INFLUENCE OF PROTECTIVE PROPERTIES OF AW-VALUE AND SURFACE COLOR ON FOOD QUALITY CONTROL

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Abstract
The world market is very interested in the methods used in determining the loss of quality of food products especially dried fruit which the Balkan region is rich with. The method for determining loss of quality of dried food products are based on the definition and formulation of the general index under the name of global stability index. With rational choice and using appropriate packaging materials we may affect the maintenance of quality and quality characteristics such as time sustainability of packaged content. The main responsibility for the overall quality of food products and their composition, choice of packaging material, design and method and storage conditions is the manufacturer of food products. The aim of this research study was to investigate aw value and surface color, impact on quality as well as to find the best and most economical solution on the type and quality of packaging materials and packaging production, manner and conditions of control in food packaging.

Key words: quality control, packaging, sustainability of dried products

Introduction

The task of packaging is to provide a packaged product protection from external factors that may affect the physical, chemical, mechanical and sensory changes during storage of content. Dried food products are very sensitive material, suitable for the development of different physical and chemical processes that result in a change in the quality of packaged dried food products. One important factor is certainly the quality of properly packaged product that is properly used and well established packaging. Due to poor pressurization system may lead to increased diffusion of oxygen molecules inside the packaging unit due to large differences in partial pressures from outside and inside the packaging. Quality formation of packaging units means that all connections to the primary container tightly closed (Gvozdenović,J. i sar. 2001). In what must not remain open or pores that allow free and undefined exchange of undefined atmosphere around content from external environment.

Water activity-aw value

Aw, that water activity was first mentioned by Scott (1953) and defined as the ratio of the vapor pressure of water in the substance and the vapor pressure of pure water. Water activity is much more important concept for the stability of the product than the total water content of the substance. Drying the remaining water is taken from food, while it is concentrated in a remainig water soluble substances as proteins, salts, sugars, etc.. and thus lowers aw. Procedures such as salting, brining, sugaring reduce aw.

For these reasons, these can be predicted losses during storage of dried products under conditions in which the moisture content of packaged foods grows or changes the contents of oxygen tolerance of packaging materials (Heiss, and sar.1978). The newest research in chemical and microbiological stability of foods depends on most of the water content (w), and its interaction with food ingredients. Data on water activity are sufficient to describe the secondary processes in the production and storage of food which is used isothermal absorption (Sablani 2004).. When storing food, and when the temperature is low does not come up with some chemical reactions and microbiological development, based on current thermodynamic and mechanical techniques provide a sensitive test of change. In the literature there is a list of models (isotherms) but is often used as a representative model of isothermal absorption of food GAB. This model is valid for a wide range of aw from 0.1 to 0.9. GAB equation reads

$$Mw = \frac{M_g\,CKA_w}{[(1-Ka_w)(1-Ka_w+Cka_w)]}$$

Mg- dry matter content

C- constant depending on the heat

K- factor of temperature dependent absorption

Sablans gave a better explanation., et al (2004), they provided a wide temperature range for storing food for commercial purposes of 250C-600C and they tested the water activity a w value equal to the constant and it is 0.56 + - 0.01 I mean there aren't some great changes. By Multon-in (1996), quality of food products that the packaging should maintain over a period of use is:

- the quality of health
- food quality
- sensory quality
- making quality.

Determination of surface color

In addition to ASTA 20, a visual assessment (evaluation) of products from fundametalnog interest, since it affects the acceptability of the product by the consumer and determine the right (real), the commercial value of the product. It is assumed that the measurement of surface color best describes and defines the color as the eye.

Color perception varies depending on the sensitivity of the eye of observers, the size of the observed object (the object) and the light source of background and contrast, the angle under which the case is considered. Quantification of color and expression (representation) of color by the numerical value, enhances the understanding and standardization of color. CIE Commission (Commisson Internationale de lEclairage; Internationale Commisson on Illumination) defined the Tristimulus system that is often used to measure the surface color. XYZ tristimulus values are based on the theory that the eye has receptors for three primary colors (red, green and blue) and that all others are perceived as a mixture of these primary colors. XYZ values were determined from the corresponding colored functions that corresponded to the sensitivity of the eye to different wavelengths of the visible spectrum. The system is based on three-dimensional colored space with three coordinates (L ab). Elements of color are perceived lightness, hue and chroma, and they are determined from L and b coordinates.

L coordinate is a measure of brightness and color is placed at the central (vertical) axis in CIELAB space painted. Hue angle is determined (locate), type (type), color (red, yellow, blue, green, etc..), calculated as:

$$\text{hue angle } (h^0) = \text{arc} \frac{b}{a}$$

Instrumental color measurement can serve as a supplement, or as a substitute to sensory analysis.

Packaging materials that were used during the experimental work

Packaging materials used in the work during the packaging of dried fruits are:

1. Mono material polyethylene, PE 95 tags
2. Packaging materials, metallized oriented polypropylene; tags OPPmet (20μ).
3. Dual-layer packaging material, oriented polypropylene / polyethylene; tags OPP (20μ)-PE (50μ).
4. Dual-layer packaging material, oriented polypropylene / metallised oriented polypropylene; tags OPP (20μ-OPPmet (20μ).
5. Three-layer packaging material, polyester / metallised oriented polypropylene / polyethylene, tags, PET (12μ)-OPPmet (38μ)-PE (35μ)

Testing methods of aw value of packaging materials and packaging units

Aw supporting packaging material, was determined by standard methods, and values are shown in the results (Aljilji., 2007).

Thickness testing of packaging materials and packaging are performed according to the following schedule:

0 - days
15 - days
30 - days
90 - days
120 - days
180 - days
180 - days

The packaging unit formed bags-of were put 100g of fruit. After filling content, samples were stored under normal conditions or at room temperature of 17-22 ° C for six months, exposed to light.

Results and discussion

Aw-value changes

When the temperature is low storage packaged food does not come up with some chemical reactions and microbiological properties. In Diagram No. 1 shows the experimental data for the dried fruit with the help of GAB equation for three different temperatures (Sablani et al 2004).

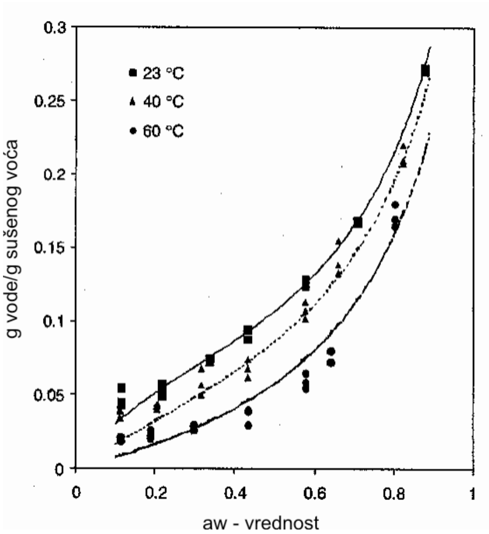

Chart No. .1 Changes aw value of frozen dried fruit to the GAB equation for three different temperatures (Sablani et al., 2004).

No. 2 in the diagram below shows the type and intensity of the content of dried fruit, depending on the aw value, which was monitored during the experiment (Aljilji., 2007).

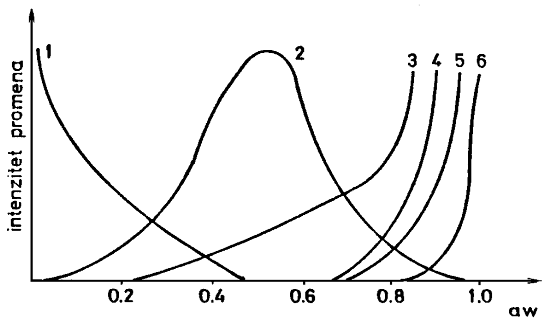

Chart no. 2 The intensity changes of the quality of dried fruit depending on the value of water activity (aw)

1. autoxidation
2. no enzymatic dim
3. enzymatic activity
4. action mold
5. yeasts
6. activity of bacteria

Changes aw value of dried fruit packed in different packaging materials are shown in Table 1.

Table 1. Change of water activity during storage

example	days of magazine				
Container materialist	15	30	90	120	180
PE(95)	0.80	0.81	0.82	0.82	0.81
OPPmet(20)	0.79	0.71	0.82	0.82	0.82
OPP/PE(20/50)	0.83	0.83	0.83	0.82	0.83
OPPmet/PE(20/50)	0.81	0.82	0.83	0.82	0.83
PET/OPPmet/PE(12/38/30)	0.81	0.82	0.83	0.81	0.83

During the test period of 180 days there has been no significant changes of water content and aw values. These aberrations measured values resulting from unevenness shape and size of samples packaged slices of dried fruits.

Determination of surface color

Surface colors packaged dried fruit, depending on the used materials is given in Table 2.

Table 2 surface color of dried fruit, depending on the type of material

Surface color of dried fruit					
L *	a *	b *	c *	Hue	Hue angle
2,25 ^{8}	6.63 ^{2}	6,09 ^{2}	6,24 ^{2}	,1008 ^{0}	4.24 ^{8}
15 days of magazine					
1,62 ^{8}	,91 ^{3}	5,98 ^{2}	6,30 ^{2}	,1505 ^{0}	1,44 ^{8}
0,63 ^{8}	,65 ^{3}	6,32 ^{2}	6, 58 ^{2}	,1386 ^{0}	2,10 ^{8}
0,61 ^{8}	,63 ^{3}	0,63 ^{3}	0,85 ^{3}	,1185 ^{0}	3,24 ^{8}
1,88 ^{8}	,38 ^{3}	7,39 ^{2}	7,61 ^{2}	0,1234 ^{0}	2,96 ^{8}
6,47 ^{7}	,78 ^{6}	4,12 ^{3}	4,79 ^{3}	,1987 ^{0}	8,76 ^{7}

All samples after 90 days were darker (L value-lightness - after 90 days is less).

Conclusion

During the test period of 180 days there has been no significant changes of water content and aw values.

The combination of packaging materials used in the paper show that can be used in quality packaging and preservation of the contents of dried fruit. Reduction of light, hue angle and increase the proportion of red color is due neenzimatskog darkening or oxidation of phenolic compounds and the creation of brown coloration with the simultaneous polymerization and interaction with the HMF.

Literature

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