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TECHNOLOGY OF SEMI-FINISHED PRODUCTS WITH MULTI-COMPONENT FUNCTIONAL FEATURES FROM PLANT RAW MATERIALS

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Abstract. The method of production of concentrated fruit and vegetable semi-finished product based on apples and quince has been improved. Selected components of plant raw materials are chosen due to the presence of such useful substances as pectin’s, vitamins, minerals, etc. The obtained semi-finished products of a high degree of readiness are semi-finished products with a natural nutrient composition. A feature of the proposed method is the use of low-temperature modes of concentration and drying of raw materials. For the developed method, the hardware set of the line with the use of advanced thermal equipment was selected. Chopped raw materials are blanched in a universal multifunctional device: apple in a steam environment (103 °C and 108 °C) for 4 and 8 minutes. Quince is blanched under conditions of pre-exposure in a 0.1 % solution of citric acid in an aqueous medium at a temperature of 75...80 °C (4...8 min.).

Concentration to a pasty state takes place in the improved design of the rotary-film apparatus with a reduced processing time of 0.75...1.25 s to a DM content of 28...30 %. To obtain a powdery state, a cylindrical IR dryer was used for drying to the final moisture content at the level of 4...6 % DM. It is also possible to dry the extracts formed after wiping the raw materials to a final moisture content of 10...13 % DM in an IR dryer. The use of low-temperature regimes in the range of 45...60 °C helps to obtain high-quality semi-finished products with maximum preservation of the initial properties of raw materials.

Key words: fruit semi-finished product, vegetable semi-finished product, powdered fraction, concentration, temperature, organoleptic properties, container dumper, rectangular shape.

Introduction. The ever-increasing interest of the population in products containing natural ingredients requires the improvement of methods of production of semi-finished products. A special place among natural ingredients is occupied by semi-finished products from fruits and vegetables with a wide range of their applications. In the food industry, concentrated vegetable semi-finished products are used in confectionery, dairy, bakery and other industries. The consumption of such food products prevents many diseases, increases the immune system, and contributes to strengthening the health of the population. There is a growing trend in the production of various plant-based concentrated semi-finished products in paste and powder form, which is due to their high content of physiologically functional ingredients. The use of innovative thermal equipment with the use of gentle temperature regimes creates conditions for the preservation of useful substances in semi-finished products. The high-quality semi-finished products obtained in this way are good components or the basis of confectionery, bakery, dairy and meat products, fast food products, production of tablets, granules, herbal teas.

The widespread introduction of new methods and hardware design of the production of fruit and vegetable semi-finished products with a high degree of readiness will contribute to the expansion of the range of food products based on them with high nutritional and biological value.

www.wordlyknowledge.uz Volume: 1, Issue: 2, 2023

An irreplaceable natural resource for expanding the range of food products, which are distinguished by increased nutritional and biological value, are various fruits and vegetables, the processing of which allows obtaining pastes and powder-like fractional semi-finished products and finished products.

The production of vegetable pasty and powder-like semi-finished products of a high degree of readiness for a wide range of applications makes it possible to ensure the population's consumption of such products more evenly throughout the year and to create the necessary reserves. Concentrated semi-finished products in the form of blended multicomponent pastes and powders are indispensable natural components with a large number of various useful substances, which also contribute to structure formation and improve the color and taste of food products. The rational introduction of fruit and vegetable semi-finished product with the selected recipe ratio and predicted structural and mechanical properties allows to increase the nutrient composition of food products, thereby increasing the nutritional value. Forms the original organoleptic properties of the semi-finished product in blending conditions and preserves natural ingredients due to gentle heat and mass exchange operations, increasing the competitiveness of the production complex.

The quince fruit contains biologically active substances, including a large amount of malic, citric and tantric acids. Yes, quince contains (per 100 g): dietary fiber 3.6 g, vitamin C 15...23 mg, there is also iron, zinc, phosphorus, copper, calcium, pectin`s. Bright yellow fruits contain vitamins C, E, B1, B2, B6, PP and provitamin A in their composition, have antioxidant, antiviral properties. 100 g of the product contains only 57 kcal. In order to achieve the goal of improving the method of producing semi-finished fruit and vegetables with a high degree of readiness based on apple and quince, it is proposed to use gentle heat and mass exchange operations. This will make it possible to obtain original competitive semi-finished products of a high degree of readiness with increased nutritional value, original organoleptic properties for increasing the therapeutic and preventive diet without synthetic components in food products. Obtaining a fruit and vegetable semi-finished product with a high degree of readiness based on apple and quince was implemented according to the proposed basic technological scheme based on gentle heat and mass exchange operations (Fig. 1). At first, ripe raw materials were sent to washing machines, followed by inspection to reject unsuitable raw materials for technological processing. After that, fruit and vegetable raw materials were cut on universal combined devices in the form of rectangles with geometric dimensions of 0.02×0.015×0.03·10–3 m to speed up and improve the quality of further thermal operations

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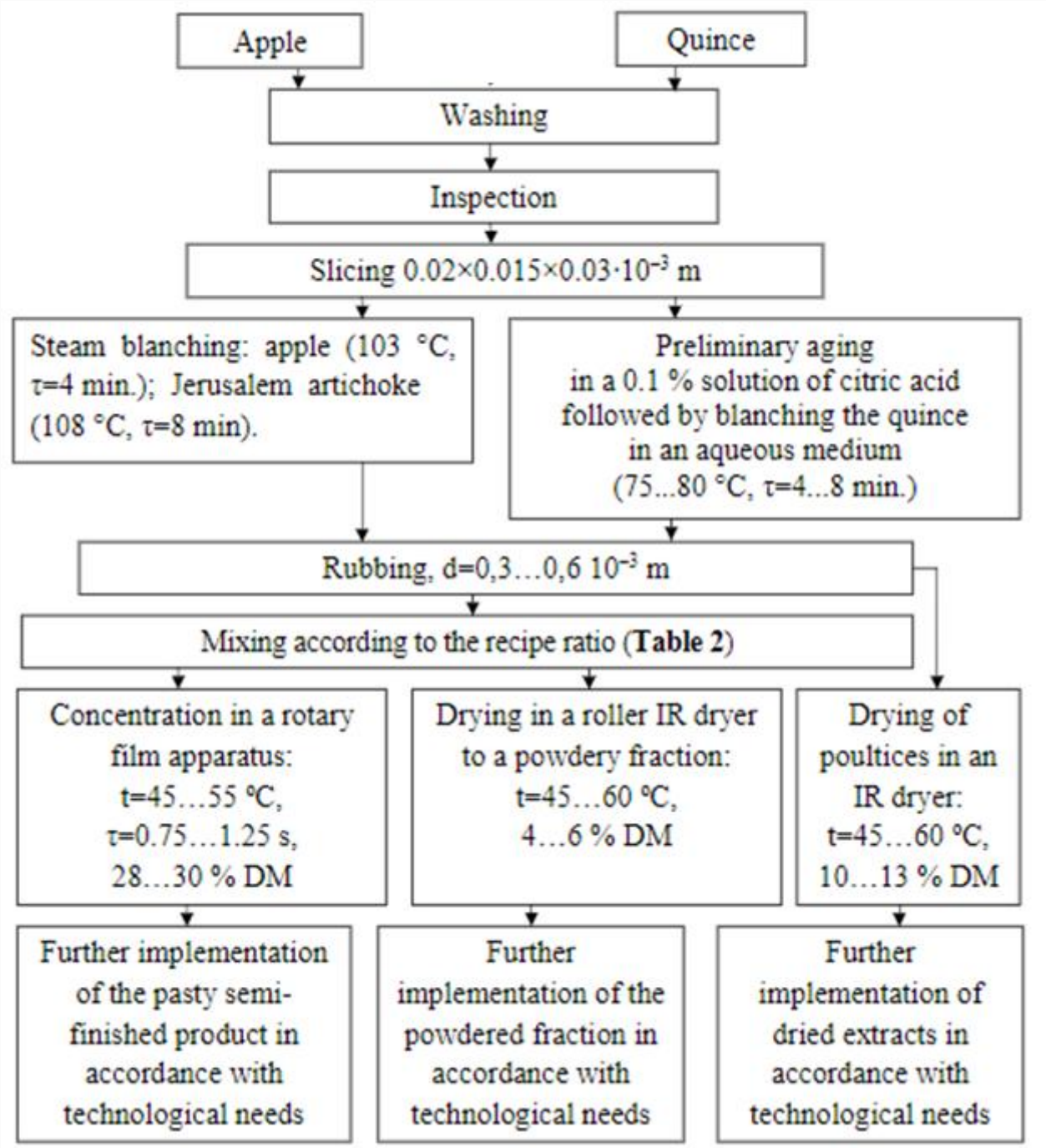


Fig. 2. Schematic diagram of the production of semi-finished fruit and vegetables with a high degree of readiness based on apple and quince.

Ripe raw materials (apples and quinces) for the production of semi-finished fruit and vegetables with a high degree of readiness enter the container dumper 1. It is loaded into the universal washing machine 2, where it is cleaned of extraneous impurities and enters the inspection for rejecting unfit raw materials for technological processing. Cleaned raw materials are directed to a cutting machine with a universal cutting mechanism 4, where it is cut into a rectangular shape with geometric dimensions of 0.02×0.015×0.03·10–3 m for intensification of further thermal operations. After slicing, the fruits undergo preliminary blanching in a universal multifunctional device 6. Apple and Jerusalem artichoke in a steam environment at temperatures of 103 °C and 108 °C for 4 and 8 min, respectively. Quince is blanched in apparatus 5 in a water

environment at a temperature of 75...80 °C for 4...8 min, while pre-curing it in a 0.1 % solution of citric acid.

After blanching, the fruits are rubbed on a double rubbing machine 7 to obtain a standardized puree-like structure (0.3...0.6 10–3 m), with subsequent homogeneous mixing, according to the recipe ratio using a paddle mixer 8. A homogeneous fraction according to with the help of gear pumps 9, it is directed to concentration in the rotary-film apparatus 10 at a temperature of 45...55 °C, for 0.75...1.25 seconds. and obtaining a content of 28...30 % DM. After concentration, the mixture is dried in a cylindrical IR dryer 11 to a powdery fraction at a temperature of 45...60 °C, 4...6 % DM and an IR drying apparatus for pomace 12 at a temperature of 45...60 °C to a final moisture content of 10...13 % DM. The basic equipment scheme for the production of semi-finished fruit and vegetables with a high degree of readiness based on apple, Jerusalem artichoke and quince is presented in (Fig. 2)

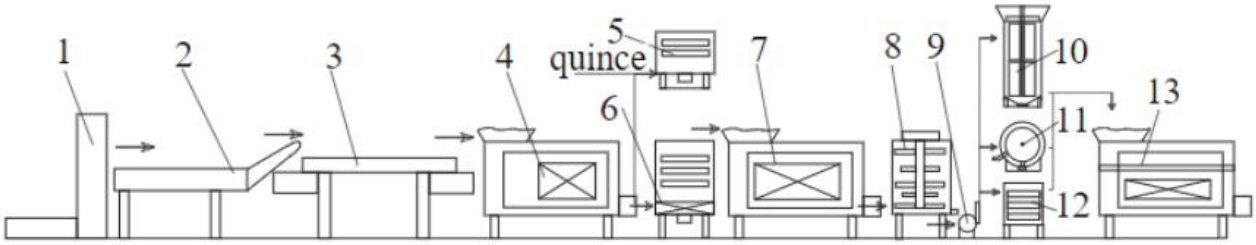


Fig. 2. Basic equipment scheme for the production of semi-finished fruit and vegetables with a high degree of readiness based on apple and quince: 1 – container dumper; 2 – universal washing machine; 3 – inspection table; 4 – cutting machine with a universal cutting mechanism; 5 – apparatus for holding in 0.1 % solution of citric acid; 6 – universal multifunctional device; 7 – double wiping machine; 8 – a mixer from a paddle stirrer; 9 – gear pump; 10 – rotary film apparatus; 11 – roller IR dryer; 12 – IR drying apparatus; 13 – universal packaging machine.

Analyzing the organoleptic properties of the obtained experimental samples of pasty and dried fractional powdered semi-finished products revealed that all samples have good indicators. But in terms of color and taste-aromatic indicators, sample B with the content of apple 40 % and quince 25 % has the advantage.

Conclusion. The selection of the components of fruit and vegetable raw materials was carried out under the conditions of taking into account the content of useful substances, pectin, vitamins, minerals, etc., to form an improved method of production of semi-finished fruit and vegetable with a high degree of readiness based on apples, Jerusalem artichoke and quince. To obtain a fruit and vegetable semi-finished product with a high degree of readiness based on fruit and vegetable raw materials, a basic technological scheme of production using gentle heat and mass exchange operations is proposed. A rational selection of the equipment complex of the technological line was carried out with the use of advanced thermal equipment that can provide gentle heat treatment. By means of organoleptic evaluation, the best experimental sample with the content of blend components was found: apple 40 %; Jerusalem artichoke 35 %; quince 25 %. The developed semi-finished products can be recommended as an additive or filler in various confectionery products in order to improve their nutritional value.

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