COLOUR CHANGES EVOLUTION DURING "PATE" COMMERCIALIZATION

SANCHEZ-MONTERO N., PERLO F., CERVERA-PEREZ R., ROSMINI M., PEREZ-ALVAREZ J., GAGO-GAGO M., LOPEZ-SANTOVEÑA F.* and ARANDA-CATALA V.

Depto. Tecnología de Alimentos - Universidad Politécnica de Valencia, VALENCIA. Spain. * Instituto de Agroquímica y Tecnología de Alimentos.

S-VIB.22

SUMMARY

In this work the evolution of differents physico-chemical parameters (Iodine number, TBA test, Residual nitrite level, pH and Moisture) and CIE L* a* b* colour evolution, in pork liver "paté" with and without ascorbic acid addition were study. The samples were stored in a illuminated display cabinet at different lux intensities. The regression equations were obtained for each one of the parameters under study, from the first day of light exposition.

Introduction

Since 1988, the spanish production of "paté" has been increased by 6% annually; the production in 1992 was 25.500 Tm. However, Spain is one of the European Union country's with less consumption (600g. per person per year), much below the main consumers: France and Denmark with 2,3 and 3,7 kg respectively (Pascual F., 1993). The traditional way of commercialize "paté" in Spain is by bulk in containers called "tarrinas" of 1 Kg approximately, this product is exposed in illuminated in display cabinets during the commercial time.

The exposure of "paté" to the light and air leads to a series of alterations in its components, as well as in fats and meat pigments, producing a deterioration in the quality of the product. The fats, in presence of air, the oxidation is an autocatalitic phenomenom wich begins very slowly, but then accelerates in a exponential way. The result of a prolonged oxidation in the fat is the development of rancidity accompanied with the appearence of undesirable tastes and smells (Razafindrakoto et al., 1986). In the meat pigments, the mono and dinitrosylhemochrome (pigments responsible for the colour of cooked cured meat products) are oxidised transforming into hemichromes (brown colour). In previous works Carballo et al. (1991) in sliced pork bologna found that light exposition cause a fast evolution in the colour parameters, inmediatly they are exposed at light.

The aim of this study was to observe the evolution of different physico-chemical parameters (iodine number, T.B.A.test, residual nitrite level, pH and moisture), as well as the colour in pork liver "paté" with ascorbic acid addition. Stored in a illuminated display cabinet at 4±1°C, at constant air velocity, and exposed at different light intensities: 0 (darkness), 300, 1000 y 2000 lux.

Materials and methods

The "paté" was prepared under commercial conditions in a pilot plant. In this study two "patés" were made: with and without sodium ascorbate. The "patés" were made with the following formula: 56,6% pork dewlap, 25% liver pork, 15% water, 1,8% salt, 125 ppm sodium nitrite, 0,2% phosphate, 1% caseinate, 0,05% monosodium glutamate and 0,23% spices. The dewlap was scalded at 100°C during 10 minutes. Then, it was emulsified by comminution and homogeneization with the other ingredients at 38-40°C. The mixture was stuffed into on artificial casing (8,5 cm in diameter) and heated in boiling water (100°C), until 75°C in the core. Then, the stuffed "patés" were chilled at 4±1°C during 24 hours. Some part of the samples (with and without ascorbate) were stored in darkness, and the other part were cut and exposed in "tarrinas" at 300±50 lux, 1000±100 lux, and 2000±100 lux. All samples under commercial conditions, were stored at 4±1°C. The illumination source employed was Osram L 36 w/76 nature de lux.

The "paté" samples were analysed at different times: 0 (after 24 hours in cold storage), 1, 2, 3, 4 and 5 days. 42 "paté" samples of 700 g. each one, with sodium ascorbate and without it, were analyzed. Moisture

(M), Residual Nitrite level (N), were measured by ISO R-1442 and ISO/DIS 2918 standard method respectively (Ministerio de Sanidad y Consumo, 1985) . Iodine number (I) using the Hanus method AOAC 26.020-26.021 (1965). TBA Test (T): extractive method by Rosmini et al. (1994), pH (Ministerio de Sanidad y Consumo, 1985). Colour parameters under study were CIE L*a*b* notation (1976)(observer 10°, D-65 illuminant). L* (lightness), a* (+/-, red/green), b* (+/-, yellow/blue). The colour measurament was made with a Minolta CM1000 spectrophotometer. Statistical analysis was made by BMDP version 9.0 program. Linear regression were calculated by 1R. Regression analysis were calculated after the first day at light exposure.

Results and discussion

The regression equations obtained for each one of the parameters, from the first day of light exposition, under the illumination condition (0, 300, 1000, 2000 lux), storage temperature (4±1°C), relative humidity (80±5%) and air velocity (0,05 m/seg) are showed in table 1.

- Moisture: Light exposition for both types of "paté" (with and without ascorbic) decrease in its values. Lux intensity increase the loss of moisture in the samples exposed to light intensities is showed in the negative slope in equation N° 1 and N° 2 (table 1).
- pH: The regression analysis (equations N° 3 and 4, table 1) showed a low correlation coefficient, by this reason the equations obtained are rejected. pH values (means and standard deviation respectivelly) are following: a)"paté" without ascorbate, 0 lux: 6,66±0,1591; 300 lux: 6,60±0,0632; 1000 lux: 6,75±0,0774; 2000 lux: 6,79±0,1069. b)"paté" with ascorbate, 0 lux: 6,79±0,1477; 300 lux: 6,88±0,0676; 1000 lux: 6,88±0,0872; 2000 lux: 6,85±0,0880.
- T.B.A test: Equation N° 5 (table 1) for "paté" without ascorbate showed a quadratic effect induced by light intensities. But "paté" with ascorbate (equation N° 6, table 1) showed only a linear effect. This evolution is only for samples exposed at light, because in darkness there was not evolution on T.B.A parameters. The T.B.A evolution for both types of "paté" (without and with ascorbate) are showed in figure 1 and 2 respectivelly.
- Residual nitrite level: The "paté" with ascorbate showed less residual nitrite level (equation N° 8, table 1) than "paté" without it (equation N° 7, table 1). This is due to the ascorbate that caused a loss of nitrite because it was involved largely in the formation of nitroso-reductant intermediates or products (Fox et al., 1974). In figure 3 the residual nitrite differences between "paté" with and without ascorbate in darkness are showed.
- Iodine number: The regression analysis (equations N° 9 and 10, table 1) showed that iodine number for each treatment and each "paté" was a straight line. This evolution remained during all the exposition. From this it can be deduced that light exposition and lux intensities did not change the double bonds number at the beginning of the first day.
- L*: For all experiments L* was lower for samples with ascorbate as agreed by Perez Alvarez et al. (1994). This has been described by Palombo et al. (1989) in which the formation of nitrous myoglobin occurs in the same time interval during which the decreasing phase in L* takes place. (equation N° 12, table 1). The "paté" without ascorbate (equation N° 11, table 1) showed a higher negative slope than "paté" with it. From this results it could be deduced that ascorbate had a protective effect upon lightness during light exposition.
- a*: The experimental results obtained during the first 24 hours of exposition at light showed an inmediate drop in redness, as agreed by Carballo et al. (1991) and Minguez et al. (1992) for cooked meat products. The equations N° 13 and 14 (table 1) showed the evolution from the first day for "paté" without and with ascorbate respectivelly. The samples with ascorbate were higher in redness, in all treatments.
- b*: The b* evolution for samples with and without ascorbate were agreed in the behaviour of cooked cured meat product (Light exposition increase in yelowness) (Minguez et al., 1992). Equations N° 16 and 15 (table 1).

Conclusion

Except pH, all regression showed a high correlation coefficients.
Neither ascorbate nor lux intensities affect iodine number.
Fading takes place in all "paté" samples at different lux intensities. Redness was higher for "paté" with ascorbate and lightness was lower with it.
a* and b* evolution was the same as cooked cured meat product during light exposure.

References

Carballo, J.; Cavestany, M. and Jimenez-Colmenero, F., (1991). Effect of light on colour and reaction of nitrite in sliced pork bologna under different chilled storage temperatures. Meat Science, 30:235-244.

Fox, J. and Nicholas, R., (1974). Nitrite in meat. Effects of various compounds on loss of nitrite. J.agr.Food Chem., 22:302.

Minguez, F.; Perez-Alvarez, J.; Sayas, M. and Aranda, V., (1992). Cured ham: colour stability study. II Cong. Int. Tec. Des. Alim. oct., 5-7. Murcia, Spain. 123.

Palombo, R.; Van Room, P.; Wijngaards, G. and Prins, A., (1989). Kinetic analysis of changes in lightness attribute of colour during the processing of comminuted meat product. Proceedings of 35th international Congress of meat science and technology. 624-631.

Pascal, G., (1988). Aditivos antioxidantes. In: Aditivos y auxiliares de fabricación en las industrias agroalimentarias. By J.L.Multon. Zaragoza, Ed. Acribia, 157-181.

Perez-Alvarez, J.,(1994). Colour during "paté" processing. Pending to publication.Cárnica 2000

Razafindrakoto, N. and Jacquet, B., (1986). Influence de la congelation et de la technique de pochage des gras sur la fabrication du paté de foie. V.P.C.; 7(3):124-130.