EFFECT OF VARYING THE PROPORTION OF MOLASSES AND LOW QUALITY HAY IN THE DIET ON DIGESTION AND MICROBIAL PROTEIN PRODUCTION BY STEERS

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The growth of animals on high molasses diets is often low, but increases when they are supplemented with true protein sources (Preston and Willis 1970; McLennan *et al*. 1998). This indicates that molasses may not support a high ruminal microbial protein (MCP) production. Rowe *et al*. (1980) reported a relatively low efficiency of microbial protein (eMCP) production in bulls fed high molasses diets whereas Ramirez and Kowalczyk (1971) reported a similar eMCP production in calves fed a molasses/urea-based diet to that usually found in steers fed concentrate-based diets. The present experiment was carried out to determine the effect of increasing the proportion of molasses in the diet on microbial protein production in the rumen of cattle.

Brahman crossbred steers, 4 intact and 4 rumen-cannulated, with an average liveweight of 230 kg, were used in a 4 x 4 latin square design. The diets consisted of either 0 (Control), 25 (25M), 50 (50M) or 75 (75M) % molasses/urea/minerals (3% urea and 1% sodium monophosphate; 10.8% CP), with chaffed pangola hay (8.2% CP). All ingredients were mixed daily and offered as a total mixed ration. For each run, the steers were fed individually in pens over 3 weeks and then transferred to individual metabolism crates for 7 d for faeces and urine collection. Samples of rumen fluid (from fistulated steers only) were also taken for analysis of NH_3-N concentration and pH. Urine samples were analysed for concentration of purine derivatives and MCP production was estimated. A single dose of 100 mL CrEDTA solution (1 g Cr/100 mL) and a dose of 72 g Ytterbium-labelled hay (1g Yb/100 g hay) were injected into the rumen and samples of rumen fluid and faeces taken for determination of fluid and solid phase dilution rates, respectively. Data were analysed by ANOVA.

Table 1. Intake, digestibility, rumen pH, rumen ammonia-nitrogen (NH_3-N) concentration, dilution rate, microbial protein (MCP) production and efficiency of MCP production (eMCP) in steers fed hay and molasses (%M) diets.

	Control	25M	50M	75M
Dry matter intake (g/kg LW/d)	19.0	22.2	24.2	21.8
Organic matter digestibility (%)	57.1^{a}	60.1^{b}	64.9^{c}	74.2^{d}
Neutral detergent fibre digestibility (%)	62.8^{a}	56.5^{b}	53.0^{b}	46.5^{c}
Digestible organic matter intake (g/kg LW/d)	10.9^{a}	12.7^{b}	14.9^{b}	14.2^{b}
Rumen pH	6.5	6.6	6.6	6.7
Rumen NH_3-N (mg/L)	77	84	99	108
Dilution rate of solid phase (%/h)	3.44	4.81	4.98	4.77
Dilution rate of fluid phase (%/h)	8.97	10.25	10.14	9.71
MCP production (g/kg W/d) [1]	0.81^{a}	1.54^{b}	2.03^{bc}	2.47^{c}
eMCP (g/kg DOM)[A]	75^{a}	124^{b}	139^{bc}	170^{c}
eMCP (g/kg DOM of molasses)[A]	-	224	195	194

[A] One animal missing plot; Values with different superscripts are significantly different, P<0.05

Molasses inclusion in the diet significantly and incrementally increased MCP production and eMCP production, but decreased NDF digestibility (NDFD). After accounting for the decline in hay NDFD, the eMCP production to molasses was estimated at 204 g CP/kg molasses digestible organic matter intake. Rumen ammonia concentration was maintained at an adequate level for optimum MCP production (>50 mg NH_3-N/L). It was concluded that microbial protein supply from molasses diets was high, and within the expected range proposed by feeding standards (e.g. AFRC 1992).

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