In vitro effect of alfalfa composition on gastric ecosystem activity

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High calcium and protein concentrations provide alfalfa a strong intrinsic buffering capacity. Alfalfa has in consequence the ability to limit pH decrease in a gastric ecosystem which could explain its protective effect against equine squamous gastric disease. This property could be modulated by the biochemical composition of alfalfa. The aim of this in vitro study was to assess the effect of three dehydrated alfalfa pellets differing in their protein and calcium content on gastric fermentations and pH evolution. Wheat bran and barley, which are more commonly included in horse feeds, were used in comparison. Gastric contents were collected from five horses via a nasogastric tube and mixed before inoculation in bottles. Each bottle contained 1ml gastric content, 50ml dilution medium and 1.0g substrate (0.5g of barley + 0.5g of feedstuff). The five feedstuffs tested were alfalfa 16, alfalfa 18, alfalfa 25, barley, and wheat bran (Table 1). All bottles were incubated in a shaking water bath at 39°C. For each substrate, fermentation evolution was followed at 6 different times (0h, 2h, 4h, 6h, 8h and 10h after inoculation). Kinetics of fermentations was monitored through measurement of pH, buffering capacity of the solution (volume of HCl 0.1M added to reach pH4) and gas production. Effect of feedstuffs, time and their interaction were analyzed using a MIXED procedure on SAS. From 6h of fermentation, significant differences between feedstuffs appeared and increased until 10h of fermentation. The bottles containing barley and wheat bran feedstuffs resulted in higher gas production (P<0.0001), which reflected higher fermentation activity, and a stronger drop of pH compared with all alfalfa feedstuffs (P<0.0001). Buffering capacity of the ecosystem was higher with the three alfalfas than with barley after 6 hours of fermentation, and also wheat bran after 8 and 10 hours (P=0.001). In conclusion, little differences were observed depending on alfalfas composition. Our results confirmed that alfalfa could be of interest compared to barley and wheat bran to limit gastric acidity and gastric fermentations which are risk factors for equine squamous gastric disease.

gastric ecosystem, alfalfa, fermentation

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	Alfalfa 16	Alfalfa 18	Alfalfa 25	Wheat bran	Barley	
Crude protein (% DM)	16.1	18.0	25.1	19.4	11.6	
Ca (% DM)	1.96	2.87	3.01	0.11	0.06	
NFC (% DM)	16.4	20.1	20.1	31.2	69.5	
Buffering capacity* (ml HCl)	5.1	7.4	8.3	1.5	0.7	

Table 1: Biochemical composition and buffering capacity of the different tested feedstuffs

* Quantity of HCo 0.1M to drop from initial pH to pH4 in a solution containing 49 ml of distilled water and 1 g DM of feedstuff