

The Intake and Retention Time in the Rumen of Grasses Varying in Crude Protein Content Fed to *Bos indicus* Steers

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Physical control mechanisms play an important role in feed intake control (Van Soest 1994) whereby ruminants attain a constant upper level of rumen digesta fill and intake is limited by its rate of disappearance from the rumen. However, with forages deficient in crude protein (CP), rumen fill does not reach this fill threshold and a metabolic mechanism for intake regulation has been proposed (Egan 1977). In our study, four forages of varying CP content (25.7-199.8 g/kg DM) were fed to steers to measure rumen fill and retention time in the rumen. One temperate species, ryegrass (*Lolium multiflorum*) cv. aristocrat, and 3 tropical species: pangola grass (*Digitaria eriantha*), Mitchell grass (*Astrebla* spp) and black speargrass (*Heteropogon contortus*) were fed.

Eight rumen-cannulated Brahman crossbred steers (423.5±36.7 kg) were randomly allocated to treatments. The experimental design consisted of 2 4 x 4 Latin squares, with 4 forage types and 1 replicate (steer) represented in each Latin square. For each run steers were fed, *ad libitum*, once daily in pens for a 10 d preliminary feeding period and then hourly using automatic feeders for an 11 d, consisting of 4 d preliminary feeding period and 7 d collection period in metabolism crates. Rumen fill was measured, and retention time calculated, by manual emptying of digesta via the rumen fistula. Fractional outflow rate (FOR) of fluid and particulate material was calculated by rumen dilution of chromium ethylene diamine tetra acetic acid (CrEDTA) and ytterbium (Yb) chloride, respectively (Table 1).

Table 1. Crude protein (CP) content, DM intake and digestibility of forages, rumen digesta load and retention time of various fractions and marker fractional outflow rates (FOR) in steers

Parameter	Speargrass	Mitchell grass	Pangola grass	Ryegrass	SEM ¹
CP content (g/kg DM)	25.7	29.7	75.5	199.8	
DM intake (g/kg W/day)	5.5 ^a	10.1 ^b	15.6 ^c	17.6 ^c	1.36
DM digestibility (%)	46.5 ^{ab}	40.7 ^a	54.6 ^b	69.7 ^c	3.79
Rumen digesta fresh weight (kg)	43.7 ^a	58.0 ^b	70.0 ^b	62.9 ^b	5.89
Rumen digesta DM (g/kg W/day)	20.3	20.3	18.1	14.4	0.20
Retention time (h)	72.1 ^a	47.7 ^b	28.6 ^c	19.1 ^c	4.59
- DM					
- Lignin	129.6 ^a	120.5 ^a	53.4 ^b	ND ²	8.73
Cr FOR (%/h)	3.08 ^a	3.81 ^a	7.52 ^b	10.02 ^c	0.59
Yb FOR (%/h)	1.79 ^a	2.79 ^{ab}	3.64 ^b	6.25 ^c	0.49

^{a,b,c} Means in the same row with different superscript are significantly different ($P < 0.05$)

¹SEM: standard error of the means; ²ND: not determined

Intake tended to be inversely related to retention time and increased with increasing CP content (up to 75.5g CP/kg DM) in the forage. However, rumen DM load was not different between forages of different quality. A relationship between intake, rumen digesta DM and retention time was expected if a physical mechanism controlled intake (Poppi *et al.*, 1980). Rumen total weight, should reflect the extent of distension in the rumen and thus any physical restriction to rumen fill and thereby intake. Rumen total weight was significantly lowest for speargrass which also had the lowest intake, suggesting therefore that intake of speargrass was not limited by physical distension of the rumen. Mitchell grass, of similar low CP content, had higher associated rumen fresh weight load and higher intake. It may be concluded that these two CP-deficient forages had different intake regulatory mechanisms.

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