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Effect of Zeolite supplementation on rumen environment and forage digestion in bovine fed temperate pasture

J Vicentin [1], D Rearte [2], F Santini [2], J Elizalde [2]

[1]*UNER, CC 24, Oro Verde, 3100 Paraná, Entre Ríos ;* [2]*INTA, EEA Balcarce, CC 276, 7620 Balcarce, Buenos Aires, Argentina*

High losses of N between mouth and duodenum were measured in ruminant grazing temperate pasture (Beever, 1986, Br J Nutr, 56, 209). Protein of high quality forage is degradable in the rumen and N-NH_3 produced and not utilized by rumen bacteria is absorbed, converted to urea in the liver and excreted in urine. Zeolite (Z) has the capability to trap N-NH_3 ions in excess and to liberate it later when concentration decrease.

The present trial was carried out to determine the effect of Z supplementation on intake, rumen environment and organic matter (OM) sites of digestion. Four Holstein steers, weighing 642 kg with rumen and duodenum proximal cannula were used. The experimental design was a cross over with 2 treatments and 2 periods. All animals were fed red clover (*Trifolium pratense*) and italian ryegrass (*Lolium multiflorum*) pasture (16 % CP, 36 % NDF and 65 % digestibility) and supplemented with 1 kg maize grain plus 2 kg wheat bran daily. Pasture was chopped and offered indoor, *ad libitum* three times per day. Treatments were T0 : 0 g Z and T1 : 500 g Z/animal/day. VFA concentration and molar proportions in rumen fluid were measured by gas chromatography. A Technicon autoanalyzer was used for N-NH_3 determination. Na and K in rumen fluid were estimated by atomic absorption. Cr_2O_3 and Co-EDTA were used as solid and liquid markers (Uden, *et al*, 1980, J Sci Food Agric, 31, 625) for estimation of dilution rate and OM and liquid flow to the duodenum (Armentano and Russell, 1985, J Dairy Sci, 68, 3067).

Z supplementation increased rumen fluid pH, Na concentration, C_2:C_3 ratio but decreased total VFA concentration, propionate and butyrate proportion and potassium concentration. Mean rumen N-NH_3 concentration was not different among treatments but it was observed that N-NH_3 was trapped during daytime and liberated at night in steers receiving Z. Molar proportion of acetic acid, dilution rate and liquid flow to the duodenum were not affected. The Z tended to increase OM intake and OM total apparent digestibility. Treatment showed no difference in OM and liquid flow to the duodenum and OM apparently digested in the rumen.

In conclusion, in the present trial condition, Z supplementation tended to increase OM intake, altered rumen environment, modified mineral balance, increased total OM digestibility and changed the sites of digestion.

	T0	T1	
pH	6.47	6.51	p<0.1
N-NH_3	11.4	11.1	ns
VFA (mmol/l)	103.1	84.8	P<0.01
Acetic Ac (mol %)	56.3	56.6	ns
Propionic Ac (mol %)	25.1	23.7	P<0.05
Butyric Ac (mol %)	15.6	16.2	P<0.1
C_2:C_3	2.3	2.4	P<0.1
Na (meq/100 ml)	5.6	8.1	P<0.01
K (meq/100 ml)	5.7	3.4	P<0.01
OM intake (g/kg BW)	15.6	17.1	P<0.1
Total OM Apparent Digestibility (%)	65.9	76.0	P<0.05
OM apparent digestibility in rumen (%)	42.5	45.2	ns
OM flow to duodenum (g/kg BW)	8.9	9.3	ns
Liquid flow (l/h)	6.5	5.6	ns
Dilution rate (% / h)	12.4	10.7	ns