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## FEEDSTUFFS AND TECHNIQUES

- 229 The potential of low temperature steam treatment for improving the nutritional value of sugarcane pith  
Chaji M., Naserian A.A., Valizadeh R., Eftekhari Shahroodi F., Mohammadabadi T.
- 230 Effects of Alfalfa particle size and soybean oil on digestibility, chewing activity, milk yield and composition of early lactating Iranian Holstein cows  
Teimouri A, Arjmandi K
- 231 Effect of fumaric acid supplementation on nutrient digestibility in growing Kadon pigs  
Vasupen K., Yuangklang C., Wongsuthavas S., Mitchaothai J., Beynen A.C.
- 232 Effects of maize cultivar and dry matter content at harvest on rumen fermentation properties  
Cone J.W.
- 233 The effects of steaming and soaking treatments on respirable particles and nutrient levels of hay  
Adjei L., Dumbell L.C.
- 234 The effect of soluble non-starch polysaccharides in piglet diets on whole digesta viscosity measurements  
Lee E., Doucet F.J., Hill S.E., Wiseman J.
- 235 Physical and chemical property of some Iranian non-forage fibre sources  
Behgar M., Valizadeh R., Naserian A. A, Shahroudi F. E., Nasiri M. R.
- 236 Nutrient composition in three varieties of full-fat canola seed from Iran  
Assadi Soumeh E, Janmohammadi H, Taghizade A, Rafat A
- 237 Determination of the adhesion of enteropathogens to food and feed ingredients  
Becker P. M., Galletti S.
- 238 The degradation kinetic of NDF and lignin of sunflower meal containing low or high fat treated with sodium hydroxide  
Mohammadabadi T., Danesh Mesgaran M., Heravi Mousavi A., Nasiri M.R., Chaji M.
- 239 Effects of *Lactobacillus plantarum* MTD1 on fermentation and nutritive value of low dry matter maize silage  
Sadeghi K, Ghorbani Gholam R, Khorvash M, Alikhani M, Moghaddasi S
- 240 Effect of defaunating the rumen of sheep fed various diets on gas production invitro  
Jafari Khorshidi K, Rezaeian M, Abedi C, Seyedeh S
- 241 Study of steam pressure and reaction time effect on chemical composition and degradability of Palm date leaves  
Karimi N, Nikkhah A, Zahedifar M, Fazaeli H, Chamani M
- 242 Effects of steam treatment on enzymic hydrolysis and bioutilization of palm date leaves  
Karimi N, Nikkhah A, Zahedifar M, Fazaeli H, Chamani M
- 243 The effects of bacterial inoculation and hybrids on fermentation characteristics and *in vitro* dry matter digestibility of maize silage  
Moghaddasi S, Khorvash M, Alikhani M, Ghorbani G, Rowghani E, Sadeghi K
- 244 Effect of lucerne hay particle size and physical effectiveness factor of diet on utilization of soy hull by dairy cows  
Behgar M., Valizadeh R., Naserian A. A., Shahroudi F. E., Nasiri M. R.
- 245 Nutritional evaluation of low dry matter maize silage ensiled with or without a bacterial inoculant: 2. Effects on aerobic stability and animal performance  
Rezaeian M., Khadem A.A., Vakily H., Afzalzadeh A., Mousavi S.S.

## The degradation kinetic of NDF and lignin of sunflower meal containing low or high fat treated with sodium hydroxide

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**Introduction** Sunflower meal is a good source of protein and NDF for ruminants. The amount of hull or fibre in sunflower might affect the ruminal and post-ruminal digestion of this protein source. Available information on the effect of sodium hydroxide on degradation of NDF and lignin of sunflower meal is scarce. It has been proposed that sodium hydroxide may break down hemicellulose, hydrolyze the ester bonds between lignin and hemicellulose, swell cellulose microfibrils (Canale *et al.*, 1992), expose the cellulose to microbial attachment and improve digestibility (Goto *et al.*, 1993). The objective of this study was to investigate the effect of sodium hydroxide (NaOH) on chemical composition and *in situ* degradation characteristics of NDF and lignin of low and high fat sunflower meal (25 and 165 g/kg DM; LFSM and HFSM, respectively).

**Materials and methods** Experimental samples were: 1- Untreated LFSM (ULFSM), 2- NaOH treated LFSM (40 g/kg, DM, LFSM+SH); 3- Untreated HFSM (UHFSM) and 4- NaOH treated HFSM (40 g/kg, DM, HFSM+SH). Chemical composition (CP, Ash, lignin, NDF and ADF-ash) was determined using standard procedures (AOAC, 1990). Lignin and NDF degradation of the samples were determined using *in situ* technique in two fistulated Holstein steers (400±12 Kg, body weight). Animals were fed 8.8 kg of DM of a diet consisted of 40% concentrate (155 g CP kg<sup>-1</sup> of DM; 30% maize, 34% barley, 8% soybean meal, 5% sugar beet pulp, 10% wheat bran, 12% cottonseed meal, 0.3% CaCo<sub>3</sub>, 0.5% mineral and vitamin premix, 0.2% salt ), 30% lucerne hay and 30% maize silage. Samples were ground to pass through a 2-mm screen and placed (5 g DM) in polyester bags (10×20 cm, 50 µm pore size), then, incubated in the rumen for 0.0, 2, 4, 6, 8, 16, 24, 48, 72 and 96 h (n=8). Data of NDF and lignin degradation beyond the lag-time were further adjusted to a negative exponential model of  $P = a + b(1 - e^{-ct})$ , where P= fraction degraded in the time t, a= rapidly degradable fraction, b= slowly degradable fraction, c= fractional degradation rate and t= incubation time. Data were analyzed using general linear model of SAS (1990) at P< 0.05.

Results Chemical composition of the samples is summarized in Table 1. Ruminal degradation parameters (a, b, c) of NDF and lignin are shown in Table 2. NaOH caused to increase fraction (b) of NDF of sunflower meals (low and high fat). The (b) fraction of lignin was also improved when samples were treated with sodium hydroxide.

**Table 1** Chemical composition (g/kg DM) of sodium hydroxide treated sunflower meals

Chemical composition	Treatments*				s.e.m
	ULFSM	LFSM+SH	UHFSM	HFSM+SH	
CP	337.6 <sup>a</sup>	305.1 <sup>b</sup>	278 <sup>c</sup>	234.6 <sup>d</sup>	1.0
Ash	59.9 <sup>c</sup>	99.2 <sup>a</sup>	49.6 <sup>d</sup>	80.1 <sup>b</sup>	0.4
NDF	400 <sup>b</sup>	410 <sup>b</sup>	400 <sup>b</sup>	430 <sup>a</sup>	14
Lignin	93 <sup>b</sup>	126 <sup>a</sup>	83 <sup>b</sup>	130 <sup>a</sup>	6
ADF-ash	330 <sup>a</sup>	276 <sup>b</sup>	323 <sup>a</sup>	321 <sup>a</sup>	7

\*Untreated LFSM (ULFSM); NaOH treated LFSM (40 g/kg, DM, LFSM+SH); Untreated HFSM (UHFSM); NaOH treated HFSM (40 g/kg, DM, HFSM+SH); s.e.m: Standard error of mean, Means with different letters within samples differed (P< 0.05)

**Table 2** *In situ* NDF and lignin (mean ± SE) degradation coefficients (a, b, c) of sunflower meals

	NDF				Lignin			
	ULFSM	LFSM+SH	UHFSM	HFSM+SH	ULFSM	LFSM+SH	UHFSM	HFSM+SH
a	0.13±0.02	0.12±0.01	0.13±0.01	0.11±0.01	0.06±0.01	0.05±0.01	0.06±0.01	0.06±0.01
b	0.72±0.15	0.79±0.20	0.45±0.10	0.54±0.10	0.27±0.80	0.80±0.64	0.26±0.52	0.79±0.88
c	0.02±0.01	0.01±0.04	0.07±0.03	0.04±0.04	0.00±0.01	0.00±0.01	0.01±0.01	0.00±0.04

a: Rapidly degradable fraction; b: Slowly degradable fraction; c: Fractional degradation rate constant (h<sup>-1</sup>)

**Conclusions** Results of the present experiment indicated that the CP concentration of samples containing both fat were significantly decreased when they treated with NaOH (P< 0.05). Slowly degradable fraction (b) of NDF of ULFSM was higher than UHFSM, while, there was not difference in fraction (b) of lignin. It was concluded that NaOH caused to increase the degradation potential of sunflower meal. In addition, the potential degradation of NDF and lignin of sunflower meal might be affected by the fat concentration.

### References

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