

Utilization of nitrogen from fermented feeds

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It is now well recognized that during the ensiling of chopped whole plant material or grain, a number of chemical (compositional) changes occur that can modify the nutritional value of the stored feeds. The two major changes during the ensiling-storage period are the solubilization of protein (macromolecular) nitrogen and the fermentation of soluble carbohydrates to lactic acid. In chopped whole plant silages, the nitrogen solubilization process occurs during the first few days of the ensiling period and appears to be a consequence of the activity of endogenous plant proteases (Bergen *et al.*, 1974). In stored high moisture grain (corn) the solubilization process is slower and not quite as extensive; the mechanism for N solubilization in high moisture corn has not been identified (Prigge *et al.*, 1976).

Bergen *et al.* (1974) observed that the soluble nitrogen fraction of corn silage was not able to support an adequate rate of *in vitro* cellulose digestion (Table 1). More recent work has shown that soluble nitrogen isolated in bulk from corn silage was not readily degraded to $\text{NH}_3\text{-N}$ in the rumen of sheep.

These results have focused attention on the nutritional quality of this N fraction in fermented ensiled feeds. For an effective rumen fermentation of dietary carbohydrates, there must be an adequate $\text{NH}_3\text{-N}$ source to promote microbial growth and activity. If a sizeable fraction of the nitrogen in feeds can not be degraded (or converted) to $\text{NH}_3\text{-N}$, then there will be a depression in the extent of digestion in the rumen with a concomitant depression in animal performance.

Table 1. *In vitro* cellulose digestion by ruminal microorganisms in the presence of different nitrogen sources.

N Source	Rate of Digestion (12 hr.)	Extent of Digestion (48 hr.)
	----- % -----	
Urea	44	60
Corn Silage - Soluble N	23	55

To date it is not clear to what extent the solubilized nitrogen can be

utilized *in vivo*. Further there is very little information on the utilization of the insoluble nitrogen in ensiled or high moisture feeds. The limit of biological availability of nitrogen from ensiled or high moisture feeds must be determined to insure adequate formulation of rations for livestock (ie. any discounting of ensiled feed protein must be made up by including more supplemental N; either as NPN or preformed protein).

References

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- Prigge, E.C., R.R. Johnson, F.N. Owens and D. Williams. 1976. Soluble nitrogen and acid production of high moisture corn. *J. Anim. Sci.*, 42:490.