Packaging and Conditioning Influence Concerning the Extension of Validity Term

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Abstract. In the paper studied the possibility of extending the validity term of bakery products (croissant) by slowing the aging process them. For this purpose investigate sorts were packed in impermeable materials to water and water vapor while were stored at temperatures ranging between 15-20°C and relative air humidity below 70%. By preserving the croissants under proper conditions in special packing: PE, PP, PP sterilized, paraffin paper, ethylic alcohol treated paper and complex material, the validity term has been extended to 7 days at most, when the first depreciation signs of sensorial (taste, colour, smell), and physical (consistency-the core becomes brittle, humidity-the water quantity lowers significantly) properties become evident. The smooth and rigid crust becomes wrinkled, elastic and soft, the odour and the taste gradually disappear and the taste becomes flat or stuffy and sometimes even sour.

The introduction of ethylic alcohol as well as the packing in proper materials determines the extension of croissant validity term to 30 days when the first signs of mould appear.

Keywords: packaging materials, croissants conservation, ethylic alcohol.

INTRODUCTION

Bakery products’ moulding is caused by numerous moulds, the most frequent of them being from the Aspergillus, Mucor and Penicillium species. The colours of bakery products moulds go from white to golden and to dark green. The contamination with mould spores happens at the end of the baking process when the spores in the air lay on the bread crust or when the product gets in touch with various spores contaminated objects, such as: conveyor belts, cases, the workers’ hands.

The moulding process is favoured by a series of factors: the relative air humidity that determines the hygrometric balance humidity, the most important factor that influences mould development on the bakery products crust. The storage temperature, the reduction of temperature in the store house extends bakery products validity until the moulds appear. The mould species that infects the bakery products. The production hygiene conditions. When packed in plastic bags or cut in loaves, bakery products can be infected with spores from the knives.

Bakery products moulding can be prevented by several methods:

- rigorous observance of production hygiene conditions,
- air-conditioning in the store house of finite products (reduction of relative air humidity and of the temperature in the store house),
- increase of acidity, respectively lowering of pH level,
- used of anti-fungi agents as preservatives. They can be added to the dough, used for crust white-washing or for packing impregnation.
- used of ethylic alcohol as preservatives.
To use ethyl alcohol agents at the surface of the product is much better than to introduce them in the dough. The operation consists of spraying the crust with a preservatives solution after cooling. (Moldoveanu et al., 1992; Niculae, 1980).

MATERIALS AND METHODS

Within the experiments achieved, there were prepared 6 samples of croissants using water, flour, yeast and salt, milk powder, butter and stuffing. No ingredient was used as preservative or for extending the validity term.

In view to determine the freshness degree and the moment when moulds appear, the croissant samples were packed in various materials and stored until the appearance of the first alteration signs.

The samples were packed in PE and PP paper bags, PP 150°C thermo-sterilized paper, paraffin waxed paper, alcohol sprayed paper and a complex material of Paper/PE.

The packed croissants was stored for a period of 10 days, at a temperature of 18-20°C, a relative air humidity of 65-70% and natural ventilation.

PE is a very resistant material, having good mechanical proprieties, reduced water and water steams permeability (18 g/m², 24 h) but rather unfit for gases.

PP has a more reduced water and water steams permeability than PE (8-10 g/m², 24 h), presents better resistance to heating as compared to other thermoplastics, a high melting point of 165-170° C and a softening point of 140-150° C.

The paraffin paper is obtained by coating the paper with hydrophobic water and water steam impermeable paraffin; the PE coated paper has good mechanical resistance, chemical inertia and reduced water and water steams permeability (11.8 g/m², 24 h). (Banu, 1999; Segal, 1989)

In the cases when the croissants is stored for longer periods of time than 4 weeks, has done as well as the bread (Cioban, 1999; Hobincu, 1966), paper packed croissant have been sprayed with 10% ethyl alcohol and immediately hermetically packed in polyethylene bags.

The croissant packed was introduced in hermetically closed polyethylene bags and stored at a temperature of 18-20°C, relative air humidity of 65-70% and natural ventilation.

RESULTS AND DISCUSSIONS

For establishing the freshness degree and the validity term, the products were submitted to sensorial and physic-chemical tests: aspect: crust, core, taste, odour, water content, acidity of products.

The organoleptic test for determining the freshness degree is achieved according to the standards (STAS 91-83) and consists of evaluating the organoleptic properties of bakery products by means of senses (Tab.1, Tab.2).

<table>
<thead>
<tr>
<th>Tab. 1</th>
<th>Organoleptic characteristics of croissant samples by 3 days</th>
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</thead>
<tbody>
<tr>
<td>Organoleptic characteristics</td>
<td>P1</td>
</tr>
<tr>
<td>Shape</td>
<td>Specific to the kind of product, non-flatted, non-deformed and uncrushed.</td>
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<tr>
<td>Crust</td>
<td>- aspect</td>
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<tr>
<td></td>
<td>Shell thin, uniform, without cracks or signs of burning.</td>
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<td></td>
<td>- colour</td>
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<tr>
<td></td>
<td>Yellow-gold, bright, uniform throughout the shell, character-ristic of mature properly.</td>
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</tbody>
</table>
Core
- aspect / section  Smooth, uniform, elastic pore mass. Filling consistency of pasta, evenly distributed throughout the mass of the product without congestion.
- colour  Characteristic for the product.
- consistency  Elastic, mellow
Smell  Pleasant characteristic of baked good, with the obvious aroma without foreign odor.
Taste  Sweet, pleasant, characteristic of baked good.

<table>
<thead>
<tr>
<th></th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
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<tr>
<td><strong>Organoleptic characteristics</strong></td>
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<tr>
<td><strong>Shape</strong></td>
<td>Shape elongated, specific range, with no defects, characteristic for the product.</td>
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<tr>
<td><strong>Crust</strong></td>
<td>The crust becomes elastic and soft.</td>
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<td>- aspect</td>
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<tr>
<td>- colour</td>
<td>Present characteristic for coloured spotted products, according to the various species of mould.</td>
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<tr>
<td><strong>Core</strong></td>
<td>Soft, compressing, when stored turns into brittles and becomes less compressing and rigid.</td>
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<td></td>
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<tr>
<td>- aspect / section</td>
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<tr>
<td>- consistency</td>
<td>Spots of mold present in the core mass, according to mould species</td>
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<td><strong>Smell</strong></td>
<td>Smell of mould or rancid smell.</td>
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<tr>
<td><strong>Taste</strong></td>
<td>The odour and the taste gradually disappear; the taste becomes flat or stuffy and sometimes even sour.</td>
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The first aging signs are evident after 5 days since storing and become stronger with the extension of the storing period.

Croissant aging is evident through the following:
1. the smooth and rigid crust becomes wrinkled, elastic and soft.
2. the soft, compressing core turns into brittles and becomes less compressing and rigid when stored.
3. the odour and the taste gradually disappear and the taste becomes flat or stuffy and sometimes even sour.

Humidity and acidity is determined in conformity with the standards STAS 91-83 and consists of establishing the mass loss by heating at 130-150 ±2° and titration of aqueous extract of the sample to be analyzed with 0.2 n NaOH solution in the presence of phenolphthalein as an indicator (Fig. 1, Fig. 2).
From the analysis of Fig. 1, we notice that the PP packed croissant has the highest degree of humidity, followed by the complex materials, PE packed croissant, alcohol treated paper, sterilized PP and paraffin waxed paper. The materials having the highest level of water steam permeability produce to the extension of freshness degree the less impermeable materials. As a consequence of the difference in humidity between the core and the crust, the core humidity moves towards the crust and then towards the environment (the packing, in the present case), by means of external diffusion.
The analysis of the data in Fig. 2 shows that the croissant packed in alcohol treated paper, has the highest degree of acidity, followed by the in complex material, PE, in sterilized PP, PP and in paraffin waxed paper.

To conclude, we can say that the determined acidity of the samples varies between restricted limits, irrespective of the packaging type.

Based on the results obtained, the following maximum storage periods have been established:

- the croissant packed in PE preserves its freshness for a period of 6 days and the mould appears on the 9th day;
- the croissant packed in PP preserves its freshness for a period of 7 days and the mould appears on the 8th day;
- the croissant packed in complex material preserves its freshness for a period of 7 days and the mould colonies appear on the 9th day;
- the croissant packed in paraffin waxed paper preserves its freshness for 4 days, and the mould colonies appear not even on the 10th day

Although the paraffin waxed paper is a sterile environment that does not allow mould development, it preserves the freshness of bakery products for a short period of time.

For packaged croissants in PP and complex material, the validity term was extension at 7 day, because the materials is impermeable to water and water vapor and maintain the freshness of products.

At the croissant packed in PP sterilized at 150°C, the first mould signs appear after 10 storage days. The sterilization of PP determines the modification of its structure (catena depolymerisation) and implicitly the increase of water steam permeability level, fact that allows water steams to migrate in the exterior. Steam water migration is accompanied by a reduction of the humidity that delays mould appearance.

The best results were obtained by means of ethylic alcohol exterior sterilization of the croissant. This packaging modality extents the storage duration by 30 days, as the ethylic alcohol sterilizes the product surfaces and prevents mould appearance, while the polyethylene film preserves its freshness due to its reduced permeability to water steams. The core aging process is very slow and limits to a certain extent the storage duration of the packed products.

CONCLUSIONS

The 6 experiments related to the croissant packaging variants as described above show a close connection between the product water steam permeability and conservation period. The materials having the highest level of water steam impermeability produce a longer conservation of the croissant than the less permeable materials.

The preservation under proper conditions and the protection by means of special packing lead to a delay in the mould appearance by 9 days and to the extension of the freshness degree by maximum 7 days, when the first depreciation signs of sensorial (taste, colour) and physical (consistency-the core becomes brittle, humidity-the water quantity lowers significantly) properties become evident.

Croissants with an less area, lose a smaller amount of water, which leads to delayed emergence mould. Also croissants retain freshness longer because of the fat composition improve the elasticity of core and shell and maintain, product freshness.

By enzymatic hydrolysis fats are split into fatty acids and glycerin, and the phosphatase are split by acid phosphates and phosphoric acid. Fatty acids, acid phosphates and phosphoric acid increasing acidity in croissants.
The introductions of the ethylic alcohol and the proper packaging have determined the extension of the product durability by 30 days.

To conclude, the introduction of ethylic alcohol substances together with the packaging in proper materials represents the best means for longer conservation.

REFERENCES