

Influence of partial replacement of animal fat by microencapsulated oil mixtures on the composition and texture of foal pâté

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Objectives: This work aimed to evaluate the effect of partially replacing of animal fat by microencapsulated healthy oils, walnut (treatment 1 - T1) or pistachio oils (treatment 2 - T2) blended with algal oil, on the proximate composition and texture of foal pâté.

Materials and Methods: The microencapsulation of T1 and T2 oil mixtures, 46.5 g of walnut or pistachio oils mixed with 3.5 g of algal oil, respectively, was performed according to the methodology described by Vargas-Ramella et al. (2020). Three different treatments of pâté were prepared: in control (CON) batch was used 100% of horse fat (30 g/100 g), while in T1 and T2, the 50% of animal fat was substitute by the respectively microencapsulated oils. All batches were elaborated following the procedure described by Domínguez et al. (2016) with some modifications and including the same ingredients, except for fat source. In particular, in addition to the fat portion, lean foal meat, foal liver, tap water, NaCl, milk powder, sodium caseinate, sodium phosphate, sodium nitrite and sodium ascorbate were included in the recipe. The same manufacture process was repeated four times during different months and five cans from each treatment were used for the analysis. Proximate composition was determined according to the protocols reported by Bermúdez et al. (2022), while the penetration test was carried out in line with the procedure explained by Echegaray et al. (2022). The data were examined using a one-way ANOVA.

Results and Discussion: The use of microencapsulated oils as animal fat partial replacers produced a significant ($P < 0.001$) reduction of moisture values, which could be related to the fact that the microencapsulated oils are characterized by low water contents in comparison with animal fat. Similarly, as could be expected, fat percentages decreased ($P < 0.001$) in T1 and T2 batches, which achieved a diminution of 34.22% and 28.17%, respectively. In this sense, T1 samples can be considered as “reduced fat content” according to the Regulation (EC) No 1924/2006 (2006). Conversely, reformulated batches reported higher protein contents since the substitution of animal fat for vegetable oils means the increase of lean ratio and consequently of protein proportion. Moreover, microencapsulated oils contained between 28-30% of protein, while horse fat only 4%. The ash content showed a similar trend to protein, where T1 and T2 samples recorded the greatest values. On the other hand, the penetration force values resulted unaffected ($P > 0.05$) by fat reformulation. This result could be associated to the fact that the dissimilarities among the employed fat source disappeared when the microencapsulated oils were incorporated into the meat matrix and submitted to the mechanical and thermal manufacture processes.

Conclusions: The outcomes showed that the fat replacement affected the proximate composition of foal pâté, favouring a reduction of fat contents, in particular in T1 batch, without altering the texture of the final products.

References:

- Bermúdez, R., Echegaray, N., Fraqueza, M. J., Pateiro, M., Domínguez, R., Munekata, P.E.S.; Lorenzo, J. M., & Santos, E. M. (2022). Chemical composition. In P. E. S. Lorenzo, J.M., Domínguez, R., Pateiro, M., Munekata (Ed.), *Methods to Assess the Quality of Meat Products* (pp. XII, 171). Humana.
- Domínguez, R., Agregán, R., Gonçalves, A., & Lorenzo, J. M. (2016). Effect of fat replacement by olive oil on the physico-chemical properties, fatty acids, cholesterol and tocopherol content of pâté. *Grasas y Aceites*, 67(2), e133. <https://doi.org/10.3989/gya.0629152>
- Echegaray, N., Rosmini, M., Pateiro, M., Domínguez, R., Munekata, P.E.S.; Lorenzo, J. M., Santos, E. M., & Bermúdez, R. (2022). Texture Analysis. In P. E. S. Lorenzo, J.M., Domínguez, R., Pateiro, M., Munekata (Ed.), *Methods to Assess the Quality of Meat Products* (pp. XII, 171). Humana.
- Regulation (EC) No 1924/2006. (2006). Regulation (EC) No 1924/2006 of the European Parliament and of the Council of 20 Decem- ber 2006 on nutrition and health claims made on foods. *Official Journal of the European Union*, L404, 9-25.
- Vargas-Ramella, M., Pateiro, M., Barba, F. J., Franco, D., Campagnol, P. C. B., Munekata, P. E. S., Tomasevic, I., Domínguez, R., & Lorenzo, J. M. (2020). Microencapsulation of healthier oils to enhance the physicochemical and nutritional properties of deer pâté. *Lwt*, 125(March), 109223. <https://doi.org/10.1016/j.lwt.2020.109223>

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