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The effects of formaldehyde treatment on the degradation of soybean meal and microbial fermentation in the rumen

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The effects of formaldehyde treatment soybean meal on protein degradability, *in vitro* pepsin digestion, microbial fermentation and synthesis were studied in this experiment. Extracted soybean meal (SBM) was ground through 1 mm screen and then mixed with 0, 0.4, 0.6, 0.8 and 1.0 g (per 100 g CP) formaldehyde (FSBM). Nylon bag method (Ørskov and McDonald, 1979, *J Agric Sci*, 92, 499-503) was used to measure protein degradation in the rumen. 0.1 N HCl pepsin solution was used in *in vitro* protein digestion (Akeson and Stahmann, 1964, *J Nutrition*, 83, 257-261). Rumen simulation technique (RST) was used to study the fermentation 0.6 g formaldehyde/100 g CP or with 10% untreated SBM.

The results from nylon bag showed that, at all levels, formaldehyde treatment reduced the rapid fraction «a» and the degradation rate constant «C» ($p < 0.05$), but did not change the potential degradable part «b» until 0.8 g formaldehyde/100 g CP ($p < 0.05$). The effective degradability P were significantly decreased ($p < 0.05$).

The *in vitro* digestibility result showed that

when the formaldehyde level increased to 0.8 g /100 g CP, the CP digestibility decreased significantly ($p < 0.05$).

The results from RST showed that FSBM in diet had no influence on OM fermentation (FOM), fermentabilities of NDF and ADF. The microbial synthesis of FSBM diet decreased, ever no significant difference from the control ($p > 0.05$). FSBM increased nonammonia nitrogen (NAN) flow significantly compared with that of SBM ($p < 0.05$). The fermentable energy efficiencies (MN g/kg FOM) were 21.4 and 22.4 for SBM diet and FSBM diet respectively ($p > 0.05$).

In conclusion, 0.6 g formaldehyde per 100 g CP treatment of SBM in the present experiment reduced effective degradability of protein by 30%, mainly from «a» fraction and «c», and had no significant effect on protein digestion. Inclusion of FSBM in diet did not affect the fermentation of fibre and OM by rumen microbes, and the fermentable energy efficiencies for microbial synthesis, but increased NAN flow.

Formaldehyde level, %	0	0.4	0.6	0.8	1.0
Nylon bag method parameters:					
a	37.6	17.9	12.7	8.0	11.0
b	62.1	77.6	70.1	47.4	18.6
c	0.0811	0.0875	0.0439	0.0387	0.0232
p	76.0	67.3	45.5	28.7	16.9
In vitro digestion, %	83.1	82.0	83.3	74.8	58.4

RST technique	SBM diet	FSBM diet
- FOM (% OM)	58.0	53.7
- NDF fermentability, %	49.7	48.2
- ADF fermentability, %	27.3	26.4
- NAN (mg/d)	716.6	784.1
- MN (mg/d)	430.1	413.4
- MN/FOM (g/kg)	21.4	22.4

(outflow rate constant K = 0.05)