

STUDIES ON THE PROPERTIES OF SELECTIVE-PERMEABLE CASINGS

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Introduction

The urgent problem of meat-processing industry is the preservation and shelf life prolongation of processed meats without change of quality attributes.

In the manufacture of sausage products natural and artificial collagen and cellulose casings, permeable to moisture and smoking gases, are used. A significant disadvantage of such casings is their instability against the effect of sanitary-indicative microflora, characteristic of meat-processing enterprises. Therefore, shelf life of cooked sausages doesn't exceed 5 days, and cooked-smoked and semi-smoked sausages– 15 days.

The use of polyamide casings with high barrier capability makes it possible to increase shelf life of cooked sausages up to 60 days. However, their major advantage – vapor- gas- and moisture impermeability is at the same time their drawback, because they limit the area of their application – they don't pass smoking fume.

The solution to this problem is the development of selective-permeable polymer casings that don't prevent smoke and vapor from penetration so, that adequate frying and smoking of sausage product can be fulfilled. At the same time they have high barrier capabilities against oxygen, are not subject to the effect of microorganisms and are impermeable to them.

The objective of this work was to study the properties of packaging materials of new generation, offering guaranteed keepability and safety of meat products.

Materials and methods

A collagen and a selective permeable, polyamide casing and cooked, cooked-smoked and semi-smoked sausages manufactured in selective-permeable casing were chosen as the objects of investigations.

In the investigations were determined:

the strength of casings [GOST (State standard) 14236-81]; vapor permeability of casings [GOST (State standard) 21472-81]; acid and peroxide numbers of sausage products; microbiological indices of sausage products during storage; color indices of sausage products (Semenova et al., 2006).

The structure of the casings was investigated with the help of scanning electron microscopy under the microscope "JEM-100 CX".

Results and discussion

Two types of selective-permeable casings were used in the work. The vapor permeability of the studied casings - a very important factor in the production and further storage of sausage products - was determined.

Permeability in relation to phenol, characterizing the degree of penetration of smoke components, depends on this index. An artificial collagen casing "Belcosin", widely used in meat industry, was chosen as a control.

Physical and mechanical properties of casings are presented in the Table.

Table 1. Physical and mechanical properties of collagen and selective-permeable casings

№	Casing	Vapor permeability of casing, g/m ² for 24 hours	Maximum load at breaking (along), H	Maximum load at breaking, across, H
1	Belcosin	690±45	3.73±0.18	4.45±0.27
2	Permeable 1 (prior to thermal processing)	467 ±21	8.78±0.41	12.28±0.68
3	Permeable 2	302±17	7.94±0.33	11.86±0.59
4	Permeable 1 (after thermal processing)	323±19	-	-

The results presented in the Table suggested that selective-permeable casings possessed lower vapor permeability as compared to the collagen one, which probably would help to prolong the preservation period of sausage products quality attributes. However, as far as strength qualities are concerned, the permeable casing exceeds the collagen one.

The permeable casing with higher vapor permeability, constituting 467 g/m², was chosen for further investigations.

The carried out comparative investigations of the structure of collagen and permeable polymer casing (Fig.1) by the method of electronic scanning microscopy have shown, that both casings have a loose, porous structure. During thermal processing the structure of the permeable polymer casing (Fig. 2) becomes denser with the reduction of porosity. This is confirmed by the decrease of vapor permeability of the casing after thermal processing from 467 to 323 g/m² (See table).

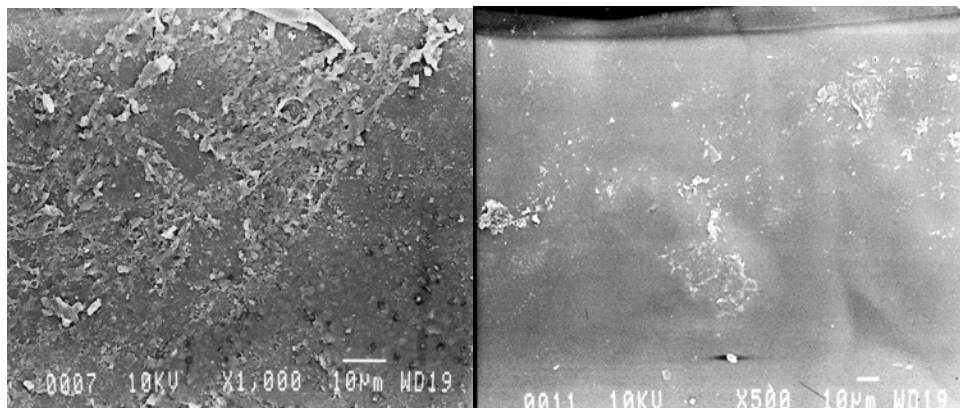


Fig. 1

Fig. 2

To investigate the effect of permeable casing on the preservation of properties of finished products during storage the experimental lots of cooked, cooked-smoked and semi-smoked sausages were manufactured.

It is known that during storage of sausage products, containing fat, oxidative processes resulting both from the contact with the air oxygen, and due to interaction with previously adsorbed oxygen take place. Solubility of the air oxygen in the fat is the cause of its oxidative spoilage. The obtained values of the acid and peroxide numbers, increase in comparison with the initial values, but still are within the norms established by Sanitary norms and rules, and after 25 days of storage they did not exceed 1.94 mg KOH and 3.06 mmol of active O₂, 1.75 mg of KOH and 2.28 mmol of active O₂, and 1.69 mg KOH and 2.85 mmol of active O₂ for cooked, cooked-smoked and semi-smoked sausages, respectively.

To have a clearer picture of changes in color intensity of sausage products, manufactured in permeable casing, during storage an objective method of the determination of color stability of meat products, based on the measurements of color characteristics of the fresh cut was used (Semenova et al.).

The results of the investigation of color indices suggested that during storage the indices of lightness and yellowness in cooked sausage products reduced very slightly, the items became darker on the 25th day of storage by 1-2%.

In cooked-smoked and semi-smoked sausages the lightness stability also reduced by 2% as in cooked sausages, but the stability of redness was 80%, so that the product on the 54th day of storage lost the hue of the red color by 20%, while in semi-smoked sausages the share of yellow color increased significantly. Such changes in color are associated with oxidative processes, occurring in sausage products during storage.

The carried out microbiological investigations have shown that cooked sausage products which had been stored during 25 days, and cooked-smoked and semi-smoked products that had been stored during 54 days, complied with the norms of Sanitary norms and rules.

This allows recommend an increase in storage periods of sausage products manufactured in selective-permeable casings:

- for cooked sausages – from 5 to 20 days
- for cooked-smoked and semi-smoked sausages – from 15 to 45 days.

Thus, the carried out investigations have shown that selective-permeable casing will allow maximum preservation of quality attributes of sausage products and increase in their shelf life.

References

1. GOST (State standard) 14236-81. Polymer films. The test method in breaking.
2. GOST (State standard) 21472-81 Gravimetric method of determination of vapor permeability
3. Semenova A.A., Goroshko G.P., Trifonov M.V. et al. (2006) Use of modern method of evaluation of color stability of meat products and the solution of colorants. Vse o myase, №2, p. 25-26