Impacts of tempering and defrosting processes on the technological quality of the raw material and the taste and texture properties of dry sausages

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Abstract

Food Industry is increasingly turning to freezing as a means of food preservation in order to streamline the production resources. This study was focused on dry sausage (raw material and finished product) with the objective of comparing three tempering/defrosting processes (traditional way in a cooler, microwave, and high-frequency) in order to determine their impacts on the product's technological characteristics. The results were unable to definitively conclude which of the processes was able to optimize the technological processability of the raw sausage material. There was only a low or even negligible impact on the finished products (dry sausage) themselves. The defrosting protocols employed make it possible to transpose these results to industrial settings.

Introduction

The freezing and the defrosting processes represent two stages very important which may damage the final product quality (Genot, 2000). Nevertheless, the use of frozen food has become essential to allow meat food Industry to be more flexible in the production according to the season and the sales.... Therefore, the manufacturers are obliged to implement thawing method (Li and Sun, 2002). In the past years, some of them moved towards speed thawing systems to increase the productivity but without measuring the impact on technological quality of meat products. Nowadays, as there is not sufficient information about the impact of defrosting processes on sensorial qualities and product's technological characteristics, the choice of defrosting process is based on from health, economic and practical criteria.

The objectives of this research were to compare three tempering/defrosting processes: the traditional way in a cooler, by microwaves, by high-frequency, in order to determine their impact on dry sausage (raw material and finished product).

Material and methods

Experiment was performed using several pork meat units of 30x30x3cm with 20% of fat tissue and 80% of lean meat. Five treatments of tempering/defrosting were experimented on meat units: 1) one short treatment by microwave (MOC) with a power of 4 x 1300W ; 12 cycles made up of emission for 10 seconds and break for 15 seconds; a total time of 5 minutes, 2) a long treatment by microwaves (MOL) with a power of 4 x 650W ; 24 cycles made up of emission for 10 seconds and break for 15 seconds; a total time of 10 minutes, 3) one short treatment by high-frequency (HFC) with a power of 1kW and a total time of 5 minutes, 4) one long treatment by high-frequency (HFL) with a power of 0,1kW and a total time of 30 minutes, 5) one defrosting process in cooler (F1 and F2).

The impact of these defrosting systems was studied on the raw meat's technological characteristics (drip loss, color by Minolta in CIELAB system, pH) and on dry sausages manufactured with defrosted meat (drip loss kinetic, pH kinetic, salt kinetic and sensorial properties). The sensorial properties were evaluated by sensorial analysis with a jury of 12 experts. Each product were evaluated as the whole and then sliced in order to assign a note (1 to 7) according to 49 descriptors. The characteristics of defrosted meat were compared with characteristics of fresh meat (VF1 and VF2).

Data were analyzed by ANOVA using the Statview software. When a significative effect was detected ($P<0,05$), the respective means of the groups were compared using the PLSD Student's test.

Results and discussions

Impact of defrosting systems on raw meat characteristics:

No drip loss has been observed from meat units. As the defrosting treatment was stopped when temperature reached –2°C, the water was still frozen. However, the result showed that surface of meat unit was not overheated. Taher and Farid (2001) have shown that it was possible to thaw the meat under controlled conditions such that its surface temperature never exceeds 10°C. No effect of defrosting processes was observed on the pH (p=0,12). Only the color seems to have been influenced since redness (a*) decreases and lightness (L*) increases with treatments by microwave (p<0,0001). Ersoy and *al.* (2008) have also shown that a* value of thawed fish usually decreased significantly.

Impact of defrosting systems on dry sausage:

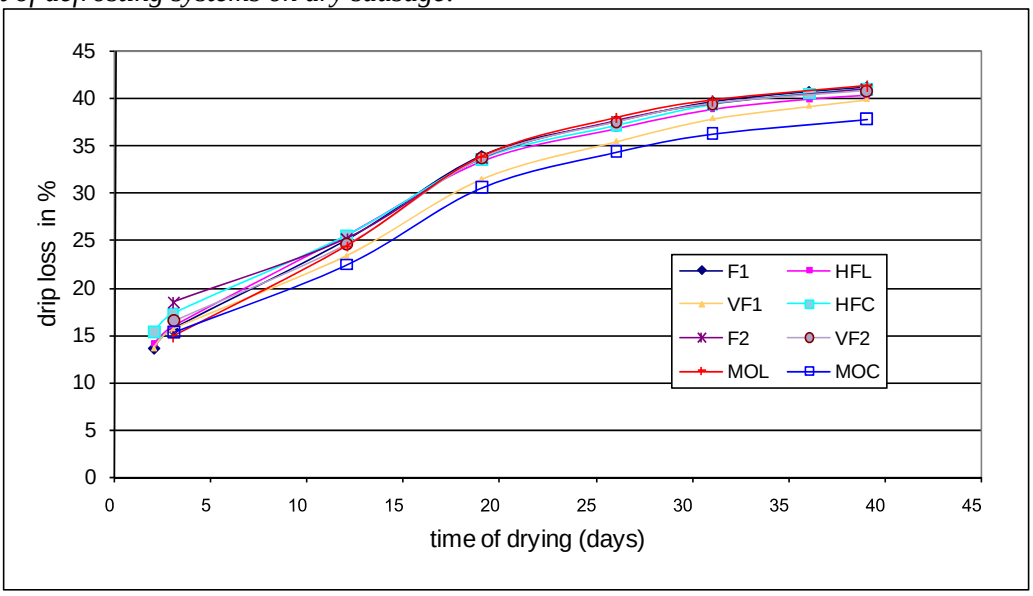

Figure 1. Kinetic of drip loss during the drying of sausage.

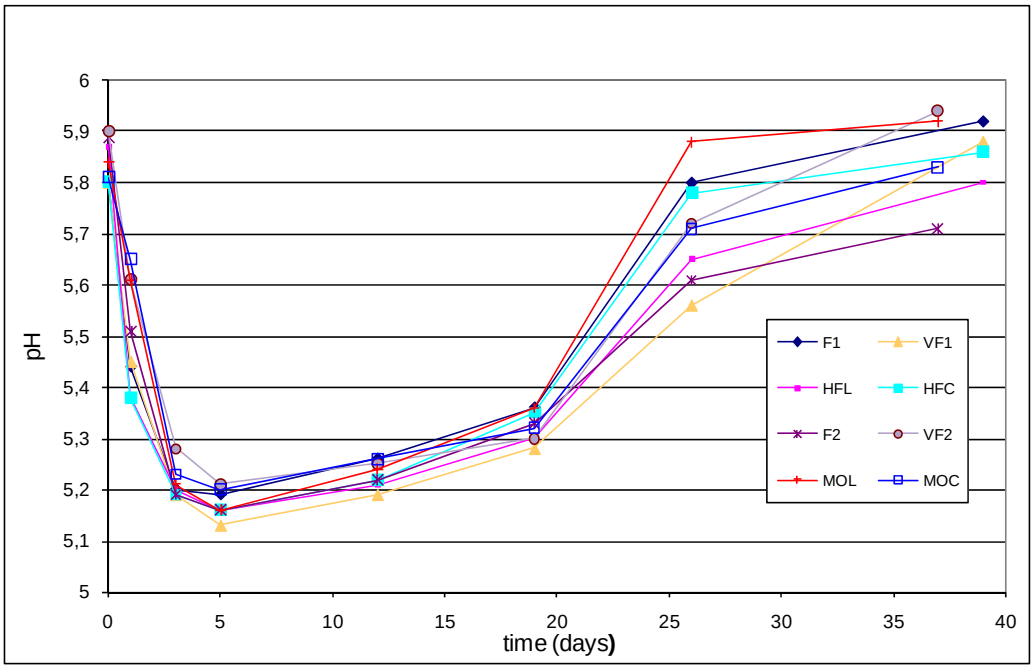

Figure 2. Kinetic of pH during the drying of sausage.

The kinetics of the drip loss (figure 1) are usual and show no effect of the defrosting processes of defrosting. Figure 2 shows that the kinetics of pH are normal and the differences observed at the end of drying are negligible.

The chemical analysis of dry sausages (salt level and water level) confirm previous results since the salt and humidity are not significantly influenced by the type of defrosting.

On the sensorial point of view, some differences were highlighted among the 49 descriptors.

Table 1. Results of sensorial analysis for significant descriptors

Descriptors	**HFC**	**HFL**	**F1**	**VF 1**	**MOC**	**MOL**	**F2**	**VF2**
white Color of surface	3,83±1,11	4,08±0,79	3,08±1,16	4,50±1,51	4,42±0,90	3,67±0,89	2,75±1,06	3,58±1,38
cohesiveness	4,33±1,61	5,25±1,22	5,50±1,38	6,5±0,8	6,17±0,94	6,17±0,94	4,75±1,48	5,58±1,24
Other odors	2,5±1,78	1,0±0,0	1,25±0,87	1,17±0,58	1,17±0,58	1,25±0,87	1,67±1,3	1,92±1,68

On whole dry sausage, the descriptor “white color of surface” is influenced by the defrosting treatments ($p=0,0022$). The surface of finished products HFC, HFL, MOC and VF1 is considered brighter than the product F2 ($p<0,0001$).

On sliced product, the best result for descriptor “cohesiveness” was obtained with product “VF1”. The sausage “HFC” presents a worse cohesiveness than products: F1 ($p<5\%$), VF1 ($p<0,1\%$), MOC ($p<0,1\%$), MOL ($p<0,1\%$) et VF2 ($p<5\%$). The cohesiveness of product HFL is worse than product VF1 ($p<5\%$).
From the olfactory point of view, the dry sausage HFC presents more intense odors than others products ($p<5\%$).

Conclusions

For kinetic of weight loss, pH, salt level or humidity, no defrosting processes effect has been highlighted on dry sausages. The sensorial analysis confirm these results since only one effect has been observed for slices sight and odors. Indeed, the HFC defrosting process would have a negative impact on cohesiveness. Nevertheless, the defrosting processes implemented in this study have no impact on taste and texture of dry sausage. The defrosting protocols employed make it possible to transpose these results to industrial scale including microwave and high frequency which have industrial applications (Durosset, 1993; Dutto and Maestrali, 1995).

Acknowledgements

The authors wish to thank ACTIA for their financial participation.

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