

# Effect of tannin supplementation on nitrogen digestibility and retention in growing pigs

M. Antongiovanni, S. Minieri, F. Petacchi

Dipartimento di Scienze Zootecniche. Università di Firenze, Italy

*Corresponding author:* Mauro Antongiovanni, Dipartimento di Scienze Zootecniche. Facoltà di Agraria, Università di Firenze. Via delle Cascine 5, 50144 Firenze, Italy - Tel. +39 055 3288332 - Fax: +39 055 321216 - Email: mauro.antongiovanni@unifi.it

**ABSTRACT:** Two levels (0.25% and 0.5%) of water soluble chestnut tannin were added to the diet of growing pigs in a 40 days feeding trial, from the average body weight of 76kg up to about 110kg. As expected, a significant depression of the apparent digestibility of both dietary dry matter and nitrogen was recorded with level 0.5%, but the decrease of retained nitrogen was not statistically significant, due to the higher dietary nitrogen. It is concluded that the present preliminary study showed that a concentration of 250g tannin per 100kg mixed feed does not appreciably influence the animals' performance. The aspect of a possible beneficial effect on the gut microflora deserves further studies.

**Key words:** Chestnut tannin, Growing pigs, Nitrogen digestibility.

**INTRODUCTION** – Some natural feeds, such as acorns, contain tannins and are usually well accepted by pigs, in particular. Tannins are known to have two main characteristics: they depress the protein digestibility (Mariscal-Landín *et al.*, 2001; 2004) and exert a beneficial influence in the alimentary canal through a modulating activity on the gut microflora, due to their toxic effect to pathogenic parasites (Voravuthikunchai *et al.*, 2004; 2005). The present experiment was carried out with the precise aim of checking two levels of added tannin to the diet of growing pigs, in order to find out the most adequate level. The tested tannin component is an industrial product extracted from chestnut wood (commercial name "Saviotan Feed"). As far as we know, there is no literature information on the use of chestnut tannin in pigs, but only in ruminants (Zimmer and Cordesse, 1996). The studied parameters were the apparent digestibility of both feed dry matter and feed nitrogen and the amount of retained nitrogen.

**MATERIAL AND METHODS** – The animals were 18 commercial hybrid pigs of an average starting body weight of 76kg, allotted at random to 3 experimental groups of 6 pigs each. The control group was fed the basal diet (Table 1) with no tannin supplementation; group 1 was fed the same basal diet, enriched with 0.5% extra crude protein and supplemented with 250g tannin per 100kg mixed feed, and group 2 was fed again the same basal diet, enriched with 1% more crude protein and supplemented with 500g tannin per 100kg mixed feed. The enrichment with crude protein was made to compensate for the protein digestion depression, as expected from the literature information.

The tannin product is a light brown powder extracted from chestnut wood, made up of 82% tannins, highly water soluble (99%), containing only 2.5% crude protein.

Each group of animals was kept in a pen for 40 days, fed the experimental diets all the time. After the first 20 days the pigs were moved to single metabolic cages for a whole week. In the cages, individual body weights were recorded at the start and at the end. Daily, individual feed intakes were recorded and faeces and urines were collected and analysed for dry matter and crude protein (Martillotti *et al.*, 1987). At the end of the whole period of 40 days, single weight gains and group feed intakes were also recorded.

The experimental data were statistically analysed by means of the Statistical Analysis System (SAS, 2001), with the general linear model, keeping the diet as the fixed factor, at 3 tannin levels (0, 0.25% and 0.50%).

Table 1. Ingredient composition (kg/100 kg) and major chemical traits of mixed feeds, as fed.

	control group	treatment 1	treatment 2
barley	40	38.8	37.5
maize	30	30	30
soy bean meal 48	19	20.2	21.5
wheat bran	6.5	6.5	6.5
calcium carbonate	0.5	0.5	0.5
dicalcium phosphate	2	2	2
mineral vitamin supplement	2	1.75	1.5
tannin	0	0.25	0.50
crude protein, %	18.00	18.47	18.97
digestible energy, kcal/kg	3.059	3.064	3.070
calcium, %	0.85	0.86	0.86
phosphorus, %	0.84	0.84	0.84
lysine, %	0.79	0.82	0.85
methionine + cystine, %	0.56	0.57	0.58

*Chemical traits of mixed feeds were calculated from analytical data of ingredients.*

**RESULTS AND CONCLUSIONS** – The preliminary results are gathered in Table 2. Both dry matter and nitrogen digestions were depressed by the presence of tannin in the diet, but only the higher level (0.5%) appeared statistically efficient ( $P < 0.01$ ). A depression of digestibility was expected, according to the literature, but the lower level of tannin (0.25%) seemed not high enough to exert a statistically ascertained effect. In fact, the lower nitrogen digestibility combined with the slightly higher dietary nitrogen resulted in statistically comparable amounts of retained nitrogen.

The same may be said with regard to weight gains and feed efficiency, with the limitation of the too short period of observation. However, with the higher level, again statistically not relevant, a trend to lower gains and worse efficiencies was recorded.

The usual common performance traits, weight gains and feed efficiency were not properly considered because the

Table 2. Faecal apparent digestibility, nitrogen retention and live performance traits.

	control group	treatment 1	treatment 2	SE
dry matter digestibility, %	84.6 <sup>A</sup>	81.2	79.0 <sup>B</sup>	1.4
nitrogen digestibility, %	85.4 <sup>A</sup>	80.4	77.5 <sup>B</sup>	1.8
nitrogen retained, g/d	37.7	37.5	36.9	3.5
protein biological value, %	61.7	59.1	59.5	5.4
daily weight gain, g/d	900	895	830	75
feed intake/gain ratio	3.34	3.41	3.60	0.25

<sup>A,B</sup> =  $P < 0.01$ .

trial was partially conducted with the animals kept in metabolic cages, in slightly stressing conditions, in any case far from the normal conditions of growth barns.

In conclusion, since the astringent property of tannin may exert an important beneficial action on the intestinal environment preventing the incidence of scours by modulating the gut microbial environment, the supplementation of pigs diets with tannin may be recommended, provided that the concentration does not exceed 250g per 100kg mixed feed.

The present study is a preliminary one. Further studies are necessary to investigate what really occurs in the gut micro population.

**REFERENCES** – **Mariscal-Landín**, G., Lebreton ,Y., Sève, B., 2001. Apparent and standardised true ileal digestibility of protein and amino acids from faba bean, lupin and pea, provided as whole seeds, dehulled or extruded in pigs diets. *Anim. Feed Sci. Technol.* 97:183-198. **Mariscal-Landín**, G., Avellaneda, J.H., Reis de Souza, T.C., Aguilera, A., Borbolla, G.A., Mar, B., 2004. Effect of tannins in sorghum on amino acid ileal digestibility and on trypsin (E.C.2.4.21.4) and chymotrypsin (E.C.2.4.21.1) activity of growing pigs. *Anim. Feed Sci. Technol.* 117:254-264. **SAS user's Guide**, 2001. Statistics, version 8.02. (Cary, NC, SAS Institute Inc.). **Martillotti**, F., Antongiovanni, M., Rizzi, L., Santi, E., Bittante, G. 1987., *Metodi di analisi per la valutazione degli alimenti di impiego zootecnico*. IPRA, Quaderni metodologici n. 8. **Voravuthikunchai**, S.P., Lortheeranuwat, A., Jeeju, W., 2004. Effective medicinal plants against enterohaemorrhagic *Escherichia coli*. *J. Ethnopharmacol.* 94:49-54. **Voravuthikunchai**, S.P., Kitpipit, L., 2005. Activity of medicinal plant extract against hospital isolates of methicillin-resistant *Staphylococcus aureus*. *Clin. Microbiol. Infect.* 11:510-512. **Zimmer**, N., Cordesse, R., 1996. Digestibility and ruminal digestion of non-nitrogenous compounds in adult sheep and goats: effects of chestnut tannins. *Anim. Feed Sci. Technol.* 61:259-273.