

## RUMEN PROTOZOA NUMBERS IN DAIRY COWS FED BARLEY OR LUPINS

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The superiority of lupin grain over cereal grains as a livestock feed has been demonstrated in many production systems and is due in part to the higher protein content of lupins. There are, however, other compositional differences between the grains which may also contribute to differences in nutritive value. The main carbohydrate of cereals, for instance, is starch while lupins contain virtually no starch, the main polysaccharide being  $\beta$ -galactan (Hill 1977). This may have a significant effect on the composition of the rumen microbial population.

Five Friesian cows with rumen fistulae were offered oaten hay (60% d.m. digestibility) ad libitum for 21 days. Coarsely hammermilled lupin grain was then administered per fistulam at 25, 40, 50, 60 or 70% of the ad libitum hay dry matter intake. Cows were given grain at 0800 h and 1600 h. Rumen samples were taken at the end of the hay-feeding period, then on days 5, 16 and 23 after lupin introduction. Digesta samples were taken 0 (0800 h), 1, 2, 3, 4, 6 and 8 hours after feeding, filtered through terylene cloth, the pH measured and the samples bulked. Protozoa were counted by the method of Purser and Moir (1959). This procedure was repeated with hammermilled barley grain with each cow receiving the same proportion of barley as it did lupins. There was no change in protozoa numbers with days of grain feeding, so data are presented for day 23 only (Table).

Table. Rumen protozoa numbers ( $\times 10^5$ /ml) in cows fed barley or lupins with cereal hay.

	Grain (%)					
	0	25	40	50	60	70
Barley	1.0	2.9	3.5	4.8	2.9	4.2
Lupins	1.0	1.3	1.5	2.0	1.1	1.0
Barley/lupins (%)	-	223	233	240	264	420

The concentration of protozoa in the rumen fluid of cows fed hay plus barley was 2 to 4 times higher than for cows fed hay plus lupins or hay alone. The proportion of small (mainly *Entodinia* spp.) to large (*Holotrichs*) protozoa was relatively constant on all diets (9:1). Minimum rumen fluid pH was 5.8-6.1 (barley) and 5.9-6.4 (lupins).

High concentrations of protozoa in the rumen reduce protein yield to the host (Lindsay and Hogan 1972). Some of the differences in nutritive value of barley and lupin grains in protein-limited systems may relate to their differential effects on protozoa numbers.

HILL, G.D. (1977). *Nutrition Abstracts and Reviews*. 47: 511.

LINDSAY, J.R. and HOGAN, J.P. (1972). *Aust. J. Agric. Res.* 23: 321.

PURSER, D.B. and MOIR, R.J. (1959). *Aust. J. Agric. Res.* 10: 555.

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