Method of Comparative Analysis of the Structure of Food

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Abstract

Pore size distribution has a large impact to determine the rational mode of drying the combined method of investigation of hygroscopic properties and the binding energy of moisture. Hence introduction of modern methods of treatment and non-traditional methods of drying fruits to produce new products that require research and mathematical description of the hygroscopic properties. The method of comparative analyses applied in this study gives the opportunity to determine diameters of pores activity of water and other parameters in dried products.

Keywords: Uzbekistan; Agriculture; Melon; Activity of water

Introduction

Food products are so complex a system as in nature, and structure that they have different types of communications moisture [1-6]. At various stages of dehydration products plays a major role or that kind of moisture.

Much of the fruit and vegetable crops subjected to drying are wet colloidal capillary- porous systems. Pore size distribution has a large impact to determine the rational mode of drying the combined method of investigation of hygroscopic properties and the binding energy of moisture [6]. Nature of the sorption and desorption isotherms depends on the type of moisture due to the material. In the hygroscopic region of connection of moisture depends on the relationship of structure and properties of materials.

Results and Discussion

There were discussed hygroscopic properties of different types of products by a number of scientists. Currently, however, introduction of modern methods of treatment and non-traditional methods of drying fruits to produce new products that require research and mathematical description of the hygroscopic properties.

In order to determine the equilibrium moisture content of fruit crops: melon varieties: “Shakar-Palak”, “Ala-uchak”-experimental studies designed and manufactured in a climate chamber. The results of these studies, the desorption isotherm melon fruits at different temperatures (t =25 - 50°C) and relative humidity (20-80%), are presented in Table 1 and Figure 1.

In connection with the penetration of syrup solution in the capillaries of melon flesh, determination and dissolution of the effective pore diameter of great importance. The specific surface of the remote water film is formed in the early part of the capillary condensation is determined by the method of: 4

\[ S = \frac{1}{G_r} \int \Delta \rho.dv \]  

G- The surface tension of liquid, Н/м;
U- Amount of moisture in the material at saturation p/p_r=1;
U- Amount of moisture in the beginning of the section of capillary condensation

According to the formula defined by the effective diameter of pores

\[ d = \frac{4GV_m}{RT \ln \left( \frac{p_e}{p_v} \right)} \]  

G- the surface tension of melon juice which depends on sugar, мН/м;
V- molar volume of water contained in the product, м³/моль;
L- The binding energy or differential operation dehydration product, кДж/кг.вл.

\[ L = -RT \ln \phi \]  

R- Universal gas constant, Дж/КМоль%

Table 1: Desorption isotherm melon processed in sugar syrup.

| Melon | t°C | Relative humidity air,% |
|-------|-----|------------------------|
|       | 20  | 30  | 40  | 50  | 60  | 70  | 80  |
| Without Treatment | 25  | 10,1 | 12  | 15,8 | 18,1 | 22,6 | 26,7 | 35  |
| With Treatment in sugar syrup | 25  | 11,8 | 12,5 | 18,1 | 22,4 | 25  | 32,1 | 38,8 |
| Without Treatment | 50  | 4,8  | 5   | 6,1  | 8,1  | 12  | 17   | 25  |
| With Treatment in Sugar Syrup | 50  | 5,1  | 6,8  | 8   | 12,1 | 15,6 | 22  | 28,5 |

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Then, after the drying process is the measurement of water activity in the two products using laboratory equipment of “rotronic Hygro Palm” with an accuracy of 0.5 - 100% and the temperature in the range from 0.5 to 50°C.

Since we know the parameters of water activity in both products and the pore diameter of one of the varieties of melons we turn to the formula for determining the activity of water depending on the structure of the product.

\[
\alpha_w = e^{-\frac{2\gamma \cos \theta}{rRT}}
\]

Or

\[
r = \frac{2\gamma \cos \theta \cdot v_m}{R \cdot T \cdot h \cdot a_w}
\]

\(\gamma\) - the surface tension of liquid; \(\theta\) - contact angle of liquid with the wall of the capillary; \(R\) - gas constant; \(r\) - radius of the capillary; \(v\) - molar volume of liquid

Assume that during the processing of sugar syrup melon pulp adsorption of one and the other varieties formed a superficial solution to Gibbs identical in composition, we can assume that the surface tension and contact angle in the products are the same. Hence the average pore radius of another kind.

\[
a_{abrimelon} = \cot(a_{rrmelon})
\]

In these calculations do not take into account the correction factor which depends on: the real values of surface tension, contact angle of liquid with the wall, the chemical potential in the product Table 3.

**Conclusion**

The method of comparative analyses gives the opportunity to determine diameters of pores activity of water and other parameters in dried products. Investigated the hygroscopic properties of the pulp after melon combined drying method in a wide range of moisture and temperature environment, their structural characteristics, the quantity of energy due to moisture.

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