

USE OF THE RUMEN SIMULATION TECHNIQUE TO STUDY THE EFFECT OF SUPPLEMENTATION ON RUMINAL ROUGHAGE DIGESTION

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The supply of rumen degradable nitrogen (RDN) has been suggested as a factor limiting the rate of digestion of roughages (Slyter et al. 1979); hence roughage digestion may be increased by dietary supplementation with a small proportion of RDN. In order to assess the effect of such supplementation on roughage digestion, a rumen simulator first described by Czerkawski and Breckenridge (1977) has been modified to allow separate supply of roughage and supplement (Ridgway and Radcliffe 1984).

The rumen simulator vessels were inoculated and maintained as described by Czerkawski and Breckenridge (1977) and fed daily with 10 g chopped oaten straw plus supplements of: nil; cracked *Vicia faba* (2 g); cracked barley (2 g); or urea (300 mg/l in artificial saliva). Two vessels were allocated to each treatment with fractional dilution rates of 0.55 or 0.40 per day. Infusate was McDougall's (1948) artificial saliva. Volatile fatty acid (VFA) and NH_3 nitrogen concentrations in the effluent and dry matter digestibility of roughage were monitored. Equilibrium conditions were reached after 5 days. Mean results obtained on days 6-14 are shown in Table 1.

TABLE 1 Effect of supplementation on the concentration of VFA and NH_3 -N in effluent and on digestibility of oaten straw (mean for 9 days \pm S.D.)

Supplement	Nil	Beans	Barley	Urea
Fractional dilution rate = 0.55				
NH_3 -N (mg/100 ml)	0.47 \pm 0.39 ^a	4.09 \pm 0.98 ^b	1.10 \pm 0.30 ^c	6.62 \pm 1.74 ^d
total VFA (mmol/d)	26.0 \pm 3.2 ^a	34.9 \pm 6.7 ^b	37.0 \pm 7.3 ^b	30.9 \pm 5.7 ^{ab}
dry matter digestion of oaten straw (%)	42.1 \pm 4.2 ^a	53.0 \pm 2.9 ^b	50.9 \pm 4.0 ^b	54.0 \pm 4.5 ^b
Fractional dilution rate = 0.40				
NH_3 -N (mg/100 ml)	0.97 \pm 0.55 ^a	5.02 \pm 0.88 ^b	0.70 \pm 0.66 ^a	5.20 \pm 0.65 ^b
total VFA (mmol/d)	28.3 \pm 11.7 ^{ab}	34.8 \pm 9.2 ^b	23.5 \pm 4.1 ^a	29.8 \pm 6.6 ^{ab}
dry matter digestion of oaten straw (%)	44.9 \pm 5.3 ^a	50.4 \pm 4.6 ^b	42.6 \pm 5.6 ^a	52.9 \pm 4.2 ^b

Row means without a common superscript vary significantly, ($P < 0.05$)

Ammonia-nitrogen was significantly increased by all supplements at the high dilution rate and by all except barley at the low dilution rate. Total VFA production was increased by supplementation with beans at both dilution rates and by barley at the high dilution rate. Increased digestion of the oaten straw occurred only in the treatments with increased NH_3 nitrogen. This technique offers a convenient means for studying the effect of RDN and fractional dilution rate on the digestion of low quality roughage.

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