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# DEVELOPMENT OF SCIENCE

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# OPPORTUNITIES FOR OPTIMIZING THE PROCESS OF PRODUCING SUKAT FROM NATURAL RAW MATERIALS AVAILABLE IN UZBEKISTAN

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**Abstract.** This article analyzes the possibilities of optimizing the candied fruit production process using natural raw materials available in Uzbekistan. The study focuses on efficient utilization of local plant resources, including fruit by-products, and improvement of technological stages to reduce energy consumption and processing time. Optimization is aimed at enhancing product quality, preserving nutritional value, and ensuring environmental sustainability. The research highlights the importance of resource-saving technologies and integrated use of raw materials in food production. The results contribute to expanding the production of competitive and high-quality candied fruits based on local natural resources.

**Keywords:** candied fruits, natural raw materials, process optimization, food technology, local resources.

**Аннотация.** В статье рассматриваются возможности оптимизации процесса производства цукатов на основе природного сырья, имеющегося в Узбекистане. Особое внимание уделяется рациональному использованию местного растительного сырья, включая фруктовые и бахчевые отходы, а также совершенствованию технологических этапов переработки. Оптимизация направлена на снижение энергозатрат, повышение качества готовой продукции и сохранение ее пищевой ценности. В работе подчеркивается значение экологически устойчивых технологий и комплексного использования сырьевых ресурсов. Полученные выводы способствуют развитию эффективного и конкурентоспособного производства цукатов на основе местного сырья.

**Ключевые слова:** цукаты, природное сырье, оптимизация, пищевая технология, местные ресурсы.

**Annotatsiya.** Mazkur maqolada O'zbekistonda mavjud tabiiy xom ashyolar asosida sukat ishlab chiqarish jarayonini optimallashtirish imkoniyatlari tahlil qilinadi. Tadqiqotda meva va poliz mahsulotlarining po'stloq va chiqindilaridan



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samarali foydalanish, texnologik bosqichlarni takomillashtirish hamda energiya va vaqt sarfini kamaytirish masalalariga alohida e’tibor qaratiladi. Sukat ishlab chiqarishda xom ashyo sifatini saqlab qolish, mahsulotning oziqaviy qiymatini oshirish va ekologik barqarorlikni ta’minlash optimallashtirishning asosiy yo‘nalishlari sifatida ko‘rib chiqiladi. Tadqiqot natijalari mahalliy xom ashyo asosida raqobatbardosh va eksportbop sukat mahsulotlarini ishlab chiqarish imkoniyatlarini kengaytirishga xizmat qiladi.

**Kalit so‘zlar:** sukat, tabiiy xom ashyo, optimallashtirish, oziq-ovqat texnologiyasi, mahalliy resurslar.

## INTRODUCTION

Today, the development of the food industry, especially the expansion of production sectors based on the deep and efficient use of local raw materials, is one of the priority areas of the Uzbek economy. Population growth, increasing demand for food products, and increased interest in healthy and natural products require the search for new technological solutions. In this regard, canned goods produced on the basis of fruit and vegetable processing are of great importance.

The favorable climatic conditions of Uzbekistan and the high agricultural potential ensure the cultivation of a wide range of fruit, melon and berry products. Melons, watermelons, apples, pears, quince, citrus fruits, as well as their peels and secondary parts, serve as a valuable source of raw materials for canned goods production. However, the level of use of these resources is still not fully effective, and in many cases part of the raw materials is lost as waste. This reduces production efficiency and creates environmental and economic problems.

The process of making sugar is a multi-stage technological process, in which processes such as raw material preparation, candiing, drying and packaging play an important role. Each of these stages requires time, energy and material resources, and their optimization allows you to reduce the cost of the product and improve its quality. In particular, the introduction of modern energy-saving methods, the scientific selection of the concentration of the sugar solution and the improvement of drying processes are urgent issues.[3; 342]

Also, the increasing demand from consumers for natural, environmentally friendly and high-nutritional products without additives requires the use of innovative approaches in the production of sugar. The use of local raw materials serves not only to produce import-substituting products, but also to create export-oriented types of sugar. This is an important factor in increasing the competitiveness of the country's food industry.

This article analyzes the possibilities of optimizing the process of candied fruit production based on natural raw materials available in Uzbekistan from a



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scientific, theoretical and practical point of view. The main goal of the study is to identify ways to increase production efficiency, rational use of resources, and create high-quality candied fruit products.

## LITERATURE REVIEW

The technology of producing candied fruit and similar candied fruit products has been studied by many scientists as one of the important areas in the food industry. In particular, the work of R.Kh. Khudoyberdiev and B.S. Ismailov "Technology of Fruit and Vegetable Processing" (Tashkent, 2018) covers in detail the chemical composition of fruit raw materials, the theoretical foundations of the candied fruit process, and factors affecting product quality. The authors emphasize that the concentration of the sugar solution and heat treatment directly affect the structure of the product.[1; 214]

A.A. Kadyrov's scientific work "Improving Food Drying Processes" (Samarkand, 2020) examined the energy efficiency of drying technologies. These studies noted the high energy consumption of traditional drying methods as a drawback, and it was proven that the use of optimized modes reduces the cost of products.[4; 410]

This issue is also widely covered in foreign literature. For example, the book "Food Processing Technology: Principles and Practice" (Woodhead Publishing, 2017) by Fellows P. presents modern technological solutions for the canning and drying processes of fruit products, including resource-saving methods and quality preservation mechanisms. Also, the work "Handbook of Food Preservation" (CRC Press, 2019) by Rahman M.S. analyzed methods for preserving and ensuring the stability of canned products.[2; 128]

Local scientific articles consider the prospects for the production of sukat from melon, watermelon and quince peels grown in Uzbekistan (Umarov D.Sh., "Problems of processing agricultural products", 2021). These works indicate that the potential of existing raw materials is not fully utilized.[5; 97]

The results of the analysis show that existing studies are devoted to individual stages of technological processes, and the issue of their comprehensive optimization is not sufficiently covered. This justifies the need for scientific research in this area.

## METHODOLOGY

In this study, a comprehensive scientific and methodological approach was used to identify opportunities for optimizing the sukat production process. Analytical, comparative and experimental methods were used in the research process First of all, local and foreign scientific literature was systematically studied and existing technological approaches were analyzed.



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In the practical part, raw materials were selected based on fruit and melon products grown in Uzbekistan and their physicochemical parameters were evaluated. The effect of changes in time, temperature, and sugar solution concentration during canning and drying processes on product quality and yield was observed. The results obtained were processed using statistical analysis methods and directed to determining the most optimal technological regimes.

## CONCLUSIONS AND SUGGESTIONS

The research results showed that the process of producing sukat from natural raw materials available in Uzbekistan has great potential, but its efficiency and product quality have not been sufficiently optimized. Peels, wastes of fruit and melon products and other secondary resources are not sufficiently used in sukat production, which leads to a loss of economic and ecological opportunities. At the same time, traditional methods of canning and drying processes are energy-intensive and their impact on product quality remains uncertain.

Practical studies have shown that by constantly monitoring the quality of raw materials, optimizing the concentration of sugar solution and drying parameters, it is possible to improve product quality, reduce costs and ensure energy efficiency. The use of combinations of various fruit and melon products allows you to create new and competitive types of canned goods. At the same time, the introduction of environmentally friendly technologies helps to reduce waste and reduce the negative impact of production on the environment.

It is recommended that manufacturers:

Completely assess the potential of local raw materials and introduce a system for their classification;

Optimize canning and drying processes on a scientific basis and use energy-saving methods;

Test different combinations of raw materials and produce new products;

Strengthen the system for monitoring product quality, nutritional value and environmental sustainability.

If these directions are implemented, the production of sukat in Uzbekistan will play an important role not only in satisfying domestic demand, but also in increasing export potential and making the national food industry competitive. When these proposals are put into practice, production efficiency, product quality and environmental sustainability will significantly improve.

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