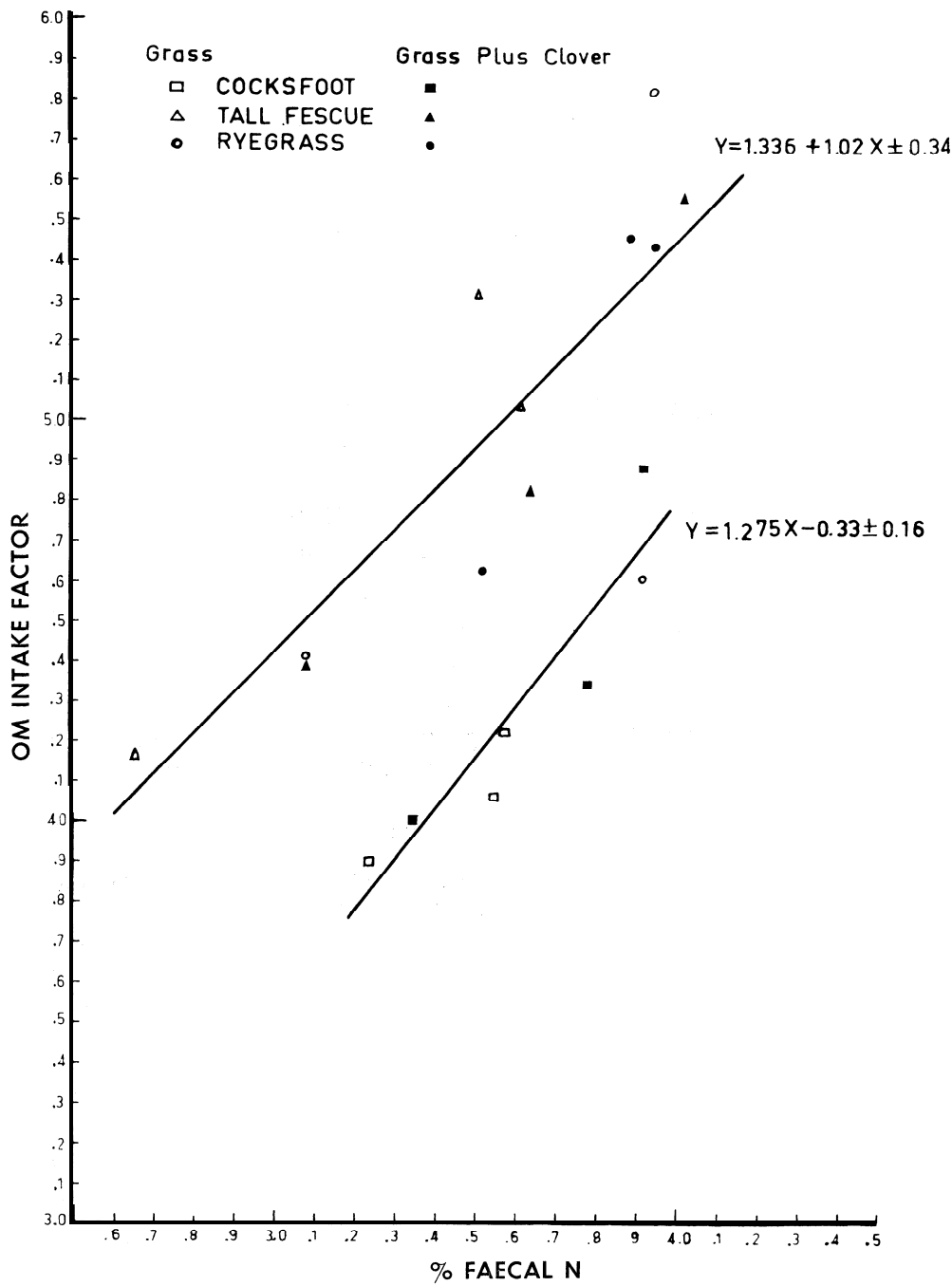


Fig. 1 .-Regression relationships between OM intake factor and percentage nitrogen in faecal OM.

Samples of approximately 1 kg wet **herbage** were collected during periods of 20-40 minutes, and taken to the laboratory in an ice box containing liquid air. After drying at 80°C for 24 hours in a forced draught oven, and milling through a 1 mm screen, the digestibility of the **herbage** samples was estimated using the *in vitro* procedure of Tilley and Terry (1963).

Estimates of faecal nitrogen and **herbage** digestibility were pooled for each pasture within each collection period, giving a total of 18 observations.

### III. RESULTS

Estimates of **herbage** digestibility were converted to organic matter (OM) intake factors:

$$\text{OM intake factor} = \frac{100}{100 - \text{OM digestibility}}$$

The intake factors (Y) were related to estimates of nitrogen in faecal OM (X) by regression analysis. The data fitted two separate linear equations which were significant ( $P < 0.01$ ):

$$\text{Ryegrass + Tall fescue } Y = 1.336 + 1.021 X \pm 0.34 \dots (1)$$

$$\text{Cocksfoot } Y = 1.275X - 0.33 \pm 0.16 \dots (2)$$

Each equation contains data from the grass plus clover plots which fitted the same regression lines as the pure grass plots, as shown in Figure 1.

The intercepts of the two equations differ significantly ( $P < 0.001$ ), but the regression coefficients do not. The difference in intercept means that at similar levels of faecal nitrogen within the two regression lines, the OM intake factor on cocksfoot swards was 0.65-0.85 units lower than that on the other two grasses.

### IV. DISCUSSION

From other published work relating to pen feeding experiments, differences in time of year appear to be an important factor affecting the relationship between faecal nitrogen and **herbage** digestibility. Separate seasonal regressions were given by Vercoe, Pearce and Tribe (1962), Lambourne and Reardon (1963) and Arnold and Dudzinski (1963), whilst Minson and Kemp (1961) plotted separate regressions for each month of the growing season. The data examined by Minson and Kemp included values from pure **ryegrass** and cocksfoot swards, but no species differences were reported. Minson and Raymond (1958) compared lucerne and cocksfoot, but found that species variation was not significant. Under field conditions, the relationship between faecal nitrogen and **herbage** digestibility may be affected by the ratio of stem leaf selected by the grazing animals (Lambourne and Reardon 1962). In this experiment the pastures were maintained in a short vegetative state so that negligible stem material was available for selection.

The results reported here suggest that differences between **herbage** species may be important in affecting the relationship between faecal nitrogen and **herbage** digestibility.

## V. ACKNOWLEDGMENTS

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