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РОЗДІЛ 4

СУЧАСНІ ТЕНДЕНЦІЇ В ТЕХНОЛОГІЇ ПИТНОЇ ВОДИ ТА ПЕРЕРОБЦІ М'ЯСА, МОЛОКА Й МОРЕПРОДУКТІВ

THE PROCESS OPTIMIZATION OF PROTOPECTIN ENZYMOLYSIS OF VEGETABLE RAW MATERIALS FOR ITS USE IN ICE CREAM PRODUCTION

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Introduction. In foods, especially structured, an important role is played by the use of stabilizing substances, which include pectins. As protective colloids, they perform important technological functions - have a stabilizing and emulsifying ability, form a creamy consistency and increase overrun, which is important for the formation of ice cream quality indicators [1]. In the production of ice cream, highly stabilized pectin preparations are used as stabilizers. But in modern food technologies, recently significant theoretical and practical interest is pectin-containing, namely vegetable raw materials, the technological properties of which are activated by hydrolytic conversion of protopectin into an active state. Exactly soluble pectin has the ability to form gels in an acidic environment and in the presence of sugar [2].

The problem relevance is to optimize the parameters of the protopectin enzymatic hydrolysis process in vegetable raw materials, which allows to increase its functional and technological properties with maximum preservation of the natural vegetables chemical composition.

The aim of the research is to study the efficiency of protopectin enzymatic hydrolysis of vegetable raw materials as a functional-technological semi-finished product for the production of vegetable ice cream and ice cream with vegetables of high quality.

Materials and methods of research. Enzyme of brand "Pectolad" for domestic production (SE "Enzyme", Ukraine) according to DSTU 8484 (Ukrainian National Standard), Fresh table beets (Technical conditions according to DSTU 7033:2009), Fresh broccoli cabbage (Technical terms according to DSTU 8147:2015), Fresh tomatoes (Technical terms according to DSTU 3246-95), Fresh carrots (Technical terms according to DSTU 7035: 2009) and Fresh zucchini (Technical terms according to DSTU 318-91) were used for the study.

Research results.

Using the mathematical package MathCad 15 obtained regression equations in the form of a multidimensional polynomial of the second degree, which describe the dependences of the yield of soluble pectin on the amount of enzyme preparation (0.05-0.25%) and the duration of biotechnological processing (60-240 min) of blanched pulp vegetable purees. In coded form, the regression equations are as follows:

$$Z1(x,y) := 0.60534 + 8.77724x - 24.90331x^2 + 0.01508y - 0.00004y^2 - 0.01172xy$$

$$Z2(x,y) := 0.44088 + 1.89409x - 4.06224x^2 + 0.00648y - 0.00002y^2 - 0.00354xy$$

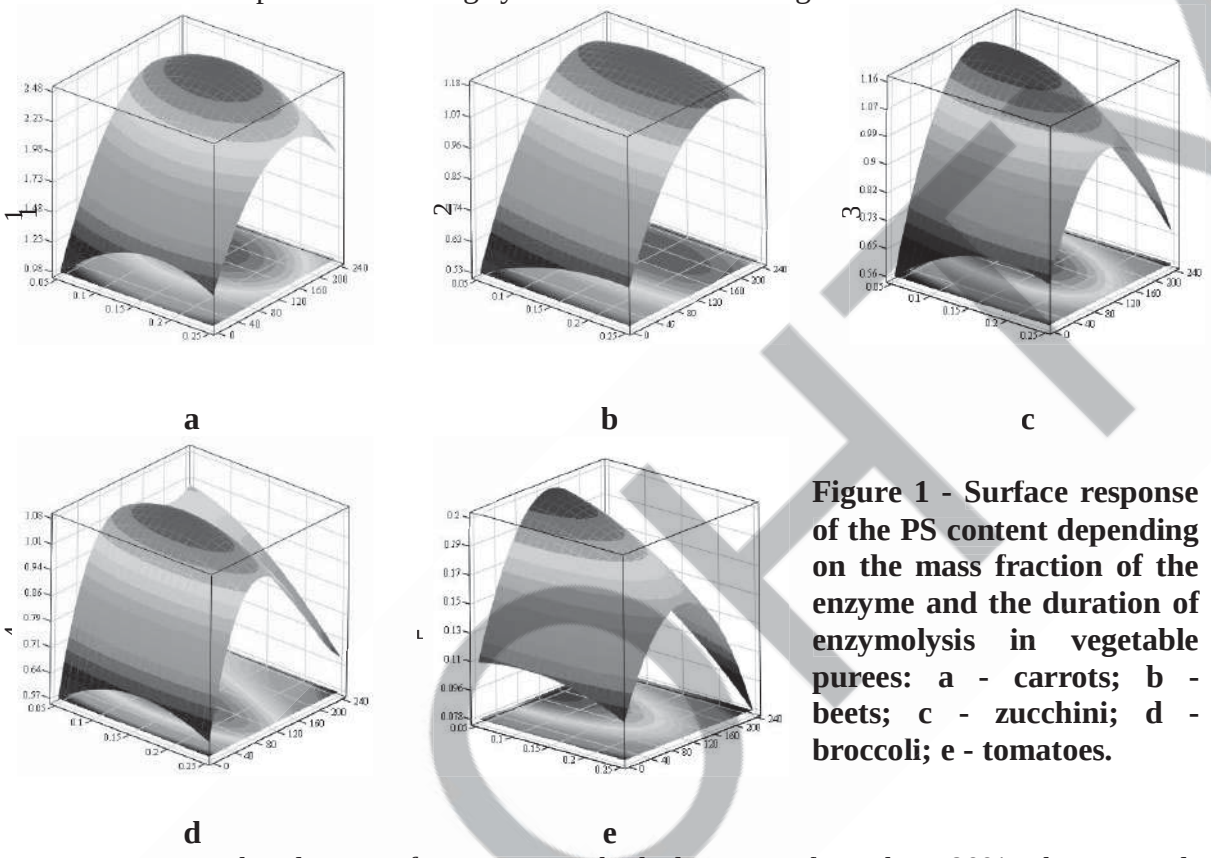
$$Z3(x,y) := 0.44165 + 2.82174x - 7.32555x^2 + 0.00779y - 0.00002y^2 - 0.0094xy$$

$$Z4(x,y) := 0.49817 + 2.06334x - 5.35853x^2 + 0.00681y - 0.00002y^2 - 0.00783xy$$

$$Z5(x,y) := 0.10596 + 0.1903x - 0.82497x^2 + 0.0014y - 0.0000049y^2 - 0.00127xy,$$

where Z1, Z2, Z3, Z4 and Z5 - mass fraction of soluble pectin in mashed carrots, beets, zucchini, broccoli and tomatoes, %; X - the mass fraction of the enzyme, %; Y - the duration of enzymolysis, min. The approximation accuracy was $\delta Z = \pm 0.01\%$.

In the environment of the mathematical package MathCad 15, response surfaces are constructed, which describe the change in the content of soluble pectin from 2 independent parameters of the enzymatic process for different types of vegetable purees. The response surfaces for different pectin-containing systems are shown in Fig. 1.



a **b** **c**

d **e**

Figure 1 - Surface response of the PS content depending on the mass fraction of the enzyme and the duration of enzymolysis in vegetable purees: a - carrots; b - beets; c - zucchini; d - broccoli; e - tomatoes.

To ensure the degree of protopectin hydrolysis not less than 90%, the optimal parameters for vegetable purees with a pectin content of 0.22 to 2.56% are as follows:

- for carrots and beets with an enzyme content of 0.1-0.15%, the duration of enzymolysis - 180-240 minutes, with a content of 0.2% - 120-180 minutes;

- for zucchini, broccoli and tomatoes for doses of the enzyme - up to 0.05-0.10%, the duration of enzymolysis is 60-120 minutes

For all vegetables it should be noted that in excess of the optimal dose of the enzyme and the duration of enzymolysis, there is a slight decrease in the content of SP. This is probably due to the partial depolymerization of pectin compounds, which are not identified by the calcium pectate method. The prospect of further research is to study the degree of preservation in vegetable hydrolyzed purees of biologically valuable compounds (vitamins, pigments, phenolic compounds, etc.) and the development of scientifically sound recipes for vegetable and milk ice cream.

Conclusions. The influence of the mass fraction of the enzyme and the enzymolysis process duration on the content of soluble pectin in vegetable purees has been studied. Based on the search for the mathematical dependence extremes, the optimal enzyme content and the recommended process duration were determined, which ensure the degree of protopectin hydrolysis not less than 90%.

Scientific supervisor – D. Sc., Head of the Department of milk and dairy products technology, Professor Galyna Polishchuk.

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POSSIBILITY OF MANUFACTURE OF BAKERY PRODUCTS OF «DELAYED» BAKING WITH USE OF ASEPTIC FRUIT AND VEGETABLE CANNED SEMI-FINISHED PRODUCTS

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In order to prevent spoilage of food and create conditions for their long-term storage, there are various methods of preservation: by heat treatment, the addition of preservatives and others. The most widely used heat treatment is sterilization and pasteurization, hot bottling and aseptic canning. The method of canning food by heat sterilization today remains one of the most common in the world. During this time the microbiological and thermo-physical bases of the process of thermal sterilization have been perfectly developed and modern equipment for sterilization of products has been created. This principle of canning has undergone virtually no changes. The main disadvantage of this method of canning is the significant duration of heat treatment, which negatively affects the preservation of a number of useful components of the product, as well as its organoleptic properties. Therefore, the idea of aseptic canning of semi-finished products from fruit and berry raw materials in containers of different capacity is proposed for etc., so that agricultural raw materials are available in any season. The essence of the idea of aseptic canning of semi-finished fruits and berries is that during the season the harvest is carried out only partially, but the most important part of technological processing of raw materials is its preparation for long-term, storage and packing of prepared semi-finished products in specially prepared containers and packaging. In this case, before packing the semi-finished product in aseptic conditions, short-term high-temperature processing in the stream is carried out, followed by cooling. Currently, the technology of rapid freezing of semi-finished products is becoming increasingly common and is used in the production of various types of dough. Rapid freezing of semi-finished products refers to the technology that is postponed during baking and the essence of which is to significantly slow down or completely stop fermentation, keep frozen semi-finished products for a long time, provide for the possibility of further baking at points of sale.

Improving the nutrition structure of the population of Ukraine involves increasing the production of bakery products by improving existing and creating the latest food technologies. Therefore, the possibility of production of bakery products "delayed" baking with the use of aseptic fruit and vegetable canned semi-finished products is proposed. Such bakery products must have a balanced chemical composition, low energy value, low sugar and saturated fatty acids and high - healthy ingredients and be completely safe for humans. In order to expand the range of bakery products in production along with traditional raw materials, the use of additives of plant origin is becoming relevant: semi-finished fruit and vegetable products.

The introduction of fruit and vegetable semi-finished products provides test blanks with better plasticity, gas-holding capacity, improves organoleptic and physical and chemical

РОЗДІЛ 2 – ХІМІЧНІ, ФІЗИЧНІ ТА МАТЕМАТИЧНІ МЕТОДИ ДОСЛІДЖЕННЯ ПРОЦЕСІВ ТА АПАРАТІВ

РОЗДІЛ 3 – ХОЛОДИЛЬНА ТЕХНІКА ТА ТЕХНОЛОГІЯ. ПРОЦЕСИ ТА АПАРАТИ ХАРЧОВИХ ТЕХНОЛОГІЙ

РОЗДІЛ 4 – СУЧАСНІ ТЕНДЕНЦІЇ В ТЕХНОЛОГІЇ ПИТНОЇ ВОДИ ТА ПЕРЕРОБЦІ М'ЯСА, МОЛОКА Й МОРЕПРОДУКТІВ

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