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To cite this article: Francesco Gai, Laura Gasco, Hua Wei Liu, Carola Lussiana, Alberto Brugiapaglia, Giorgio Masoero & Ivo Zoccarato (2009) Effect of diet chestnut tannin supplementation on meat quality, fatty acid profile and lipid stability in broiler rabbits, Italian Journal of Animal Science, 8:sup2, 787-789, DOI: 10.4081/ijas.2009.s2.787

To link to this article: https://doi.org/10.4081/ijas.2009.s2.787
Effect of diet chestnut tannin supplementation on meat quality, fatty acid profile and lipid stability in broiler rabbits

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ABSTRACT - This study investigated the effect of chestnut tannins on meat quality in broiler rabbits. 72 commercial hybrid rabbits (mean body weight 740 g, 32 days old) were fed for 49 days with three diets containing 0%, 0.5% and 1.0% of a commercial chestnut wood extract (ENC\textsuperscript{®}, Silvachimica srl), respectively. Eight rabbits per group were slaughtered at 12 weeks of age and at 24h post-mortem pH and colour were measured on the carcass. Moreover, both sides of m. longissimus thoracis (LT) were dissected. Left side was used for cooking losses whereas the other side was used for the determination of fatty acid profile and lipid oxidation. Data were statistically analyzed by one-way ANOVA. No differences were found in pH, colour and cooking losses, as well as the fatty acid profile of LT muscle and its relative health indexes. Concerning the antioxidant effect, the ENC shows a positive and significant effect at the inclusion level of 0.5%. In conclusion, the ENC has not undesirable side effects on the meat quality of rabbits, although further studies will be necessary to find the optimal diet inclusion level of ENC to elicit a stronger antioxidant effect in the rabbit meat.

Key words: Chestnut tannins, Rabbit, Meat quality, Lipid oxidation.

Introduction - Rabbit meat is considered a Mediterranean food and the most important attributes of rabbit meat to consumers are colour, texture and flavour (Dalle Zotte, 2002). These characteristics could be affected by the lipid oxidation that is a major problem in rabbit meat due to the high content of polyunsaturated fatty acids (PUFA). In order to increase the storage stability of the processed meat, synthetic antioxidants are widely used in the food industry, but these are suspected to elicit side health effects. Therefore to avoid these undesirable side effects several natural compounds are investigated to find valid alternatives as partial substitute of synthetic antioxidants molecules. Among the natural antioxidants, tannins seems to be potential candidates. Tannins occur in many plants and are classified into two main groups: condensed tannins (CT\textsubscript{e}) with known antioxidant properties, and hydrolysable tannins (HT\textsubscript{e}), for which little information has reported, in particular those extracted from chestnut wood. Published results showed that tannins form complexes with proteins and other nutrients provoking negative and positive effects (Kermauner and Lavrenčič, 2008). The aim of this paper was to investigate the effects of chestnut tannins on meat quality in broiler rabbits.
Material and methods – Seventy two (36 males and 36 females) commercial hybrid rabbits (32 days old, mean body weight 740 g) were divided into 3 homogenous groups according to live weight and sex. Rabbits were fed ad libitum with three diets containing 0% (C), 0.5% (C+0.5%ENC) and 1.0% (C+1.0%ENC) of a commercial chestnut wood extract (ENC®, Silvachimica srl). Animals were fed with a weaning diet from 1 to 35 days of the trial (DM 88.5%, CP 19.7%, EE 3.3%, CF 18.1%, DE 11.7 MJ/kg all expressed on DM basis) and with a fattening one from 36th day to the end of the trial (DM 88.5%, CP 21.3%, EE 5.8%, CF 18.1%, DE 11.7MJ/kg all expressed on DM basis). The feed chemical composition were analyzed (AOAC, 2000) while fatty acid (FA) profile were determined by gaschromatography (GC, Shimadzu GC17A). At the end of the trial, 8 rabbits per group were randomly chosen, stunned and slaughtered without prior of fasting. After 24h post-mortem, pH at the 13th thoracic rib (Crison MicropHmeter 2001) and colour determinations at the 7th lumbar vertebra were performed on the carcass (Boccard et al., 1981). A Minolta CR-331C colorimeter was used for measuring colour in the CIELAB space (Lightness, L*; redness, a* and yellowness, b*), and the chroma (C*) and the hue (H*) indexes were calculated as \[ C^*=(a^{*2}+b^{*2})^{0.5} \] and \[ H^°=\arctan(b^*/a^*) \]. Both sides of m. longissimus thoracis (LT) were dissected. Left side was used for cooking losses (CL) at 80°C/1h by immersion in a water bath (Combes et al., 2000), whereas the other side was used for the determination of FA profile and lipid oxidation. Total lipids of LT muscle were extracted according to Folch et al. (1957) and methyl esters of FA were prepared in accord to Chistopherson and Glass, (1969) and analysed by GC. Atherogenicity (AI) and trombogenicity (TI) indexes were also calculated according to Ulbricht and Southgate (1991). Lipid oxidation was determined using the iron-induced TBARS assay (Huang and Miller, 1993) at 0, 30, 60, 120 and 180min of incubation. Results were expressed as mg of malonaldehyde bis diethyl acetal (MDA) per kg of wet muscle tissue. All the data obtained were statistically analyzed (SPSS, 1999) by one-way ANOVA. The effect of ENC inclusion was evaluated by polynomial contrasts and treatments were compared with the control group by Duncan’s t-tests. The level of statistical significance was set at P<0.05.

Results and conclusions – The results of the effect of ENC on meat traits are summarized in Table 1. No significant differences were found in pH24, colour parameters and cooking losses among three groups, which fell in the standard range of rabbit meat.

FA profile of fattening diets and LT muscles are reported in Table 2. No differences were observed among the three experimental diets as well as in the lipid composition of LT muscle and its relative health indexes.

The TBARS values are shown in figure 1. At 30min of induced oxidation, values were significantly (P<0.05) lower in rabbits fed 0.5%ENC diet than in the other treatments showing a quadratic (P<0.05) response with increasing level of ENC. There was no effect of different diets in the other incubation time points.

In conclusion, on the light of these results, the chestnut tannins, in the inclusion levels used, have not undesirable side effects on the meat quality of rabbits. Further studies will be necessary to find the optimal inclusion level of ENC to improve the antioxidant effect in the rabbit meats.
The research was supported by Silvachimica S.r.l. - San Michele di Mondovì (Cuneo) and Silva Extracts S.r.l. Alba (Cuneo) Italy.

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