THE PROTECTION OF MEAT PRODUCTS BY POLYMER COATINGS

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The use of the progressive vehicles, tareless transportation, mechanization of loading-unloading works is connected with packages application. The carriage, storage and sale of cooled beef and meat products require the safe and sanitary conditions.

Different polymer packages and packaging methods used for meat products make available the avoidance of food losses, the extend of life-terms. The protection from negative factors of environment such as oxidation, microbiological actions and others xenobiotics trades off due to intimate contact between polymer coating and food product' surface.

But the packaging of large meat blocks runs into the definite difficulties because the presence of sharp corners, bones, the irregular forms of beef create the dangerous of a breakage and loosely fitted of polymer packages.

Because the most rational and promised method for protection of beef, pork and meat products is the development of polymer coatings named «second skin», which are formed on foodstuff's surface from polymer film-creative compositions, for example, from polyvinyl alcohol (PVA). The application of PVA-coatings do not require the termosealing of packaging films and decides all problems connected with weak sealing joints during transportation, storage and sale.

Experimental methods

The sanitary-chemical researches are conducted with help analytical methods. By the microbiological researches we determined microbial number of integrated and individual microorganisms which influence to foodstuffs quality. The storage of meat (beef and pork) with coating and without it (control) has been carried out under follow conditions: temperature - 273 K, relative humidity - 65 %, storage time interval - from 1 to 25 days.

Results and discussion

The water (vapor and liquid) permeability of the studied PVA-films is attributed to presence of many hydroxyl groups in PVA macromolecules. The replacement of hydroxyl groups by different functional groups causes the changes of polymer structure and chemical modification of its properties.

The detailed exploration of the coating's formation from water solutions have shown that the addition of tixotropic additives into polymer compositions makes available the decreasing of colloid-chemical characteristics (corner of wetting, surface tension, etc.) on the boundary of three phases (liquid-solid-air) and the time of film' formation (see tabl.1). At the same time the formed films show a reduced internal stresses which have an influence upon the coating' durability at the expense of relaxation processes.

Table 1

The physico-chemical characteristics of polymer compositions for protective coatings

Surface tension, din/cm	The angle of wetting, grad.	The spreading time , c	Viscosity, N. s /m	Density of film, kg/m^3
22 ± 2	5 ± 2	40-60	65	$1{,}29\ 10^3$

The information about hygienic safety of PVA-coating in contact with beef and pork was received by sanitary-chemical investigations. The sanitary evaluation of PVA-films was produced on follow integral properties: oxidation capacity, concentration of substances, interacting with Br_2, the quantity of dry residue and UV-spectrum of water extracts (tabl.2).

These results (tabl.2) are shown that PVA-coating has a low integral migration of ingredients into simulated medium (water). The absence of absorption peaks characterized for PVA (260-280 nm) in water extracts is evidence about absence of substance' migration from PVA compositions.

Table 2

The preliminary sanitary-chemical estimation of PVA-coatings (at 293 K)

Time of exposition in water, days	pH	Dry residue, mg/l	Concentration of Br_2 - interacting substances, mg Br_2/ l	Oxidation capacity, mg O_2 / l	Optical density of water extracts at 230-360 nm
1	7,0	0,2	0,3	0,36	Absorption peaks at
3	7,0	0,3	0,3	0,40	260-280 nm are
10	7,0	0,5	0,3	0,41	absent

The moisture content of pork textiles after 25 days storage at 0^0C was practically constant. The values of peroxidic, acidic and aldehyde number of lipids, which were separated from pork muscles, indicate that protective PVA-coating has the stabilized effect on lipid's oxidation as well as change of packaged pork mass.

The capacity of PVA-coating for the inhibition of microorganisms' growth and microbes penetration through PVA protective films were studied by microbiological methods. The washes from internal surface of coating, from pork surface and from undercoating pork' layer with thickness 0,01 mm were cultured on Kessler's mediums and following transplantation to Endo's mediums (nutrients). The microbiological investigations showed the absence of bacteria *E.coli, Proteus*, as well as microorganisms *Clostridium, Bacillus, Streptococcus, Staphilococcus,* etc.

Also the protective PVA-coatings suppress the bacterial growth on meat surface especially at the beginning stage of storage. The number of bacterial cells on unpacked pork after 12 days of storage was greater by 22 times in comparison with meat packed in PVA-film.

The external appearance of PVA-coating is very attractive; it is glossy, transparent, fit snugly to meat surface, easy rub off meat without discontinuity. The packed meat and meat products did not changed their color and form.