FACTORS AFFECTING FIBRE BREAKDOWN IN *Digitaria pentzii* GROWN WITH OR WITHOUT SULPHUR

D.E. AKIN* and J.P. HOGAN**

Digitaria pentzii grown under conditions of sulphur fertilization (S+) is consumed in greater quantity than the corresponding forage grown without fertilization (S-) (Rees *et al.* 1982). The purpose of the present study was to investigate the plant anatomy and the interaction between plant structures and the rumen microbiota involved in fibre digestion of sheep fed S- and S+ *Digitaria pentzii* as a possible explanation for increased intake.

Two Merino ewes prepared with rumen and abomasal fistulae were fed *ad libitum* on S- and S+ forage. Plant tissues were quantitated by measuring cross-sectional areas under light microscopy, and the sites and types of lignification in cell walls were determined. The manner of attack and the relative ease and extent of tissue degradation of leaf blades of S- and S+ forage incubated in nylon bags in the rumen of the sheep fed the same forage was examined by electron microscopy. Samples of ground S- and S+ forage were incubated *in* vitro with rumen liquor from a sheep fed 800 g/d of a diet of 60% lucerne hay and 40% oat grain, and leaf blades within nylon bags were incubated in sheep fed the lucerne:oat diet.

The anatomy of S- and S+ leaf blades was similar and typical of warm-season grasses. Both had a high vascular density (25% cross-sectional area) with relatively low amounts of more easily digested mesophyll (about 30%). Lignin appeared in rigid vascular tissues (i.e., xylem cells) and in the sclerenchyma in both forages.

In vitro dry matter digestibilities of ground S- and S+ forage were both about 55% using rumen liquor from a sheep fed the lucerne:oat diet. Further, with this inoculum no differences were observed in the manner, ease, or extent of leaf tissue degradation between forages using electron microscopy. However, in the study of blades within nylon bags of sheep fed each of the Digitaria diets, all mesophyll and epidermal cell walls were degraded by 48 hours in the S+ leaf blades, but these tissues were often still present in S- blades. Parenchyma bundle sheaths resisted degradation in both treatments (as well as in animals fed the lucerne:oat diet) and, along with lignified vascular tissue and portions of sclerenchyma, comprised the nondegradable portion of the leaf blade. Although mesophyll and epidermis were degradable (but less readily in S- forage), relatively few bacteria adhered to the plant cell wall during degradation. Extensive breakdown of the sclerenchyma occured in the S+ blades, and was associated with the presence of structures identical to rumen fungi which attach to lignified tissues (Bauchop 1979). No fungi were observed with the S- leaves and the sclerenchyma was undegraded except at the periphery, and then only by bacteria. Sclerenchyma cells of both S+ and S- leaf blades were attached by similar microbial cells in sheep fed the lucerne:oat diet.

These data suggest that anatomical and structural variations in cell walls that influence microbial degradation do not occur between S+ and S- leaf blades. A more rapid digestion of mesophyll and epidermis, possibly due to a greater number or a different type of fibre-digesting bacteria, and the weakening of some lignified structures by fungal attack may explain increases in intake of S+ compared with S- *Digitaria* in previous work (Rees *et al.* 1982).

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*Russell Research Center, ARS-USDA, Athens, Georgia, USA.
**Division of Animal Production, CSIRO, Prospect, N.S.W. 2149.