Eating Quality of Lamb and Broiler Meat Fed on Linseed

Zudaire G. [1], Sarries M.V. [1], Insausti K. [1], Beriain M.J. [1], Gomez I. [1] and Arana A. [1]

[1] ETSIA, Universidad Publica de Navarra, Pamplona, Spain

Abstract— **There is an evidence of the nutritional benefits of consuming long-chain n-3 fatty acids. But it seems that in monogastrics more off-flavours and odours exist than in ruminants, when some sources of n-3 are supplemented in the diet. The aim of this study was to find out the acceptability of consumers to meat enriched in n-3 by using linseed from different species: lamb and chicken. Two consumer panels were carried out, the first one to evaluate lamb meat and the other one for chicken meat. Twenty two males of Navarra Breed Ternasco lambs were fed on two groups: 11 animals received the control concentrate diet and the other 11 received linseed diet. The *longissimus dorsi* was used for the sensory analysis. 88 panellists formed the consumer panel where odour, flavour and overall liking were evaluated. Twenty four females of Hubbard Color broilers were fed on two groups: 12 animals received the control concentrate diet and the other 12 received linseed diet. The breast was used for the sensory analysis. 72 panellists formed the consumer panel where odour, flavour and overall liking were evaluated. In lambs, no differences were observed between the diets; on the contrary in broilers, the animals fed on linseed were worse evaluated in odour, flavour and overall liking than the control. Thus, from this study, it could be inferred that linseed affects in a different way the organoleptic properties of meat of the two species, being the broiler meat enriched in n-3 by using linseed worse evaluated by consumers.**

Keywords— **lamb, broiler, linseed.**

I. INTRODUCTION

Consumers are nowadays more conscious about their health and demand safer food products. In this context, several studies have been focused on increasing the polyunsaturated fatty acid (PUFA) content and in particular the n-3 long chain fatty acids in meat [1]. The health benefits of PUFA and of n-3 fatty acids in particular are well known but unfortunately, the Western diet is poor in the intake of these fatty acids. Dietary supplementation with linseed may increase n-3 fatty acid content in the form of linolenic acid (18:3n-3), which acts as a precursor of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) [2]. However, meat enriched with PUFA is more likely to oxidise and the formation of off-flavours and off-odours can appear [3]. Moreover, the effect of the supplementation of PUFA in the diet can differ depending on the animal specie [2]. In monogastrics, the lack of rumen means a little variation of the fat they take from the diet. That does not happen with ruminants whose rumen hydrogenates high amounts of dietary fatty acids [1]. The difference in the digestive system may also affect the sensory quality of the final product. It seems that in monogastricts more off-flavours and odours exist than in ruminants when some sources of n-3 are supplemented in the diet [2].

The aim of this study was to find out the acceptability of consumers to meat enriched in n-3 by using linseed from two different animal species: lamb and chicken.

II. MATERIAL AND METHODS

A. Material and sample preparation

Two parallel studies were performed to study the acceptability of meat enriched in n-3.

The first one involved twenty two males of Navarra Breed Ternasco lambs fed on two groups. 11 animals received the control concentrate diet and the other 11 received linseed diet in form of extruded flaxseed during a fattening period of 1 month. The animals were slaughtered at an average of 83 days of age and 11.84kg (sd 0.68) of carcass weight. The *longissimus dorsi* was removed twenty four hours after slaughter from the right carcass of each animal. It was then vacuum packed, aged for 3 days and frozen until the sensory analysis was carried out.

The second study involved twenty four females of Hubbard Color broilers fed on groups of 12 animals. 12 broilers received the control concentrate diet and

the other 12 received linseed diet in form of extruded flaxseed during 3 weeks. Target age at slaughter for these animals was 56 days with a carcass weight of about 1.7kg. The two skinned breasts from each animal were removed after slaughter, placed into a tray and overwrapped in oxygen-permeable packaging film, aged for 7 days and frozen until the sensory analysis. In both lamb and broiler studies, the meat was thawed at 4ºC during 24h before consumer evaluation and then cooked on a grill (Fagor, Spain) to an internal temperature of 70ºC. Two grills with identical characteristics were used; control diet samples were cooked in one and linseed diet samples in the other in order to avoid the mixing of flavours of the different treatments.

B. Sensory analyses

Both lamb and chicken sensory evaluations were performed by consumer panels and held in the tasting room [4] with individual booths at the Public University of Navarra (Pamplona, Spain). The samples of meat from the different treatments were presented to evaluators. All samples were labelled, randomised and served warm. Between samples panellists were required to eat unflavoured bread and to drink water to minimize the carry-over effect.

In lambs, 88 panellist formed the consumer panel where odour, flavour and overall liking (1 = dislike very much, 8 = like very much) were evaluated.

In broilers, 72 panellist formed the consumer panel where odour, flavour and overall liking (1 = dislike very much, 9 = like very much) were evaluated.

III. RESULTS AND DISCUSSION

Table 1 shows the results for the lamb meat sensory trial.

Table 1 Effects (mean±s.e.) of linseed on the sensory quality attributes of lamb meat compared with control diet.

	Control	Linseed	sig
Odour	6.14±0.11	5.84±0.12	ns
Flavour	5.98±0.12	5.82±0.13	ns
Overall liking	6.07±0.12	5.93±0.11	ns

ns: $p \geq 0.05$

No differences were observed in lambs between the diets. The meat supplemented with linseed was neither worse nor better evaluated than the control meat. Although linseed supplementation should have increased the n-3 PUFA concentrations [5], in this study it seems it was not enough to make samples fed on linseed different in odour and flavour. On the contrary, in broilers differences appear between the diets (Table 2). The animals fed on linseed had lower scores in odour, flavour and overall liking than the control ($p<0.001$; $p<0.01$; $p<0.001$ respectively).

Table 2 Effects (mean±s.e.) of linseed on the sensory quality attributes of broiler meat compared with control diet.

	Control	Linseed	sig
Odour	6.71±0.17	5.82±0.17	***
Flavour	6.39±0.17	5.59±0.18	**
Overall liking	6.48±0.18	5.60±0.18	***

**: $p<0.01$; ***: $p<0.001$

Recent studies [6] show a negative effect on palatability when supplementing n-3 through flaxseed also in pork.

A previous study (2009) [7] did not find sensory defects in broilers enriching the diet with flaxseed for less than 16d, but samples of meat were unacceptable when animals were fed for more than 20d. Therefore, in the present study the duration of the fattening might also have had an influence.

Apart from this, in broilers, meat was aged for 7 days what can intensify the oxidation and rancidity of the meat. On the other hand, control diet suffered the same process and even then, its samples got better sensory scores although both control and linseed samples had higher scores than the mean of the scale (5 = neither like, nor dislike).

IV. CONCLUSIONS

From this study, it could be inferred that linseed affects in a different way the organoleptic properties of meat of the two species, getting the broiler meat enriched in n-3 by using linseed a lower sensory profile.

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