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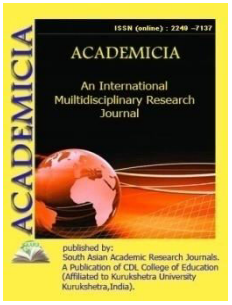

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PRODUCTION AND STORAGE TECHNOLOGY APPLE CHIPS

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ABSTRACT

This scientific article is devoted to the development of technology for the production of chips from apples zoned in Uzbekistan, which allows to preserve the micronutrients of the original plant raw materials as much as possible and to obtain a safe product with high organoleptic properties, increased nutritional value, useful for all age groups of the population.

KEYWORDS: *Apples, Value, Chips, Technology, Products, Storage*

INTRODUCTION

Fast food, breakfast cereals and snacks are becoming a familiar part of modern consumer culture. The most important direction of the development of the processing industry and agricultural production is the improvement of technologies for preparing fast food products, namely, obtaining natural, full-fledged and light food with high shelf life without the use of artificial food additives [1].

The assortment of chips produced in Uzbekistan is 80% represented by potato and grain processing products, while the use of fruits, in particular apple fruits, is a promising direction. According to statistics, the gross harvest and yield of seed crops in Uzbekistan increases annually.

A growing trend that is actively developing abroad is the production of fruit slices, including from apples fried in oil. At the same time, the finished product has a specific pleasant taste and aroma with a "crispy" consistency characteristic of chips [2].

Sweet and sour apple varieties, in particular Jonathan, Reinet Simirenko, are suitable for canning by dehydration, and Red Scarlett and Impala varieties with a low amount of reducing sugars are suitable for potato root crops. It is recommended to use round-shaped raw materials with a cross-sectional size of 45-65 mm to reduce the appearance of broken finished products in packaging during production and subsequent storage [3].

The above indicates that apple processing is a multi-level system characterized by the interconnection of all links with each other. Therefore, the development of technology and technical means of mechanical and thermal processing of vegetable raw materials is a comprehensive solution to the problem of increasing the efficiency of fruit processing by reducing the content of harmful ingredients in finished fast food products by improving the technological process, as well as minimizing the energy costs of the equipment used [2,3, 4, 5, 6].

In the production of chips, a number of oxidative processes of fats and the undesirable formation of carcinogenic substances that adversely affect the human body occur. In addition, a high mass fraction of oil in the finished product causes rancidity, a decrease in the quality characteristics of the product, followed by damage to the entire contents of the package. It follows from this that a uniform residual moisture content of the material is achieved by the same thickness of all slices. At the same time, equal conditions are created during the heat treatment of the material with the possibility of obtaining products uniform in oil content. With this in mind, the development and justification of optimal technological modes for grinding fruit and vegetable raw materials and subsequent frying of the obtained slices is an urgent task of the agro-industrial complex [4, 5, 6].

Theoretical and experimental studies of the process of cutting fruit and vegetable raw materials into slices and subsequent frying in vegetable oil with minimal energy and material costs, as well as high yield of high-quality finished products without defects are an obvious resource-saving factor and are of great scientific and practical importance [6].

The studies of S.A. Arnaut, Z.Lovkis, V.V.Yakimtsov and others are devoted to improving the efficiency of the technological process and technical means of cutting apples. They have developed a number of disc-type cutting machines, which have disadvantages expressed in some low technical characteristics, namely limited productivity, increased energy consumption and a high percentage of products with different granulometric composition [4, 5].

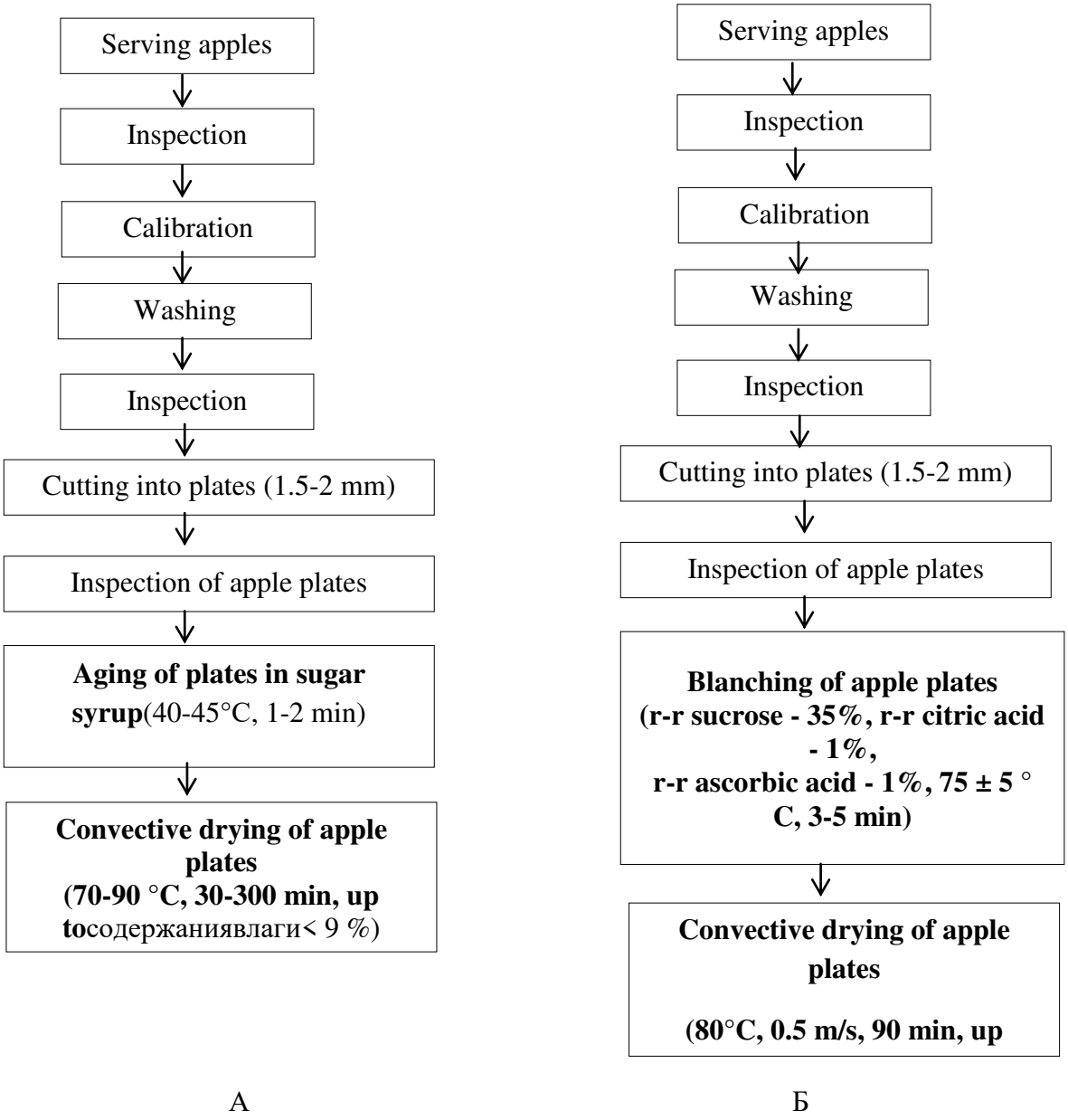
However, the tasks of their research did not include the selection of varieties of apple raw materials for the manufacture of chips. There are also practically no comprehensive studies of scientists on the development of competitive technology for the production of apple chips, and the available data relate to the scientific justification of the parameters of cutting apple fruit into plates.

RESULTS AND DISCUSSIONS

The results of the conducted research have developed a technology for producing apple chips (Figure), which can be implemented at any canning enterprise equipped with a cutting machine, as well as blanking equipment and a convective dryer.

To obtain apple chips with high consumer properties and maximally preserved nutrients, the raw materials cut into plates with a thickness of 1.5-2.0 mm must be blanched in a solution

containing 35% sucrose, 1% ascorbic acid, 1% citric acid for 3-5 minutes at a temperature of 75 ° C, and further convective drying should be carried out at a temperature of 80 ° C drying agent and a speed of 0.5 m / s drying agent, to a mass fraction of moisture less than 9 %



А Б

Figure Existing (A) and proposed technology (B) scheme of apple chips production

The results of studies of physico-chemical and biochemical parameters of experimental samples of chips made according to the developed technology indicate that its use ensures the production of finished products with maximum preservation of macro- and micronutrients of the feedstock (mass fraction of titrated acids (2.0 ± 0.2)%, total sugars - (68.1 ± 6.8)%, ascorbic acid content - (3.5 ± 1.7) mg / 100g, pectin substances - (8.5± 3.2)%.

It was shown that apple chips are a source of minerals, the average content of which was as follows: potassium - 263.15 mg/100 g, calcium - 36.12 mg/100 g, iron - 1.37 mg/100 g, sulfur - 43.19 mg/100 g, manganese - 0.13 mg/100 g, nickel - 0.02 mg/100 g, copper - 0.09 mg/100 g. When eating 100 g of the product, a person's daily need is satisfied on average in Fe by 21%, S and K - by 12%, Si - by 9%, Mp and Ni - by 7%, Ca - by 6%.

The data on the total quantitative composition of amino acids of apple chips (from 305 to 1707 mg /100 g of dry matter) are new, while the proportion of essential amino acids is 24-40%, which confirms the high biological value of apple chips.

The study of the dynamics of organoleptic, physico-chemical and microbiological parameters of apple chips during storage allowed us to establish that after 4 months of storing products in polymer packaging, the organoleptic properties of chips deteriorated, expressed in the loss of crispy consistency and deterioration of color, there was also a change in physic-chemical parameters (table): the content of ascorbic acid decreased 4.4 times, the moisture content increased by 10% and the amount of water activity by 14%.

Physic-chemical parameters of apple chips during storage

Shelflife, month	The name of the indicator		
	Ascorbic acid content, mg/100 g	Titrated acidity, %	Content 5-hydroxymethyl-furfural, mg/100 g SV
0	2,70	2,05	2,0
4	1,37	2,00	2,0
6	0,61	1,90	2,1

However, despite these changes, the quantitative composition of the microbiota and the concentration of 5-hydroxymethylfurfural in apple chips remained almost at the same level during the entire shelf life. Thus, the data obtained made it possible to establish the shelf life of apple chips in polymer bags without vacuuming - 4 months.

CONCLUSION

To obtain apple chips with a crispy consistency, aroma and color of the raw material containing (on average from the initial amount in the raw material) 18% ascorbic acid, 84% flavones, 86% of the total amount of catechins and Lecco anthocyanins, convective drying of blanched apple plates must be carried out at a drying agent temperature of 80 ° C and its speed of 0.5 m / s.

The optimality of these modes is confirmed by the low content of 5-hydroxymethylfurfural (no more than 2.2 mg /100 g) and the amount of water activity (no more than 0.40), as well as the complete inactivation of ascorbate oxidase, per oxidase and polyphenol oxidase, which guarantees the durability of the product during storage.

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