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PROCEEDINGS OF THE NUTRITION SOCIETY

ABSTRACTS OF COMMUNICATIONS

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The effect of condensed tannins from heated and unheated cottonseed on the ileal digestibility of amino acids. By FENG YU[1]*, P.J. MOUGHAN, T.N. BARRY and W.C. McNABB, [1]*Department of Animal Science, Massey University, Palmerston North, New Zealand and* [2]*AgResearch, Grassland Research Centre, Palmerston North, New Zealand*

The nutritive value of cottonseed meal (CSM) for farmed livestock is lower than that predicted on the basis of its chemical composition. This is thought to be due to the effects of processing during oil extraction, and to the presence of anti-nutritional factors such as gossypol. Heating is used during processing to bind free gossypol to the ε-amino group of lysine. New methodology which measures extractable and bound condensed tannin (CT) showed that CT was present in commercial CSM (Terrill *et al.* 1992). CT occurs in the hulls and not the kernels of cottonseed (Yu *et al.* 1993), and addition of unheated hulls to unheated extracted kernel decreases the ileal digestibility of amino acids (Yu *et al.* 1996). There is a need to establish whether this finding also holds for heat-treated materials.

Twenty-four Sprague-Dawley rats (body weight 178 (SD 8.5) g) were randomly assigned to four semi-purified diets which contained solvent-extracted cottonseed kernel and hulls (166.7 g hulls/kg kernel) as the sole protein source (28.6 g N/kg DM). Two of the diets contained unheated solvent-extracted cottonseed kernel and hulls while the remaining two diets contained similar material that had been heat-treated by autoclaving at 110° for 120 min. Cr_2O_3 was added to all diets as an indigestible marker. For each pair of diets, PEG (*Mr* 3500) was either included or excluded. PEG was used to bind dietary CT and to displace protein from the CT–protein complexes (Jones & Mangan, 1977). Adding PEG to the diet in the absence of CT has no effect on protein digestion (Yu *et al.* 1996). Contents from the terminal 150 mm of the ileum of hourly fed rats were collected at slaughter after 14 d.

Table 1. *Apparent ileal digestibility of essential amino acids for rats given a cottonseed kernel + hulls diet*

	Unheated		Heated		Overall	Level of significance		
PEG...	-	+	-	+	SE	Heat	PEG	H×P
Arginine	0.92	0.93	0.86	0.88	0.007	***	P=0.08	NS
Histidine	0.88	0.89	0.87	0.87	0.012	NS	NS	NS
Isoleucine	0.75	0.78	0.64	0.68	0.010	***	**	NS
Leucine	0.78	0.80	0.69	0.71	0.010	***	**	NS
Lysine	0.77	0.80	0.58	0.64	0.008	***	***	P=0.06
Phenylalanine	0.84	0.86	0.78	0.81	0.006	***	**	NS
Threonine	0.69	0.69	0.56	0.62	0.013	***	P=0.06	*
Valine	0.78	0.80	0.69	0.72	0.009	***	**	NS

*P<0.05, **P<0.01, ***P<0.001.

Heat treatment of the kernel and hull mixture reduced the free gossypol concentration (g/kg DM) from 0.48 to 0.34 and the total CT concentration (extractable + bound) measured with butanol–HCl from 7.9 to 5.6, but did not affect the amino acid content. Apparent ileal amino acid digestibility for rats fed on the kernel + hulls-based diet was significantly depressed by the heat treatment (Table 1) for all essential amino acids except histidine, and the depression was particularly marked for lysine and threonine. Adding PEG to either diet led to a significant increase in the apparent ileal digestibility of the essential amino acids, but the magnitude was smaller than those produced by heat treatment. The significant heat × PEG interactions for threonine (P<0.05) and lysine (P=0.06) are explained by the responses to PEG being greater on the heated than on the unheated cottonseed diet. Heat treatment did not diminish the reversible reactivity of CT with cottonseed protein in the small intestine but rather appeared to increase it for threonine and lysine, causing large reductions in apparent ileal digestibility of these amino acids. Hull content should therefore be reduced to minimal levels in CSM.

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