

***In vitro* first order dry matter disappearance kinetics of chemically and physically treated cottonseed hulls**

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Introduction Limited supplies and or high costs of conventional roughages and concentrates dictate that alternate sources of feeds should be used in ruminant rations (Brown *et al.*, 1976). Cottonseed hulls (CH) are a by-product of cotton processing, containing a large proportion of neutral detergent fibre (NDF) and associated lignin, and have been considered as a useful non-forage fibre source in ruminant rations (Hall and Akinyode, 2000). However, low dry matter (DM) digestibility of CH is an inhibitory factor to include this feedstuff in the high performance dairy cow diets (Brown *et al.*, 1976). Results of previous *in vitro* studies have revealed that sodium hydroxide treatment of fibrous feedstuffs can improve DM or NDF digestibility of them. The objective of this study was to determine the effect of chemical, using sodium hydroxide, or physical treatment, using microwave irradiation, on *in vitro* DM disappearance kinetics of CH.

Material and methods For chemical treatment, CH were treated with NaOH as 20 g/kg DM [a 20% solution of NaOH was sprayed on CH and kept for 0.5 h (CH2S0.5) or 48 h (CH2S48)] or 40 g/kg DM [a 40% solution of NaOH was sprayed on CH and kept for 0.5 h (CH4S0.5) or 48 h (CH4S48) at room temperature]. Physical processing was done using microwave irradiation (900 W) for 4, 6 and 8 min (CHm4, CHm6, CHm8, respectively). Samples were incubated in a medium prepared as described by Arroquy *et al.* (2005). Forty-five ml of medium was supplied into a 100 ml bottle containing 0.45 g DM of each sample (Four replicates per each sample were run). Then, each bottle was inoculated under carbon dioxide with 5 ml of mixed rumen microbes. Rumen fluid was obtained from three sheep (49.5±2.5 kg body weight) fitted by rumen fistulae, before the morning feeding, and immediately strained through four layers of cheesecloth. The animals fed 1 kg/d of DM lucerne hay and 0.3 kg/d DM concentrate (165 g CP/kg DM). The bottles were incubated for 24, 48, 72 and 96 h at 38.6° C. After each time of incubation, bottle contents were filtered through a 42 µm filter, and DM of unfiltered medium was determined. Non-linear first order model was used to estimate the digestion kinetic parameters of DM. The model was $D_{(t)} = D_{(i)} \cdot e^{-k_d \cdot t} + I$; where, $D_{(t)}$ is residual DM at any time, $D_{(i)}$ is potentially degradable fraction, k_d is fractional rate constant of digestion (h^{-1}) and I is indigestible fraction.

Results Non-linear first order parameters of *in vitro* DM disappearance of the samples are presented in Table 1. Physical or chemical treatment had no significant effect on DM disappearance parameters of CH.

Table 1 Non-linear first order parameters of *in vitro* DM disappearance of non treated or chemically and physically treated cottonseed hulls

Parameters	Treatments								s.e.m	P
	CH	CH2S0.5	CH2S48	CH4S0.5	CH4S48	CHm4	CHm6	CHm8		
D_i	0.310	0.310	0.260	0.340	0.350	0.300	0.26	0.290	0.088	P> 0.05
K_d	0.007	0.016	0.011	0.006	0.009	0.008	0.011	0.010	0.005	P> 0.05
I	0.140	0.140	0.190	0.110	0.110	0.150	0.190	0.160	0.091	P> 0.05
R^2	0.97	0.93	0.98	0.96	0.96	0.98	0.97	0.97		

Conclusions Results of the present study indicate that non-linear first order parameters of *in vitro* DM disappearance of CH were not influenced by the chemical or physical processing. Present results did not confirm previous findings used NaOH to enhance the ruminal degradability of NDF sources (Ololade *et al.*, 1975). It was previously indicated that DM digestion of forages might be enhanced by NaOH treatment (Canale *et al.*, 1985). Sadeghi and Shawrang (2008) showed microwave irradiation caused a decrease in degradation potential of barley grain starch. However, present results indicate that it is not beneficial to use microwave irradiation for enhancing the DM digestibility of CH.

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