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Secretaría de Desarrollo Agropecuario del Gobierno del Estado de México, Secretaría de Agricultura, Ganadería, Desarrollo Rural,
Pesca y Alimentación, Consejo Mexiquense de Ciencia y Tecnología

**SENSORY MEAT QUALITY: INFLUENCE OF DIET SUPPLEMENTED WITH
OIL AND ANTIOXIDANTS IN FATTENING RABBITS**

**LAMANNA ML*, COSSU ME, PICALLO A, GAMBETTI P,
CUMINI ML and GRIGOLI.**

Departamento de Producción Animal, Facultad de Agronomía, Universidad de Buenos Aires. Av.
San Martín 4453. BsAs. Argentina.

*Corresponding author: lamanna@agro.uba.ar

ABSTRACT

As consumers are becoming conscious of their diets and the impact on their health, there has been a shift to eating white meat by its lower fat content. Meat from rabbits fed commercial diets show a greater n6/n3 ratio than those of health recommendations ($n6/n3 < 5$); a tool to improve the lipid quality is to add fish oil, rich in n-3FA, these changes can affect consumer acceptability as nutrition influence the sensory quality of meat. The objective of this study was to compare the effect of adding fish oil and two types of antioxidants in fattening rabbit diets on sensory quality of loin and thigh meat. Eighty NZxC rabbits were fed *ad libitum* (35-70d) with 4 diets: 'C', commercial diet; 'F', fish diet with addition of 1.8% of oil fish; 'V', vitamin diet (F+200ppm vit.E as an industrial antioxidant) and 'A', algae diet (9% dry algae as a natural antioxidant). After 24hs of slaughter (2,5kg live weight; chilling chamber, $2 \pm 0.5^\circ\text{C}$), loin and thigh portions were removed and cooked in a double contact grill ($71^\circ\text{C} \pm 1^\circ\text{C}$) after deboning. Samples were analyzed by an analytical panel of 8 trained assessors for overall color; intensity and typicality of odor/flavor; fat taste and juiciness, using an unstructured linear scale of 10cm, without anchorage (lower limit: 0; upper limit: 10). Statistical analysis of data was performed using the Proc Mixed (SAS, 2004). Differences among treatments were analyzed by Tukey test ($p < 0.05$). For both the loin and the thigh, only smell-taste variables as the characteristic odor, off odor and off flavor were influenced by diets; Control diet had higher 'rabbit odor' and less off odor / flavor compared to diets with added fish oil ($p < 0.05$). For both cuts of meat, between experimental diets, the presence of algae determined quantitatively higher values of off odor/flavor but no differences in characteristic odor while diets F and V were similar. In conclusion the fish oil and antioxidants addition in fattening rabbit diets, provides meat with same color, flavor, juiciness and untuosity respect a commercial diet, but more presence of off odor/flavor, being stronger in thigh than loin and especially for algae's diet.

Key words: fish oil, algae, vit.E, sensory parameters

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INTRODUCTION

Today's consumers are more concerned with the qualitative characteristics of food, causing a growing demand for more selective food and an increasing need of its differentiation. As consumers are becoming conscious of their diets and the impact on their health, there has been a shift to eating white meat by its lower fat content. Meat from rabbits fed commercial diets show a greater n6/n3 ratio than those of health recommendations (n6/n3<5; British Nutrition Foundation 1992); a tool to improve the lipid quality is to add fish oil, rich in n-3 fatty acids (n-3FA). These dietary changes can affect consumer acceptability as nutrition influence the physico-chemical and sensory quality of meat.

By the high proportion of PUFA, the enriched rabbit meat will be more susceptible to lipid oxidation. From the sensory point of view, color stability, taste and smell, by the presence of volatile compounds, will be the most affected parameters. In order to limit the presence of oxidized compounds, several studies were performed with the addition of antioxidants in diets ('natural' as fresh fodder and 'artificial' as vitamin E), achieving extend shelf life and the retardation of oxidation (Corino *et al.*, 1999; Dal Bosco, *et al.*, 2004; Álvarez *et al.*, 2006; Hernández *et al.*, 2007, Cossu *et al.*, 2008). The addition of natural antioxidants would have better consumer acceptance regarding artificial sources.

The objective of this study was to compare the effect of adding fish oil and two types of antioxidants (natural and artificial) in fattening rabbit diets on sensory quality of loin and thigh meat.

MATERIAL AND METHODS

The experimental work was performed in the rabbit Unit of the Animal Production Department of Faculty of Agronomy, UBA. Eighty New Zealand x Californian rabbits were fed *ad libitum* (35 to 70 days of age) with 4 diets (20 animals/treatment): one control diet with vegetable oil and 3 experimental diets containing fish oil and with/without presence of antioxidants.

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Treatments were randomized and named as ‘C’, commercial diet; ‘F’, fish diet with addition of 1.8% of oil fish with 35% of HPUFA (replacing commercial diet corn oil); ‘V’, vitamin diet (‘F’+200 ppm α tocopherol, as an industrial antioxidant) and ‘A’, algae diet (‘F’ + 10% of dry *Macrocystis* algae as a natural antioxidant (partially replacing the alfalfa meal). All diets were isoproteic (20%) and isoenergetic (4050 Mcal /Kg)

Animals were slaughtered at commercial weight (2,5 kg live weight). After 24 hours of slaughter (chilling chamber, $2\pm 0.5^{\circ}\text{C}$), loin and thigh portions were removed. The meat was cooked in a double contact grill to reach $71^{\circ}\text{C} \pm 1^{\circ}\text{C}$ in the centre of the sample (cold point, monitored by thermocouples) after deboning.

Samples were analyzed by an analytical panel of 8 trained assessors according to international standards and experience in sensory analysis of meat (ISO 1987, 1992, 1994). Each assessor received the samples (cubes: 1x1x1cm) in Petri dishes coded with three-digit, randomized numbers. The following descriptors were assessed: overall colour; intensity and typicality of odour/flavour; fat taste and juiciness, using an unstructured linear scale of 10cm, without anchorage where the ends of the scales corresponded to the intensity of the attribute: light pink, extremely soft, dry, not oily (lower limit: 0) and red, extremely strong (intense), juicy, very oily (upper limit: 10).

Statistical analysis of data was performed using the Proc Mixed of SAS (2004)]. Differences among treatments were analyzed by Tukey test ($p < 0.05$).

RESULT AND DISCUSSION

The influence of diets on rabbit meat sensory parameters is shown in Table 1. Although each cut own intrinsic characteristics, sensory parameters measured on loin and thigh showed a

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similar response in both diets. Evaluating fresh meat, the color, the odor intensity and juiciness were not altered and, as more important fact, the fishy taste and fat taste was not transmitted. Comparing loin and thigh, the thigh was evaluated with more color, typical flavor and juiciness respect rabbit loin but they showed no differences for the intensity of smell and taste to fat.

Table 1. Influence of fish oil diets, with or without adding antioxidants, on rabbit loin and thigh sensory parameters.

parameters	Treatments: diets				probability	error
	control	fish	Vitamin	algae		
Loin						
Color	4,74	5,29	5,95	5,35	0,3765	1,60
Odor intensity	5,85	4,90	6,00	5,62	0,4001	1,69
Rabbit typical Odor	5.52 a	3.49b	3.32b	3,73b	0.0023	1,41
Off odor	0,85a	1,68ab	2,51bc	3,20c	<.0001	1,10
Rabbit typical flavor	4,75	5,22	4,97	5,79	0,4567	1,57
Off flavor	1.63a	3,16ab	2,70ab	3,74b	0,0191	1,54
Juiciness	3,29	2,59	3,11	2,96	0,6591	1,34
Fat taste	2,81	2,98	3,93	3,90	0,0501	1,85
Thigh						
Color	5,27	5,98	6,33	6,88	0,0662	1,46
Odor intensity	5,23	6,05	6,06	4,52	0,3696	1,50
Rabbit typical Odor	5,17 a	2,68b	3,07b	3,17b	0,0021	1,62
Off odor	1,52a	3,27b	3,91b	6,23b	0,0002	1,54
Rabbit typical flavor	5,65	6,53	6,18	6,20	0,5042	1,42
Off flavor	0,38a	4,41b	4,44b	6,00b	<.0001	1,62
Juiciness	3,98	3,68	3,73	2,88	0,2929	1,46
Fat taste	3,32	4,34	4,04	3,24	0,2021	1,48

a, b: $p < 0,01$



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For both the loin and the thigh, only smell-taste variables as the characteristic odor, off odor and off flavor were influenced by diets; Control treatment had higher ‘rabbit odor’ and less off odor / flavor compared to diets with added fish oil with or without antioxidants ($p < 0,05$).

For both cuts of meat, between experimental diets, the presence of algae determined quantitatively higher values of off odor / flavor but no differences in characteristic odour regarding diets F and V. From the sensory characteristics point of view, analyzed in fresh meat, the addition of an antioxidant in the form of vit. E, seem not to be necessary because both diets, F (fish oil addition) as diet V (fish oil addition + vitamin E) show the same results no entiendo que quiere decir. Evidently the normal amount of vitamin E present in the vitamin-mineral nucleus of the diet would be sufficient to control oxidative processes when meat is consumed before 3 days post slaughter. The presence of algae as an antioxidant, it would not be necessary either if the meat is eaten fresh and, as a negative factor, transmitted odor/flavor not typical.

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CONCLUSIONS

In conclusion the fish oil and antioxidants addition in fattening rabbit diets, supplied in order to increase the content of omega 3 fatty acids, provides meat with same color, flavor, juiciness and untuosity respect a commercial diet, but more presence of off odor/flavor (but still acceptable for consumption), being stronger in thigh than loin and especially for algae’s diet.

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