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Lipid oxidation and consumer's acceptability of lamb patties with active and edible coatings (#156)

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Introduction

Lipid oxidation is one of the main factors that decrease quality and sensory acceptability in meat products [1]. Synthetic additives are often used by the food industry in order to slow down lipid oxidation and extend shelf life. But consumers are becoming more health conscious and the demand of replacing synthetic by natural additives is increasing [2]. The use of essential oils (EOs) could be an alternative [2], which is well accepted by consumers [3, 4]. An edible coating is a possible way to incorporate essential oils in the meat [5, 6]. The aim of this study was to evaluate lipid oxidation and consumer acceptability of lamb patties covered with alginate edible coating containing two different EOs (thyme and oregano).

Methods

Sixteen deboned hind limbs from Rasa Aragonesa lambs, selected from "Ternasco de Aragón" IGP Quality Label animals, were used to prepare lamb patties. They were assigned to six treatments: CON: patties uncoated (control); EC: with edible coating without EOs; THY 0.1%: with edible coating with 0.1% thyme EO; THY 0.05%: with edible coating with 0.05% thyme EO; ORE 0.1%: with edible coating with 0.1% oregano EO; ORE 0.05%: with edible coating with 0.05% oregano EO. Edible coating was prepared from sodium alginate solution [5]. Essential Oils of thyme (*Thymus vulgaris* QT linalol) and oregano (*Origanum vulgare*) from Pranarôm International® (Ghislenghien -Belgium) were used.

All patties were packaged in individual polystyrene trays with a modified atmosphere (70% O₂ and 30% CO₂) and displayed at 4° C simulating market conditions during 7 days.

Lipid oxidation assays were performed by TBARS [7].

Eighty Spanish consumers participated on the sensory test. Each patty was individually cooked in a pre-heated grill (200 °C) until reaching an internal temperature of 75 °C. Each sample was then divided in five portions, wrapped in aluminum foil, and kept at 50 °C until consumer evaluation. Each consumer tasted 6 different samples (one per treatment), served in a randomized design assessing tenderness acceptability, flavour acceptability and overall acceptability; using a structured hedonic 9 point scale ranging from (1 = dislike extremely to 9 = like extremely). Analysis of variance (SPSS

22.0) was performed. Treatment was considered as fixed effect and consumer as random. Duncan's test ($P \leq 0.05$) shows differences between means.

Results

There were statistical differences ($P < 0.001$) between treatments on lipid oxidation after 7 days of display (Table 1). The incorporation of alginate edible coatings *per se* did not reduce lipid oxidation. However the inclusions of essential oils significantly reduced it. Oregano EO had a greater effect than thyme EO independently of the dosage used.

Both plants (oregano and thyme) are worldwide used on lamb culinary process, however their strong aromas modify the food organoleptic properties [8], consequently affecting consumer acceptability. Statistical differences ($P < 0.001$) were reported on flavour and overall acceptability (Table 1). No differences ($P > 0.05$) appeared on tenderness acceptability, according to [4].

Flavour acceptability of thyme EO, especially at higher dosages (0.1%), was significantly lower than those reported on CON group. Addition of oregano decreased slightly acceptability scores. Nevertheless, it did not differ from CON and EC treatments.

Overall acceptability is frequently correlated with other sensorial variables as flavour. Thus samples from THY 0.1% presented lower values than those from CON, EC or ORE 0.1%. The preference for the dose added varied according to the oil used (0.1% for oregano and 0.05% for thyme).

Related to consumer attitudes and preferences, the 88.6% of participants knew EOs and the 96.2% thought that they are applicable on food industry. The 66.3% would will to pay more for a meat product with natural additives as EO and the most chosen overprice was <5% (37.7%).

Notes

Table 1. Lipid oxidation (mg malonaldehyde / kg meat) and consumer acceptability (n= 80) of lamb patties with active and edible coatings (mean \pm standard deviation)

	CON	EC	THY 0.05%	THY 0.1%	ORE 0.05%	ORE 0.1%	P
TBARs	0.42 \pm 0.03b	0.50 \pm 0.07a	0.26 \pm 0.02c	0.25 \pm 0.01c	0.12 \pm 0.01d	0.11 \pm 0.01d	<0.001
Flavour acep.	6.87 \pm 1.4 a	6.75 \pm 1.5 ab	5.98 \pm 1.8 bc	5.45 \pm 1.8 c	6.21 \pm 1.9 abc	6.35 \pm 1.9 ab	<0.001
Tenderness acep.	6.55 \pm 1.6	6.95 \pm 1.3	6.60 \pm 1.7	6.46 \pm 1.5	6.95 \pm 1.5	6.80 \pm 1.4	0.163
Overall acep.	6.61 \pm 1.4 a	6.56 \pm 1.6 a	5.96 \pm 1.7 ab	5.57 \pm 1.9 b	6.26 \pm 1.9 ab	6.43 \pm 1.7 a	<0.001

a, b, c: different lower letter means statistical differences in the same row ($P < 0.05$).

CON: patties uncoated; EC: patties with edible coating without EOs; THY 0.05%: patties with edible coating with 0.05% thyme EO; THY 0.1%: patties with edible coating with 0.1% thyme EO; ORE 0.05%: patties with edible coating with 0.05% oregano EO; ORE 0.1%: patties with edible coating with 0.1% oregano EO.

Conclusion

Addition of essential oils on edible coatings on patties was an effective strategy to reduce lipid oxidation in lamb. However, it also modifies sensory properties and consumer acceptability, especially flavour and overall scores. On the current research oregano was more effective and accepted than thyme EO.

Notes