THE EFFECT OF WHOLE COTTONSEED ON INTAKE, DIGESTION AND MICROBIAL PROTEIN PRODUCTION IN CATTLE FED RHODES GRASS HAY

MARSETYO [A], D.P. POPPI [A], S.R. McLENNAN [B]

[A] School of Land and Food Sciences, University of Queensland, St Lucia, Qld, 4072
[B] Queensland Beef Industry Institute, DPI, Animal Research Institute, Yeerongpilly, Qld 4105

Whole cottonseed (WCS) has high fibre, lipid and energy content, is moderately high in protein and is relatively palatable, leading to its widespread use as a protein and energy supplement for both beef and dairy cattle. However, as a result of its high lipid content, it can depress the intake and digestion of the forage component of a diet when fed as a supplement (McLennan *et al.* 1998), presumably through changes in the rumen microbial population (Devendra and Lewis 1974). This in turn could impact on microbial crude protein (MCP) synthesis in the rumen, but there is no information on this in relation to WCS feeding with low quality forages. Our experiment was carried out to investigate the effects of increasing intake of WCS on dietary intake and digestion and on MCP production by cattle.

Five Charbray crossbred steers (body weight (BW) 318±8 kg) were randomly allocated to five different intakes of WCS (0, 0.15, 0.30, 0.45 and 0.60% BW, DM basis) in an incomplete 5 x 5 Latin square, with three runs, i.e., three steers/treatment overall. Each run consisted of a 14 d adaptation period in pens and a 7 d collection period in metabolism cages. Steers received Rhodes grass (*Chloris gayana*) hay (0.77% N) *ad libitum* and a mineral block and drinking water were available at all times. Microbial crude protein production was estimated from the excretion of purine derivatives in urine (Chen and Gomes 1992). Data were analysed using a general linear regression analysis.

Table 1. Effect of whole cottonseed on intake of hay and total dry matter, organic matter digestibility (OMD), on rumen ammonia-nitrogen (NH_3-N) concentration and on the extent and efficiency of microbial crude protein (eMCP) production, expressed in relation to digestible organic matter intake (DOMI)

	WCS intake (% BW)				
	0	0.15	0.30	0.45	0.60
Hay DM intake (% BW)	1.48 ± 0.07	1.63 ± 0.08	1.80 ± 0.14	1.54 ± 0.12	1.41 ± 0.08
Total DM intake (% BW)	1.48 ± 0.07	1.78 ± 0.07	2.10 ± 0.14	1.99 ± 0.12	2.01 ± 0.07
OMD (%)	52.9 ± 0.39	57.0 ± 0.80	60.9 ± 0.84	56.6 ± 0.78	52.3 ± 0.98
Rumen NH_3-N (mg/L)	32 ± 2.8	64 ± 1.1	77 ± 1.3	84 ± 1.6	93 ± 1.9
MCP production (g/d)	103 ± 15	172 ± 19	268 ± 13	230 ± 15	201 ± 13
eMCP production (g/kg DOMI)	58 ± 1.8	71 ± 1.7	87 ± 1.1	81 ± 1.3	76 ± 1.6

Rumen ammonia concentration increased linearly with intake of WCS ($P<0.05$). For all other parameters, there was a significant quadratic relationship ($P<0.05$) when intake of WCS was increased, with peak values occurring at an intake of 0.3% BW. McLennan *et al.* (1998) similarly found that total intake by young cattle declined when this intake of WCS was exceeded, and the fat content of the total diet exceeded about 2.6% DM. At all intakes of WCS, efficiency of MCP production was considerably lower than that suggested in the feeding standards, e.g., 130-170 g/kg DOMI (SCA 1990), and was reduced when intake exceeded 0.3% BW. Combined with the intake trends, this suggests reduced rumen microbial growth at higher lipid intakes and indicates an optimum supplementation rate of about 0.3% BW for cattle grazing low quality forages. The WCS was generously provided by Dunavant Enterprises, Moree, NSW.

CHEN, X.B. and GOMES, M.J. (1992). Occas. Pub., Rowett Research Institute, Aberdeen, UK p.1-22.
DEVENDRA, C. and LEWIS, D. (1974). *Anim. Prod.* **19**, 67-76.
McLENNAN, S.R., PLASTO, A.W., DOOGAN, V.J. and DILLON, R. (1998). *Anim. Prod. Aust.*, **22**, 111-4.
SCA (1990). 'Feeding Standards for Australian Livestock. Ruminants', CSIRO, Melbourne.

Email: marsetyo@mailbox.uq.edu.au