Variability in the quality of oat (Avena sativa) grain as a feed for ruminants is well known and has, traditionally, been attributed to its protein and fibre content, bulk density and groat (hull-less grain) to hull ratio. More recently, Crosbie et al. (1985) reported considerable variation in the lignin content of hulls of Western Australian oat cultivars, and showed in vitro digestibility to be negatively correlated with lignin content. Crosbie et al. (1985) also identified the silica content of the hull as an important factor influencing digestibility and, in the study presented here, the relative importance of lignin and silica in determining digestibility were investigated.

Thirty-five samples of oat grain were collected from trial sites throughout the agricultural area of Western Australia in 1983. Subsamples were dehulled using a laboratory dehuller and the hull fraction inspected to remove groat fragments. The clean hulls were ground through a 1 mm screen prior to analysis for acid insoluble ash (mainly silica), lignin and in vitro digestibility. Lignin was measured following acid detergent fibre analysis and treatment with 72% H_2SO_4. In vitro digestibility was determined by pepsin-cellulase digestion. The influence of lignin and silica on acid insoluble ash were determined using multiple regression analysis.

There was no correlation between lignin content and acid insoluble ash ($r = 0.17$; NS) whereas in vitro digestibility was negatively correlated with lignin ($r = -0.95$; $P < 0.001$) and to a lesser extent with acid insoluble ash ($r = -0.59$; $P < 0.001$). The effect of hull lignin ($X_1$, g/kg dry matter) and acid insoluble ash ($X_2$, g/kg dry matter) on in vitro digestibility ($Y$, %) was described by the following equation.

$$Y = 31.1 - 2.29 X_1 - 1.85 X_2 \ (r^2 = 0.91; \ P < 0.001; \ \text{RSD} = 1.92)$$

Although in vitro digestibility was negatively correlated with both silica and lignin content, it is clear that the influence of lignin in this experiment was of far greater importance. In fact, once the effect of lignin has been accounted for, the inclusion of silica in the multivariate regression reduced unexplained variance by only 2%. Lignin content is genetically controlled and low-lignin cultivars are already available. The results presented here show that, irrespective of the environmental factors determining silica content, the selection of low-lignin varieties would appear likely to result in a major improvement in the digestible energy value of oat grain.