COMMERCIAL SCALE APPLICATION OF SODIUM LACTATE FOR SHELF LIFE EXTENTION OF VACUUM PACKED HAM TYPE PORK PRODUCTS

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BACKGROUND

Microbial safety and quality are major factors in the overall consumer acceptance of meat products. The products of production yield above 100% are usually of limited shelf-life type and therefore the major problem is to maintain microbial safety and quality during storage. For this reason a variety of antimicrobial chemical treatments have been investigated and the sodium lactate has been recognized as safe for human health.

There is a number of references regarding hygienic and technological aspects of the use of sodium lactate in meat processing (Brewer et all 1993; Burik and Koos,1990; Debevere ,1989; Houtsma et all,1995, Papadopulos et all,1991; Smiechowicz 1997; Bogoczek and Napierala, 1997 and much more). General conclusion that arises from these data is that sodium lactate effectively reduces the dynamics of bacteria growth and extends the shelf-life of meat and meat products stored under chilling conditions. Therefore it seemed reasonable to verify these findings under the conditions prevailing in meat processing plant.

OBJECTIVES

The experimental batch of two pork products of high production yield were manufactured in commercial quantities to study the effect of addition of 0.6% and 1.5% sodium lactate on changes of total aerobic plate count and palatability during storage in 2°-4°C.

METHODS

Pork leg muscles (95 kg) and debonned, skinned shank muscles (5 kg) were taken for producing pork ham pasteurized in multilayer foil. Steam cooked ham sausage of coarse ground type (φ = 90 mm) composed of the I-st grade pork meat (85 kg) and III-rd grade meat (15 kg). Curing solution contained the salt (4.2 kg/100 kg of meat) , sodium nitrite (0.0125 kg/100 kg, approved additives, spices and the sodium lactate. 60% sodium lactate solution (AKWAWIT - Leszno Co., Poland) was added to the mixture to achieve the concentration of pure component equivalent to 0.6% and 1.5% per 100 kg of meat. Both products were manufactured in local processing plant in amounts of few hundred kilograms for commercial sale. The processing technology was carried out in compliance with company standards. The production yield of ham was 140% and that of ham sausage - 160%.

24 hours after the processing was over, the ham and ham sausage were sliced and vacuum-packed in the MULTIVAC CD 6000 as the samples of 100 g. Sliced products were then stored for 40 days in 2° - 4°C.

Total plate count (TPC) was determined according to the procedures of Polish Standard PN-A-82055-6. On the basis of appearance, colour and taste the overall palatability of the products was evaluated and the following 5 point scale was applied: 1 - not acceptable, 2 - palatability not satisfactory, 3 - satisfactory palatability, 4 - good palatability, 5 - very good palatability. The sensory evaluation was performed by the panel of trained employees of the processing plant. The analyses were conducted in 10 day intervals during 40 days storage of the products.

RESULTS AND DISCUSSION

Initial contamination of ham and ham sausage when determined just after the processing was relatively low. The TPC of ham was $1.7 * 10^3 \pm 4 * 10^1$ cfu/g (mean of 3 determinations ± standard error) and that of ham sausage - $5.8 * 10^2 \pm 2.2 * 10^1$ cfu/g. Such low contamination was due to thermal processing (pasteurization, steam cooking) and also proves that the rules of GMP were maintained during slicing and prepackaging of products.

Changes of TPC during storage period were described in terms of time-effect relationship:

$$\log [N_t / N_0] = \log A + b * t$$

N_o - initial TPC for t=0,
N_t - TPC after t days of storage,
b - dynamics of growth, 1/b - number of days required for 10 times increase of N_o.

Time-effect curves for changes of TPC are presented in Fig.1 and 2. The parameter „b" (the slope) characterizes dynamics of bacterial growth and may serve as a source of valuable technological information. Dynamics of TPC growth in samples with sodium lactate added was reduced by the factor 1.6 - 5.6 (the „b" ratio) , depending on the product. Also, the storage period required for increase of TPC by 1 log cycle was substantially extended, from 17 days (ham, 0% lactate) to 37-42 days in samples containing the lactate. For ham sausage the respective numbers were from 9 (0% lactate) to 16 - 50 days.

Changes of palatability (Y) of the products during storage (t) are of the Weibull distribution type and the formula is:

$$Y = a - b * \exp (-c * t^d)$$

b, d, c - parameters of the curve,
a - initial palatability (points granted, mean values)

It can be seen from the Figures 3 and 4 that even 0.6% addition of sodium lactate extended practical storage life, i.e. time an overall palatability would be ≥ 3. This results from accurate calculations, that the PSL-value for products without the lactate does not exceed 26 days.The products with lactate addition can be stored for 33 days. Thus, in relative terms the extention of PSL for samples manufactured with the lactate added would be 127%.

CONCLUSIONS

1. 0.6% - 1.5% of sodium lactate added to pork ham-type products caused substantial inhibition of growth of aerobic bacteria. Dynamics of the growth was reduced by the factor of 1.6 to 5.6 in log terms.

2. Under industrial conditions practical storage life in 2° - 4°C of vacuum packed perishable pork meat products with the sodium lactate added was prolonged by 27% in comparison with products without the lactate.

3. No worsening of sensory quality of products due to the use of sodium lactate was observed.

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