Milk production efficiency improvement in buffaloes through the use of slow ammonia release and protected protein supplement

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ABSTRACT: To study the effect of feeding Slow Ammonia Release and Protected Protein supplement (SARPP) on blood urea nitrogen (BUN) and urinary levels of allantoins as well as on quantity and quality of milk, a feeding trial was conducted on 24 lactating buffaloes. Animals were divided into three similar groups, fed on standard basal ration. Animals in group-I were fed 1.0 kg untreated rapeseed meal containing 50 g untreated urea, animals in group II were fed 1.0 kg treated rapeseed meal containing 50 g untreated urea and animals in group III were fed 1.0 kg treated rapeseed meal containing 50 g treated urea (SARPP supplement), in place of one kg compound cattle feed. Levels of BUN and allantoins in urine were 10.33, 10.48 & 9.64 ($P<0.05$) mg/dl and 2.35, 3.03 & 5.23 ($P<0.01$) mmol/litre in groups I, II and III, respectively. Daily average milk yield was 6.46, 7.42 ($P<0.05$) and 7.70 ($P<0.01$) kg in groups I, II and III, respectively. Average fat and protein % were 6.64 & 3.41, 6.81 ($P<0.05$) & 3.53 and 6.95 ($P<0.05$) & 3.57 in groups I, II and III, respectively. On feeding SARPP supplement, crop residues and dietary proteins could be utilized in a more efficient manner in buffaloes.

Key words: Protected protein, Urea, Blood urea nitrogen, Allantoins.

INTRODUCTION - In south Asia, India is a country of the world with largest buffalo population and 99% of the milk producing buffaloes are owned by small to medium land holding farmers, fed mainly on crop residues. As there is shortage of feed and fodder resources in the country, available feed resources need to be utilized judiciously and with value addition. National Dairy Development Board (NDDB) of India has developed a SARPP supplement, in which dietary proteins and urea are simultaneously treated with a suitable level of aldehyde, to ensure efficient utilization of urea by rumen microbes by slowing down its breakdown in the rumen and treated dietary proteins escape ruminal degradation substantially and are digested in the lower part of the gastro-intestinal tract.

MATERIAL AND METHODS - A feeding trial was conducted on 24 lactating buffaloes (*Mehsani*), yielding 6-8 kg milk per animal per day, for 12 weeks. Each animal in all the three groups was fed similar basal ration, comprising 15 kg green jowar fodder and 6 kg bajra straw per day. Concentrate mixture, with 21.44 % crude protein, 2.86 % ether extract, 10.35 % crude fibre and 3.77 % silica, was given according to level of milk production, to meet the maintenance and production requirements (Kearl, 1982). In addition to basal ration, animals in group I were fed 1.0 kg untreated rapeseed meal containing 50 g untreated urea, animals in group II were fed 1.0 kg treated meal containing untreated urea and animals in group III were fed 1.0 kg treated meal containing treated urea (SARPP supplement) daily. The feeding was done twice daily in the morning and evening and animals were offered ad-lib clean drinking water, twice a day.

The chemical composition of feeds and fodder was carried out as per AOAC (1995). Feeds and fodder were also analyzed for NDF, NDIN, ADF, ADIN, cellulose, hemi-cellulose and acid detergent lignin as per Goering and Van Soest (1970). The data were analyzed statistically (Snedecor and Cochran, 1968). Levels of BUN (mg/dl) and allantoins (mmol/litre) in urine were measured in all the three groups. The measurement of allantoins in urine was carried out according to the method described by Yong and Conway (1942). All the animals were hand milked and the milk yield of individual animals was recorded in the morning and evening. The milk samples were drawn weekly and were analyzed for fat (IS: 1224, 1977) and protein (IS: 1479, 1961) contents.

RESULTS AND CONCLUSIONS - On feeding SARPP supplement, BUN (mg/dl) was significantly low (9.64 ± 0.20; $p<0.05$), as compared to group I (10.33 ± 0.21) and group II (10.48 ± 0.13), indicating that the microorganisms for protein synthesis in the rumen are able to utilize more efficiently the urea. The synthesis of urea itself is an energy consuming process, which costs 4 moles of ATP per mole of urea synthesized. Thus, loss of excess nitrogen in the form of urea not only causes a decreased efficiency of nitrogen utilization but could also cause decreased efficiency of energy utilization. However, when SARPP supplement was fed to lactating animals, this excessive loss of both nitrogen and energy could perhaps be avoided. It may result in an increased energy and nitrogen balance causing increase in milk production and yield of different milk constituents. In dairy cattle, blood urea reflects not only the catabolism of protein by the ruminant tissues, but also breakdown of protein and non-protein nitrogen within the rumen by microorganisms. Rumen ammonia can be utilized by rumen microbes depending upon its release rate and availability of precursors for synthesis of microbial protein, or can be absorbed into the blood stream. Comparatively low BUN levels indicated that the urea from SARPP supplement was utilized more efficiently for microbial protein synthesis in the rumen.

On feeding SARPP supplement, level of allantoins (mmol/litre) in urine of buffaloes, was 2.35 ± 0.18, 3.03 ± 0.05 and 5.23 ± 0.18 ($p<0.01$) mmol per litre in groups I, II and III, respectively. Allantoins in urine is an indicator of microbial protein synthesis in the rumen (Chen *et al*. 1990). It is expected that the slow release ammonia from the SARPP supplement is utilized more efficiently for the synthesis of microbial protein. Thus, on feeding SARPP supplement, level of allantoins in the urine of animals were higher, indicating greater microbial protein synthesis in the rumen.

Daily average milk yield in kg was 6.46 ± 0.34, 7.42 ± 0.34 ($p<0.05$), 7.70 ± 0.28 ($p<0.01$), fat

% 6.64 ± 0.12, 6.81 ± 0.14 ($p<0.05$), 6.86 ± 0.10 ($p<0.05$) and protein % 3.41 ± 0.02, 3.53 ± 0.02, 3.56 ± 0.03 for the groups I, II and III, respectively. There was an increase in daily milk yield, fat and protein per cent in SARPP fed group, as compared to other two groups. Significant improvement in milk yield and composition on feeding protected protein was also reported earlier in buffaloes (Garg *et al*. 2003; 2005; Walli and Sirohi, 2002). The significant improvement in milk production performance could be due to the increased supply of amino acids at the tissue level. There are reports by several workers that, formaldehyde treatment caused an increased supply of amino acids at the lower tract (Xu *et al*. 1998). Chalupa and Sniffen (1996) also reported that an increased supply of essential amino acids in a protected form causes an increase in milk production. Methionine in particular, plays a significant role as a methyl donor during milk fat synthesis, and is also the precursor for phospholipid component i.e. choline synthesis. The improved supply of amino acids in the presence of sufficient metabolizable energy, might have also improved the protein-energy balance and created a better balance of precursors for milk synthesis, resulting in increased milk production.

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