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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®, 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_s) with known antioxidant properties, and hydrolysable tannins (HT_s), 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 pH_{24}, 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.

Table 1. Effects on meat quality of rabbits fed the experimental diets (n=8).

	C	C+0.5% ENC	C+1.0% ENC	SEM
pH_{24}	5.72	5.74	5.75	0.01
CL%	30.01	30.29	28.65	0.44
*L**	46.57	46.18	45.09	0.51
*a**	21.64	21.91	22.54	0.42
*b**	3.67	3.30	3.90	0.28
Chroma	22.00	22.19	22.92	0.45
Hue	9.12	8.28	9.60	0.62

SEM: standard error of the mean.

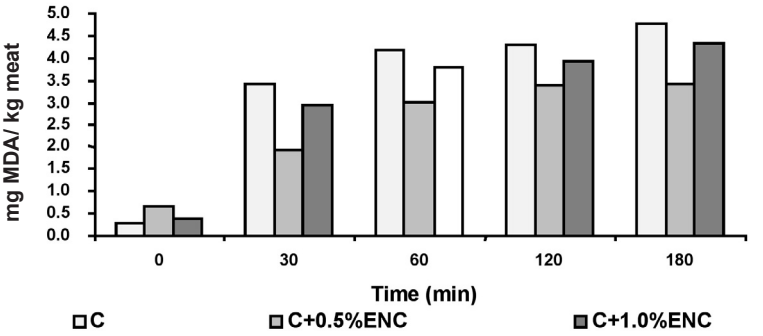
The TBARS values are shown in figure 1. At 30min of induced oxidation, values were significantly ($P<0.05$) lower in rabbits fed 0.5%ENC diet than in the other treatments showing a quadratic ($P<0.05$) response with increasing level of ENC. There was no effect of different diets in the other incubation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

Table 2. Fatty acid profile of fattening diets and *Longissimus thoracis* muscle of rabbits.

	Fattening Diets			Longissimus thoracis			
	C	C+0.5% ENC	C+1.0% ENC	C	C+0.5% ENC	C+1.0% ENC	SEM
Saturated FA	16.87	17.21	17.00	42.45	42.22	42.98	0.24
MonoUnsaturated FA	23.10	23.09	22.99	27.15	27.03	26.22	0.23
PolyUnsaturated FA	60.02	59.72	59.99	30.41	30.76	30.81	0.26
AI	-	-	-	0.67	0.68	0.67	0.01
TI	-	-	-	1.45	1.45	1.49	0.01

Figure 1. Kinetic of lipid oxidation iron-induced in LT muscle samples (n=8, *P<0.05, quadratic effect).



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REFERENCES – **AOAC,** 2000**.** Official methods of analysis, 17th edition. Association of Official Analytical Chemists, Gaithersburg, MD, USA**. Boccard**, R., Butcher, L., Casleels, E., Cosentino, E., Dransfield, E., Hood, D.E., Joseph, R.L., MacDougall, D.B., Rhodes, D.N., Schön, I., Tinbergen, B.J., Touraille, C., 1981. Procedures for measuring meat quality characteristics in beef production experiments. Report of a working group in the Commission of the European Communities (CEC), Beef production research programme. Livest. Prod. Sci. 8:385-397. **Chistopherson**, S, Glass, R.L., 1969. Preparation of milk fat methyl esters by alcoholysis in an essential non-alcoholic solution. J. Dairy Sci. 52:1289-1290. **Combes**, S., Auvergne, A., Lebas, F., 2000. Effect of cooking temperature on Warner-Bratzler tenderness measurement in rabbit meat. In Proceedings of the 7th World Rabbit Congress. Vol. A, 573–578. **Dalle Zotte**, A., 2002. Perception of rabbit meat quality and major factors influencing the rabbit carcass and meat quality. Livest. Prod. Sci. 75:11–32. **Folch**, J., Lees, M., Stanley, G.H.S., 1957. A simple methods for the isolation and purification of total lipids from animal tissue. J. Biol. Chem. 226:497-509. **Huang,** Y.H., Miller, E.L., 1993. Iron-induced TBARS as an indicator of oxidative stability of fresh chicken meat. In: Morris (Ed) Proceedings of "Quality of poultry products" Tours, 11 October 1993, 430-434. **Kermauner,** A., Lavrenčič, A., 2008. Supplementation of rabbit diet with chestnut wood extract: effect on *in vitro* gas production from two sources of protein. In Proceedings of the 9th World Rabbit Congress, 689–694. **SPSS,** 1999. SPSS Release 11.5. SPSS Inc., Chicago, IL. **Ulbricht**, T.L.V., Southgate, D.A.T., 1991. Coronary heart disease: seven dietary factors. Lancet 338, 985–991.