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EFFECT OF COOKING TEMPERATURE AND OLIVE OIL PERCENTAGE ON THE QUALITY OF MEAT EMULSIONS

Beriain*, M. J., Diéguez[a], P.M., Esquíroz M., Indurain, G., Arrizubieta MJ., [b]Insausti. K.

Área de Nutrición y Bromatología, [a]Área de Máquinas y Motores Térmicos, [b]Área de Producción Animal. Universidad Pública de Navarra. Campus de Arrosadía, 31006 Pamplona. Spain

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Introduction

No meaty proteins, as soya protein, are used to fabricate meat products because of the technological advantages they provide, such as favouring water retention, the formation of the meat emulsion and improving the texture. In addition to decreasing fat percentage in the product, the use of olive oil instead of pork fat, provides important nutritious properties to the meat emulsions. It is widely accepted that the intake of olive oil lowers the cholesterol plasma content (Mattson and Grundy, 1985).

Objectives

The purpose of the present work was to study the effect of heating temperature and the olive oil percentage on the sensory quality of meat emulsions fabricated with turkey meat and soya fibre.

Methodology

Three meat emulsions were fabricated with different olive oil concentration (30, 15 and 5%) and 50% turkey meat, 1% soya fibre and water until completing 100%. There were also added salt (1,5% in 30%olive oil emulsions and 2% in the rest), sodium nitrite (150 ppm), sodium ascorbate (0,5 g/kg) and tripolyphosphate (0,3%). Cooking of the emulsions was performed in hot water (82ºC) to internal endpoints of 60, 70 and 80º C, which were recorded by a probe. These probes were located in the middle of the 1 kg meat emulsion that was in a tin, and they were connected to a temperature data register PC-logger 2100 (Intab, Sweden). The following parameters were evaluated in the meat emulsions: cooking losses, chemical composition (water, protein, fat), color (Cie L*a*b*) and sensory analysis using a descriptive quantitative analysis (QDA) (Meilgaard et al., 1991). The trained panel assessed meat emulsions for initial and sustained juiciness, hardness, cohesiveness, granulosity, fattiness and chewiness. The method of Finite Elements for simulation the heating conditions of meat emulsions with olive oil was used to describe thermal processing (ANSYS 5.7 program).

Results & Discussion

Figure 1 shows the values experimentally observed of the temperature evolution for the three meat emulsions. It can be observed that meat emulsion with 5% olive oil reached 60ºC internal temperature after 16 minutes, approximately, while the other two emulsions needed 21 and 29 minutes, respectively. Regarding 70ºC internal temperature, meat emulsions with 15 and 30% olive oil attained this temperature after approximately 48 minutes, while meat emulsions with 5% olive oil did it in 32 minutes. Time and temperature differences were lower at 80ºC internal temperature. These results make in evidence that the composition of the meat emulsions modifies their thermal properties, as reported by Carballo et al. (1996) and Ngadi et al. (1998). Figure 2 shows simulation of heating process of 5% live oil meat emulsion with the time. The numerically calculated temperature values can be used to describe the thermal process of meat emulsions with respect to product quality. In this study also shows differences between meat emulsions fabricated with 30, 15 and 5% of olive oil where different heating degrees were observed experimentally for the studied meat emulsions.

Cooking yield was lower than 6% in all the studied meat emulsions, being that of 5% olive oil the one that showed higher weight losses when heating.

Fat percentage affected color coordinates (Cie L*a*b*), showing meat emulsions a lower Lightness (L*) with decreasing olive oil percentage. Table 1 shows that a* increased and b* decreased with increasing cooking temperature between 60 and 70ºC, except for the meat emulsion fabricated with 30% olive oil, where no differences were observed between heating temperatures. Redness (a*) decreased and b* increased with increasing cooking temperature.

Figure 1, also shows the results from the sensory analysis by the trained panel that assessed meat emulsions with 5 and 15% olive oil as low in hardness, with soft flavour and low fattiness and juiciness was similar between 30 and 15% oil emulsions. Regarding cooking temperature, the texture profile at 70ºC was better scored by the trained panel that the emulsions cooked at 60 and 80ºC, showing the former higher juiciness, lower cohesiveness and hardness.

Conclusions

The time hended for meat emulsions to achieve 60 and 70ºC internal temperature was lower for the meat emulsions fabricated with 5% olive oil, while no differences were observed at 80ºC. The sensory quality of the meat emulsions fabricated with 5 and 15% olive oil were assessed as tender, soft in flavour and with low fattiness against those emulsions fabricated with 30% olive oil. Meat emulsions cooked until 70ºC internal temperature had the best scores at the sensory analysis by the trained panel.

References

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Tables and Figures

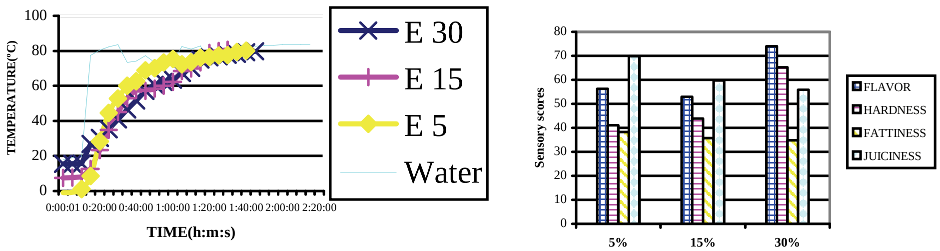

Figure 1. Experimental values of evolution of cooking temperature with the time and sensory evaluation of meat emulsions fabricated with 5, 15 and 30% olive oil.

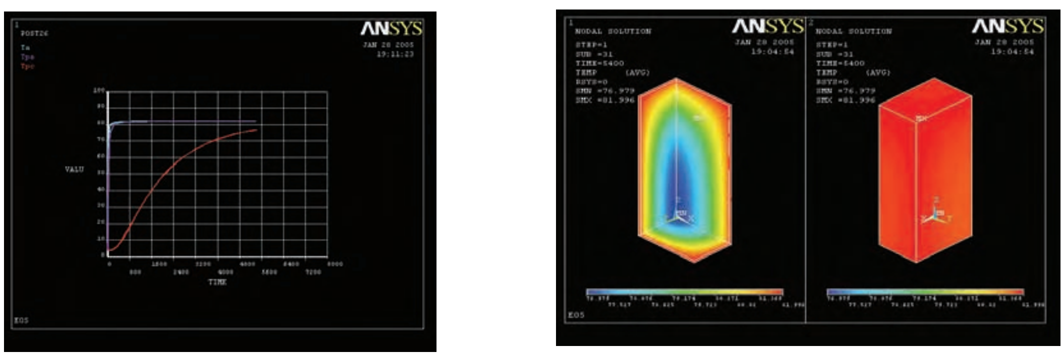

Figure 2. Simulation of heating process of 5% olive oil using the Finite Elements Method (FEM).

Table1. Effect of cooking temperature and olive oil percentage on Cie L*a*b* color coordinates (Letters compare columns, numbers compare raws; p<0.001 ***, p>0.05 ns).

	Fat %	*60 º*	*70 º*	*80 º*	*Sig.*
	5	5.29±(0.04)^{b1}	5.59±(0.03)^{b2}	5.70±(0.04)^{c2}	***
a*	**15**	3.60±(0.03)^{a1}	4.01±(0.04)^{a2}	4.11±(0.02)^{b2}	***
	30	4.01±(0.21)^{a}	3.98±(0.03)^{a}	3.93±(0.03)^{a}	**ns**
	Sig.	***	***	***	
	5	12.34±(0.05)^{b2}	10.06±(0.05)^{a1}	10.25±(0.10)^{1}	***
b*	**15**	11.33±(0.16)^{a2}	10.07±(0.04)^{a1}	10.33±(0.02)^{1}	***
	30	11.09±(0.08)^{a2}	10.59±(0.01)^{b1}	10.50±(0.07)^{1}	***
	Sig.	***	***	**ns**	