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A comparison of the voluntary intake and digestion of a range of forages at different times of the year by the sheep and the red deer (*Cervus elaphus*)

BY J. A. MILNE, J. C. MACRAE, ANGELA M. SPENCE AND S. WILSON

Hill Farming Research Organisation, Bush Estate, Penicuik, Midlothian

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1. Comparisons were made between castrated male Scottish Blackface sheep and red deer (*Cervus elaphus*) of voluntary forage intake (VFI), digestibility and the mean retention time (MRT) of a particulate-phase marker (^{103}Ru-phenanthroline) in the alimentary tract, when a range of forages: dried-grass pellets, chopped dried grass, fresh-frozen *Agrostis–Festuca* spp. and heather (*Calluna vulgaris*, L. Hull) were given at different times of the year.

2. On both the dried-grass-pellet and chopped dried-grass diets the red deer and sheep ate similar quantities. Both species had a higher VFI of dried-grass pellets in July than in November. The sheep digested the dried-grass-pellet diet better than the red deer and this was associated with a longer MRT of the particulate-phase marker in the alimentary tract.

3. The VFI of *Agrostis–Festuca* spp. and heather by the red deer was twice that of the sheep. The VFI of heather by the sheep increased by 32 % between January and April, and the VFI of both the *Agrostis–Festuca* spp. and heather diets by the red deer increased by 65–70 %. The sheep digested the *Agrostis–Festuca* spp. better than the red deer but the red deer digested the heather slightly better than the sheep. MRT of the particulate-phase marker was greater for the sheep than for the red deer on both diets. The digestibility and MRT of both diets in the red deer did not decrease with the seasonal increase in VFI, suggesting a possible hypertrophy of the alimentary tract.

Domesticated sheep and feral red deer (*Cervus elaphus*) are the principal producers of food for human consumption from a large proportion of the rough grazings of Scotland. In any study of land use or resource management it is necessary to know whether there are differences between the two species in the biological efficiency with which they use the resource. These can be brought about by differences between the species in their grazing behaviour, ability to consume more of a diet and digest it better, in their efficiency of utilization of the end-products of digestion and in their nutrient requirements. It is the second aspect which is examined in this paper.

Sheep and red deer eat many similar plant species which range from highly digestible grasses in summer to poorly digested grasses and heather (*Calluna vulgaris*, L. Hull) in winter (Hobson, 1969), but seasonal fluctuations in voluntary intake by red deer (Simpson, 1976) and other *Cervidae* (Long, Cowan, Strawn, Wetzel & Miller, 1966; McEwan & Whitehead, 1970) would appear to be greater than those found with sheep (Gordon, 1964). Preliminary results of Kay & Goodall (1976) have indicated that with good-quality roughage diets there were only small differences between sheep and red deer in voluntary intake (VFI), digestibility and mean retention time of undigested residues in the gut. However, comparisons using poor quality roughages have not been made.

The present experiments were designed to examine the differences between the sheep and the red deer in VFI, digestibility and mean retention time of a particulate-phase marker (MRT) when low-quality *Agrostis–Festuca* spp. and heather were given in the winter and spring and good-quality chopped or pelleted dried grass were given in summer and autumn. A preliminary report of this study has already been given (Milne, MacRae, Spence & Wilson, 1976).