Is sorghum a safe grain for horses? Digestibility and hind gut fermentation

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Oats and barley are popular grains for horses but sorghum is not, mainly because its starch is less susceptible to digestive enzymes (McAllister *et al*. 1993) and may be fermented in the hind gut (Al Jassim and Rowe 1999) resulting in the accumulation of lactic acid, a condition closely related to laminitis (Pollitt and Davies 1998). Sorghum contains more starch than barley and oats (750, 610 and 420 g/kg DM respectively). Processing may increase the rate and extent of intestinal starch digestion, reducing the amount of starch that enters the caecum and the risk of fermentative acidosis.

Twelve yearling Australian stock horses, randomly allocated to four groups, each with one castrated male and two females of approximately the same age and weight, were housed individually in a partially opened box stall with an attached open yard and offered (fresh weights daily, in equal amounts at 0800 h and 1500 h) 6 kg/head of a medium quality grass (*Urochloa panicoides*) hay, and 4 kg/head of rolled oats (RO), dry rolled sorghum (DRS), steam flaked sorghum (SFS), or extruded sorghum (ES). Lanthanum was used as external marker for measurement of apparent total tract digestibility. Fresh water was available *ad libitum*. Horses were allowed 18 d to adapt to the diets followed by a 3 d faecal collection, during which faeces samples were collected directly from the rectum twice daily before feeding.

Digestibilities of DM and ADF (Table 1) were higher ($P<0.01$) for DRS and ES. Digestibility of starch was similar ($P<0.53$) between treatments, averaging 97.7 ± 0.95. Faecal pH was lower ($P<0.05$) for the sorghum treatments but remained slightly above 6.4 for the SFS. Faecal pH after a 20 h incubation at 39°C with glucose was also lower ($P<0.05$) for the SFS group. Concentration of total VFA in faeces was higher ($P<0.001$) for DR and ES groups and no lactate was detected. Lactate accumulation at the end of the incubation period of 20 hours was higher ($P<0.001$) for SFS; the difference was due to higher ($P<0.05$) D (–)lactate concentration.

Our results indicate that the starch supplied by processed sorghum is readily available to horses, and that it is as safe to supplement grass hay with processed sorghum in amounts £ 4 kg/d as it is with oats.

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McAllister T.A., Phillippe R.C., Rode L.M. and Cheng K.J. (1993). Effect of the protein matrix on the digestion of cereal grains by ruminal microorganisms. *Journal of Animal Science* 71, 205–212.

Pollitt C.C. and Davies C.T. (1998). Equine laminitis: its development coincides with increased sublamellar blood flow. *Equine Veterinary Journal* 26 (Supplement), 125–132.

	Treatments (grain supplement)				
	RO	**DRS**	**SFS**	**ES**	***P* value**
Digestibilities (g/kg)					
DM	588 [a]	710 [b]	617 [ac]	671 [bc]	0.01
ADF	445 [a]	570 [b]	420 [a]	554 [b]	0.01
Starch	973	989	979	966	0.41
Total VFA (mmol/l)	50.32 [ac]	64.67 [b]	52.48 [c]	59.49[b]	0.001
Faecal pH	6.75[a]	6.58[b]	6.42[c]	6.48[bc]	0.001
Potential lactate test †					
L (+) – lactate (mmol/l)	15.84	16.5	18.84	16.73	0.94
D (–) – lactate (mmol/l)	3.34 [a]	4.42 [a]	8.55 [bc]	6.23 [ac]	0.05
Total lactate (mmol/l)	19.18	20.92	27.39	22.96	0.61
Faecal pH	4.46 [ab]	4.56 [a]	4.16 [b]	4.43 [ac]	0.20

[ab] Values within a line with different letters are significantly different

† Four g of fresh faeces were mixed with 8 g of water and 1 ml of glucose solution (50 mg/ml) and incubated at 39°C for 20 h before measuring pH and lactate accumulation