Effect of phosphorus supplementation of ammoniated rice straw on rumen fermentability, synthesised microbial protein and degradability *in vitro*

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Introduction Nutritive value of some straws and other by-product feeds can be improved simply by adding urea and minerals as such as P. These bacteria are needed for pregastric digestion of fibre in cattle. Replication and growth of the bacteria are dependent upon a P supply (Petterson, 2002). P supplementation is important for rumen fermentation and growth of rumen microbia, therefore, a study was conducted to examine the effects of P addition on *in vitro* fermentability, synthesised microbial protein and degradability of ammoniated rice straw..

Material and methods The experimental diet composed of 50% ammoniated rice and 50% concentrate, and this diet was used as a control diet (A). The rice straw was previously treated with 4% urea. The crude protein of the diet was 10.16%. P2O5 was used as a P source and added to the diet 0.2, 0.4 and 0.6% on dry matter, respectively. *In vitro* fermentability and degradability of nutrients were determined following the first stage of the Tilley and Terry procedure (1969). Ruminal fluid was obtained from a cannulated steer. Fermentation tubes contained of 10 ml of ruminal fluid and 40 ml of McDougall buffer solution. Samples were incubated in duplicate in 100 ml polyethylene tubes in 39^{o}C in a shaken water bath for 48 h. Two fermentation tubes that did not contain diets were also incubated and used as blanks. Sample was taken from each fermentor for bacterial counting. Fermentation was terminated at 48 h by injecting the tubes with 1 ml of $HgCl_2$. Tubes were then centrifuged at 2000 x g for 15 min and the supernatant was removed. Tubes with residue were dried at 60^{o}C for 48 h and weighed and the data were used for degradability determination. These residues were also analyzed for its DM, OM and N by using standard procedures (AOAC, 1984), the NDF, ADF, and cellulose of residues were determined by Goering and Van Soest (1970) procedures. Supernatants were used in order to determine NH_3 concentration (microdifusion Conway method), total VFA concentration (Gas chromatography) and rumen fluid pH. Total and cellulolytic bacterial population was determined by methods described in Suryahadi (1990), cellulase enzyme activity and the amount of synthesised microbial protein was, determined by methods described in Widyastuti (2004) and (Gopar, 1981) respectively. A completely randomized design was used as experimental design consisting of four treatments. Data were analyzed by ANOVA using the GLM procedure (Steel and Torrie, 1981). Differences between the control treatment and P supplementation treatment were analyzed by Duncan multiple range test (DMRT) (Steel and Torrie, 1981).

Result Table shows results of P supplementation effects on bacterial population and other variables of rumen fermentability. Effects of treatments were significant (P<0.05) for ammonia and total VFA concentrations. Data on *in vitro* degradability of ammoniated RS are presented in the table and show that the addition of P at different level affected all degradability variables (P<0.05).

Table 1 Effect of phosphorus supplementation on total and cellulolytic bacterial population and fermentation in the rumen and *in vitro* degradability

Variables	P Supplementation (%DM)			
	0	0.2	0.4	0.6
Synthesised microbial protein (%/g)	0.19	0.18	0.21	0.13
N-NH_3 (mM)	11.09^{a}	10.02^{b}	9.25^{c}	8.80^{d}
Total VFA (mM)	88.75^{c}	98.12^{b}	106.87^{a}	111.87^{a}
Dry matter degradability (%)	52.91^{c}	54.85^{bc}	57.66^{a}	60.79^{a}
Organic matter degradability (%)	54.69^{c}	58.43^{b}	60.18^{a}	62.69^{a}
NDF degradability (%)	39.31^{b}	41.58^{b}	43.94^{a}	50.91^{a}
ADF degradability (%)	27.99^{c}	32.78^{bc}	37.59^{a}	40.30^{a}
Cellulose degradability (%)	29.47^{b}	33.04^{b}	38.74^{a}	41.61^{a}

Means within rows with the same superscript letter are`significantly different at P<0.05

Conclusion The effects occurred through a reduction in ammonia concentration, increase in total bacterial population, cellulolytic enzyme activity, total VFA concentration, and degradabilities of DM, OM, and fibrous fraction. In terms of the synthesis of microbial protein, most effective level of P supplementation occurred at a supplementation rate of 0.4% of dry matter. Further study is required to determine effects of supplementation in an *in vivo* experiment.

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References

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