The kinetic of *in vitro* gas production of tannic acid treated sunflower meal with or without polyethylene glycol

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Introduction Tannins are polyphenolic compounds of plant which bind to proteins, by hydrogen bonding. At normal pH of the rumen, protein remains bound to the tannin, but at the low pH of abomasum, the protein is released, so protein becomes available for digestion in the small intestine (El-Waziry *et al*., 2005). The researchers reported treating soybean meal with tannic acid (hydrolysable tannins) in *in vitro* gas production technique was reduced protein degradation of soybean meal and kinetics of gas production, primarily by hydrogen bonding (EL-Waziry *et al.,* 2005). Poly ethylene glycol (PEG) was used as a tannin binder for their ability to counteract the action of tannin on gas production. The aim of this study was to investigate effects tannic acid (with or without PEG) on gas production and rumen fermentation of sunflower meal (SM) in *in vitro* condition.

Material and methods Experimental treatments were; untreated SM (USM), 3% tannic acid treated SM (TSM), 3% tannic acid treated SM +10 % PEG (TSM+PEG). Rumen fluid was supplied from two fistulated sheep were fed a 40:60 concentrate: forage (3 kg concentrate: 2 kg alfalfa hay and 4.5 kg corn silage) in prior to the morning meal. Samples ground through a 1.0 mm screen and 500 mg were weighed and incubated in 100 ml glass syringes with 35 ml of incubation medium, according to the method of Menke and Steingass (1988). Gas production was measured at 2, 4, 6, 8, 12, 24, 48, 72 and 96 h. All samples were incubated in triplicate together with three syringes containing only incubation medium (blank), and gas production from the sample was corrected for the blank. Cumulative gas production data were fitted to the exponential equation $Y=B\ (1-e^{-Ct})$, where B is the gas production from the fermentable fraction (ml), C is the gas production rate constant for B, t is the incubation time (h) and Y is the gas produced at time t. Ammonia-N (NH_3-N) concentration (mg/dl) was determined in supernatant samples at the end of the incubation time by macro Kjeltec System Tecator (Büchi 1030, Sweden). *In vitro* digestibility of organic matter (OMD, g/kg OM) of samples was calculated by the equation of Menke and Steingass (1988). Short chain fatty acids (SCFA) were determined by the equation reported by Getachew *et al.* (1999). Gas production parameters, OMD, NH3-N and SCFA were subjected to analysis as a completely randomized design using the general linear model (GLM) procedure of SAS (1990). Duncan's multiple range test was used to compare treatment means at $P < 0.05$.

Results Gas production and rate of gas production, OMD, SCFA and NH_3-N of USM was significantly higher than the other treatments and 3 % tannic acid decreased gas production, OMD, SCFA and NH3-N content ($P < 0.05$), but inclusion of 10% PEG caused to increase gas production and the other fermentative parameters ($P < 0.05$).

Table 1 *In vitro* gas production parameters, OMD, SCFA and NH_3-N of sunflower meal treated tannic acid (with or without PEG)

	Treatments				
	USM	TSM	TSM+PEG	s.e.d	P
B (ml)	147.3^{a}	124.4^{c}	136.5^{b}	0.56	<.0001
C (ml/h)	0.07^{a}	0.02^{c}	0.03^{b}	0.001	<.0001
OMD (g/kg OM)	199.6^{a}	178.8^{c}	189.2^{b}	2.1	<.0001
NH3-N (mg/dl)	46.2^{a}	38.7^{c}	43.5^{b}	0.23	<.0001
SCFA (µmol/l)	0.94^{a}	0.65^{c}	0.82^{b}	0.31	<.0001

Conclusions Tannic acid decreased amount and rate of gas production, OMD, SCFA, and ammonia releasing from degradation protein and these parameters was increased with elimination of tannin from fermentation medium by PEG. Therefore, this result recommends, tannins (tannic acid) protect protein from degradation in the rumen.

References

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