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TECHNICAL NOTE: PRELIMINARY RESULTS WITH A TANNIN EXTRACT ON THE PERFORMANCE AND MORTALITY OF GROWING RABBITS IN AN ENTEROPATHY INFECTED ENVIRONMENT

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Abstract: In 3 preliminary trials, the effect of a dietary addition with 0.5% of a chestnut tannin extract, containing approximately 55% hydrolysable tannins, was examined on mortality after weaning. The tannin-enriched diet was fed to the does and their litters from 22 days of lactation. After weaning (day 29), young rabbits did not change dietary treatment and remained on the control diet or the tannin-enriched diet, respectively. In total 1217 rabbits were considered, about half of whom were fed the tannin-enriched diet. Mortality reached 17.1% and 7.7% (trial 1, P=0.054), 17.2 and 18.2% (trail 2, NS) and 29.0% and 9.9% (trial 3, P<0.001) in controls and tannin-fed rabbits, respectively. The autopsy on 6 control rabbits revealed typical symptoms of rabbit epizootic enteropathy with a predominance *of Clostridium spiroforme*. Weight gain was determined only in trial 3 and was significantly higher in tannin-fed rabbits (average weight at 57 d of age: 1893 and 2005 g, respectively; P<0.01). Some hypotheses are formulated to explain these preliminary results, but they still have to be verified.

Key words: tannin supplementation, growing rabbits, mortality.

INTRODUCTION

In animal nutrition, tannins are usually regarded as antinutritive substances because of their ability to form stable complexes with dietary proteins, thereby reducing protein and amino acid digestibility. However, tannins in various plant extracts act to prevent or dissociate the colonization of intestinal parasites, bacteria, protozoa, and viruses and are widely used in traditional medicine to counter incidence of diarrhoea and dysentery (Lewis, 2003).

Two main types of tannins can be distinguished: the condensed tannins (polymers of flavanoids) and hydrolysable tannins (polyesters of gallic acid and various individual sugars). The condensed types are known for their toxic and/or antinutritional effects (McSweeney *et al.*, 2001). The hydrolysable tannins, however, are used in ruminant nutrition to protect the dietary N in the rumen, the so called by-pass effect (Douglas *et al.*, 1995). Moreover, some reports indicate a reduced incidence of diarrhoea and mortality in farm animals as consequence of the dietary use of tannins from various plant extracts (Zimmerman and Bessei, 2001; Ishihara *et al.*, 2001).

The aim of the present initial study was to evaluate if hydrolysable tannins from sweet chestnut wood (*Castanea sativa* Mill.) could reduce the incidence of mortality in a chronic epizootic rabbit enteropathy (ERE) environment.

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MATERIALS AND METHODS

Three preliminary trials with 234, 598 and 385 weanlings, respectively, were conducted at the experimental facilities of the Department of Animal Nutrition and Husbandry. Since June 2000, this site has been chronically infected by ERE. Rabbits were caged in groups of 4 or 5 depending on the litter size at weaning. The wire cages were flat-deck cages measuring 71 cm (length) x 47 cm (width) x 52 cm (height) equipped with a feeder with 2 feeding places. The building central heating system and the forced ventilation (over- and under-pressure) allowed the temperature to be maintained between 16 and 22°C during the experiments.

In trial one, progeny of the female line was used, while in the 2 other experiments the final cross of the female and sire line of our Department was used. Weaning was always performed at 29 days of age.

In all experiments, before weaning (day 22 post parturition), 2 homogeneous groups of females were constituted with 8, 9 or 10 suckling kits and taking into account their parity order. Half of them received a standard reproduction diet without the tannin extract (control diet). The reproduction diet was formulated to contain 18% of crude protein (CP), 15.5% of crude fibre (CF), 4.5% of ether extract (EE), 19% of acid detergent fibre (ADF), 4% of acid detergent lignine (ADL) and 10.5 MJ/kg of digestible energy (DE) and prepared at the Department. The experimental diet (tannin-enriched) was prepared from the same batch of meal by adding 0.5% of a commercial chestnut tannin extract-Farmatan (containing approximately 55% hydrolysable tannins). Both control and experimental diets were then pelleted and offered *ad libitum*.

In trial 1 and 2, after weaning rabbits received a fattening diet formulated to contain 16.5% CP, 16.5% CF, 20% ADF, 5.5% ADL and 9.5 MJ/ kg DE. The same diet was prepared with 0.5% of the tannin extract (experimental diet) as described for the reproduction diet. Growing rabbits were maintained in the same experimental group (control or tannin-enriched) after weaning. In trial 3, the rabbits did not change feed after weaning and remained on their respective reproduction diets (control and tannin-enriched diets).

In trial 1 and 2, only the post weaning mortality was judged until 4 weeks after weaning. In trial 3, individual weight was also measured 4 weeks after weaning (57 days of age) and 6 rabbits of the control group were autopsied by a specialized laboratory. In all experiments, no antibiotics were used in feed and drinking water. The fattening diets contained the anticoccidial Robenidine (66 mg/kg), while no drugs were included in the reproduction diet.

Trials were performed following the recommendations of the European Group for Rabbit Nutrition (EGRAN) For rabbit experiments (Fernández-Carmona *et al.*, 2005).

Data referring to mortality were statistically evaluated using a X^2 test. Daily weight gain and final weight (trial 3) were subjected to analysis of variance.

RESULTS AND DISCUSSION

The mortality rate and the number of rabbits involved in the different trials are presented in Figure 1. In a period of 4 weeks after weaning, a significant reduced mortality rate was observed in trial 1 (P=0.054) and 3 (P<0.001). However, in trial 2 the mortality rate was on average 17-18%, both in controls and tannin treated rabbits. Since no systematic autopsies were performed, all dead rabbits were considered. Overall mortality in the 3 trials was 17.4% and 12.2% in controls and tannin groups, respectively (P<0.05).

In trial 3, the mortality rate in controls (29%) was much higher than in controls of trial 1 and 2 (17%). A possible explanation could be the high protein content of the diet fed after weaning in trial 3, where weanlings received the same (reproduction) diets as before weaning. The high protein content of this diet (18%) could have been a favourable factor for the losses due to ERE. Early studies on protein requirements have shown that high dietary protein levels promote the incidence of digestive disorders (de Blas *et al.*, 1981) and ERE in particular (Gidenne *et al.*, 2002). Carabaño *et al.* (2002) hypothesized that when rabbits are fed high protein diets or less digestible protein sources, the higher nitrogen flow in the ileum favours changes in microbial growth with prevalence of pathogenic species.

In trial 3, mortality occurred mainly in the 2nd and 3 rd week after weaning (Figure 2). This is typical for ERE (Licois *et al.*, 2000). Six control rabbits were autopsied and all of them showed typical symptoms of ERE and revealed the presence of *Clostridium perfringens*. Coccidiosis or *E. coli* were detected only in one of these rabbits.

In Table 1, the performances of the rabbits in trial 3 are presented. Rabbits fed the tannin enriched diet at 57 days reached a live weight higher by 6% ($P<0.01$) with a daily weight gain comparable with the usual performance obtained by our stock (Maertens *et al.*, 2005). Increased weight gain has also been reported by Garcia *et al.* (2002) on tannin-enriched diets using grape seed meal. Their results can be explained by the substantial increase of feed and DE intake of grape seed meal diets. In our preliminary trial, we could not verify this effect because feed intake was not determined. The optimum performance level obtained in our trials can be considered as a sign that the addition of 0.5% commercial tannin we used did not have any toxic effect. Even at a dosage of 5% with the same product, Struklec *et al.*, (2001) did not observe palatability problems or antinutritional effects.

Different hypotheses to explain the positive effect of these tannins can be suggested. In the small intestine, tannins form non degradable complexes with dietary protein that avoid a protein overload in the gut. Furthermore, complexes with the membranes of proteolytic microorganisms can reduce their activity. Tannins partially cover the mucus membrane of the gut and thereby a barrier against toxins is established with an inhibiting effect on diarrhoea in humans (King-Thom Chung *et al.*, 1998). However, more profound studies are necessary to verify these hypotheses.

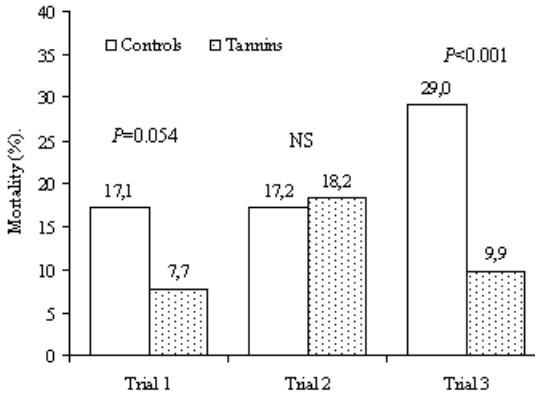

Figure 1. Mortality between weaning (29d) and 57d in controls and tannins-fed rabbits during 3 trials.

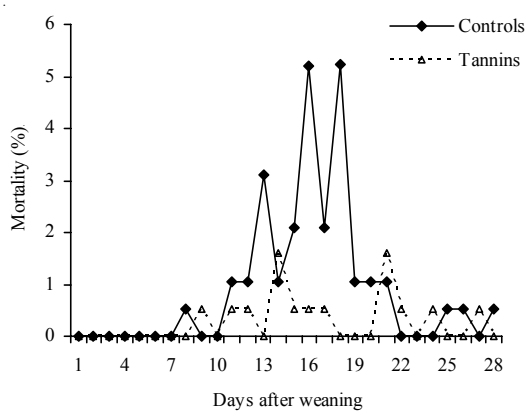

Figure 2. Daily mortality (%) in controls and tannin-fed group during trial 3

Table 1: Growth performances and mortality in controls and tannin fed rabbits during trial 3.

	Controls	Tannins	Significance
Number of rabbits	193	192	-
Average weight at 29 d (g)[1]	727	723	-
Live weight at 57 d (g)[2]	1893 ± 176	2005 ± 136	**
Daily weight gain (g)[1]	41.6	45.8	-
Mortality between 29 and 57 d (%)	29.0	9.9	**

[1]At weaning rabbits were weighted together/treatment.
[2]Mean ± standard deviation

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