STABILITY OF VACUUM PACKED COOKED FERMENTED SAUSAGES WITH ADDED BHA AND BHT

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INTRODUCTION

The effects of the use of butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), and use of polipropylene/metalic polyethylene (M) and nylon/polyethylene (P) packing films with cooked fermented sausage, stored at 20 to 22° C, for 180 days w evaluated on residual nitrite content , total plate count , colour, and sensorial attributes.

MATERIALS AND METHODS

Meat from beef forequarter , pork foreshank and backfat were trimmed, packed in polyethylene bags, and stored at -18°C for two week Cooked fermented sausage (A) was processed according to formulation: meats, 2.5% salt, 0.5% dextrose, 0.03% sodium nitrite, 0.00 sodium nitrate, 0.05% sodium erythorbate, herbs and seasonings.

Product B formulation was the same as (A), with the addition of BHA (0.01% fat basis) and BHT (0.01% fat basis). *Lactobacillus plantar* starter was inoculated to $1.3x10^8$ UFC/g meat. The sausages were stuffed in 18mm cellulose casings. The fermentation was carried out for hours at 28°C and 6 hours at 32°C and 80-85% relative humidity untill a pH of 5.0 was achieved. Cooking was proceeded as follow: minutes smoking at 45°C, 120 minutes drying at 45°C and cooked to 72°C. Products A and B were peeled off after cooling and cut into 10 sticks . Half of A and B sticks were vacuum packed in M film, and the other half in P film. Oxygen permeability of M and P was 1,290 and $76.81 cm^3/m^2/day$, respectively, while the water vapor permeability was 1.82 and 7.78 g water/cm^2/day, respectively.

Analysis: **Chemical and physical** - moisture, fat and ash (HORWITZ,1980), protein (Torry Res.Station, 1973) , water activity (Novas EEJA-3 at 25°C) , pH (filtrate of 10g homogenization with 50ml distilled water), shear force (Instron with Warner-Bratzler acessories) formulation A and B were determined of newly processed products. Products AM, AP, BM and BP at 3, 10, 30, 60, 90, 120, or 150 days w analysed for residual nitrite content (ANGELUCCI, et al. 1984) and L, a* and b* colour values (Minolta Chroma Meter CR-200b). **Sensori** evaluation of firmness, juiciness, flavour and overall quality (COMPUSENSE program version 4.1) and subjective relative colour were carr out. **Microbiological** - total plate count (SPECK, 1984) were determined at 10, 30, 60, 90 and 150 days.

RESULTS AND DISCUSSION

The characteristics of newly processed cooked fermented sausages A and B for moisture, fat, protein, ash, sodium cloride contents, pH, wat activity and shear force are shown in Table 1.

Table 1. Characteristics of newly processed A and B products

	A	B
Moisture (%)	49.25*a*	48.20*b*
Fat(%)	16.84*a*	18.13*a*
Protein (%)	27.04*a*	28.30*a*
Ash (%)	4.74*a*	4.73*b*
Sodium cloride(%)	5.42*a*	5.40*a*
PH	5.04*a*	5.10*b*
Water activity	0.92*a*	0.92*a*
Shear force(kgf/section)	2.50*a*	2.47*a*

Means followed by different characters in the same line are diffferent at $p<0.01$

Nitrite content (Figure 1) decreased after the tenth day, fro around 8ppm to less than 4.5ppm, after 120 days to less th 3.0ppm; and did not differ significantly among AM, AP, BM and B during the storage.

Objective measurements of external colour for lightness (L redness (a*) and of yellowness (b*) decreased drasticallly at the d 30, from around 86, 40 and 22, to around 40, 17 and 1 respectively, but after this period, did not change significant There were good correlations among the 4 products in these colo parameters ($r \geq 0.9648$, $r \geq 0.9720$, and $r \geq 0.7680$, for L, a*, and b respectively). The figure 2 shows the curves of product AM. It w detected with significant high a* values ($p=0.00$) in M packe products, being the means of all determinations around 26 for M products and 23.5 for P products.However, the relative colour among four products evaluated by subjects, differed between M and P packed products ($p=0.00$) (Figure 3); with a good correlation between external and internal relative colour ($r=0.7709$). The subjective colour measurements were more discriminative and more sensitive than objective ones.

There is no general accordance on the critical value that can be adopted in studies on stability, for how much changes in a quality parameter the product should lose to be considered still acceptable (or with minimum acceptable quality). Some works reported the loss of 25% to 35% o maximum scores of a quality, as the critical values for the product acceptability. In this direction, the Hungarian Standard, 1971 as mentioned by VARSÁNYI & SOMOGYI (1983), considered a 35% reduction in the maximum number of quality points as critical limit.

Using the above limit for the present work, there were no significative changes as expected in firmness and juiciness as the packing films were of low water vapour permeability. Loss of 10% flavour and overall quality($r=0.86341$) (Figure 4) of initial scores, during 180 days storage products in M packing; and loss of 30 to 35% after 60 days of storage, for the products in P film were obtained. The use of BHT and BHA did not affect the microbiological stability. The number of aerobic microorganisms increased to a maximum, between 60 and 90 days of storage and then decreased or were constant. M packing better protected the products than P, decreasing the number os microrganisms untill 60 days (Figure 5).

CONCLUSIONS

1. Subjective evaluation was more sensitive and discriminative than objective measurements for detecting changes in colour of cooked fermented sausages, during 120 days storage.

2. Using the loss of 35% of the initial quality as a limit to one product to be considered of the minimum acceptability (as refered in VARSÁNYI & SOMOGYI, 1983), M packed cooked fermented sausages were acceptable for at least 150 days and the antioxidants added sausages were acceptable for 60 days, on sensorial flavour and overall quality parameters.

3. Products AM and BM, were microbiologically acceptable during the 150 days storage period, but AP and BP, reached the count of 10^7UFC/g at 60 days, considered the limit for a food to be microbiologically acceptable.

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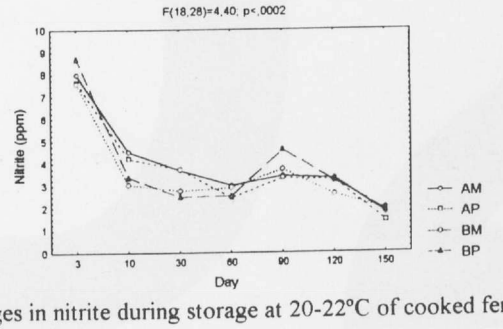

Figure 1: Changes in nitrite during storage at 20-22°C of cooked fermented sausage

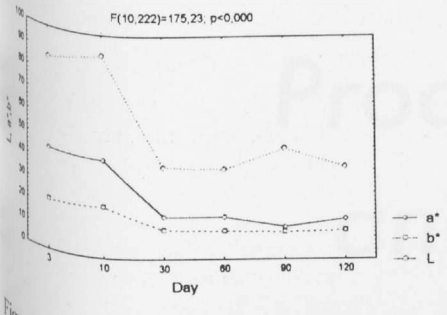

Figure 2. Changes in L a* b* values during the storage at 20-22°C of AM cooked fermented sausage.

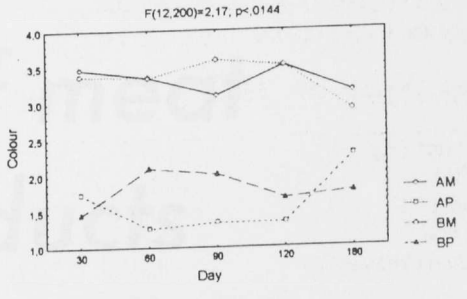

Figure 3. External subjective colour during the storage at 20-22°C of cooked fermented sausage.

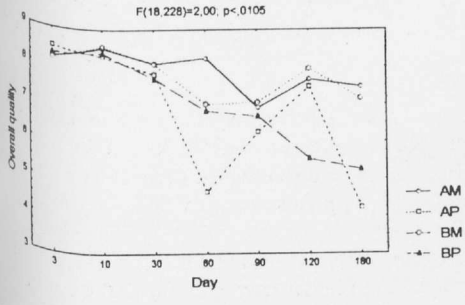

Figure 4. Changes in overall quality scores during the storage at 20-22°C of cooked fermented sausage.

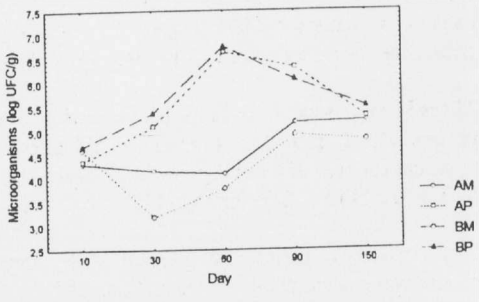

Figure 5. Total aerobic microorganisms during storage at 20-22°C of cooked fermented sausage.

NOTES