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**BLENDING
AND DRYING
OF ANTIOXIDANT
RAW MATERIALS**

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The monograph solves important problem - reducing energy consumption in the drying process of antioxidant plant materials. Energy-efficient pre-treatment of raw materials for drying is proposed, which makes it possible to reduce energy consumption at this stage by 85% compared to previous. The kinetics of the convective dehydration process is theoretically and experimentally studied and the optimal modes are selected, as a result of which energy consumption is reduced by 50 %. Due to the researches of gravimetric and calorimetric properties antioxidant plant materials, it was proved for the first time, that the thermal stability of the antioxidant composition based on red beetroot is higher, than the thermal stability of the components separately and occurs later, than in mono-raw materials; specific heat consumption during dehydration is much smaller, than the cost of dehydration of the individual components of the mixture. Energy-efficient heat technology for obtaining antioxidant powder from red beetroot with maximum betanine preservation of 95-97 % has been developed.

The monograph is intended for employees of food industry enterprises, scientists, graduate students and masters of engineering and technical specialties.

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Монографія вирішує важливу проблему - зменшення енерговитрат у процесі сушіння рослинних антиоксидантів. Запропоновано енергоефективну попередню обробку сировини для сушіння, що дозволяє зменшити споживання енергії на цьому етапі на 85% порівняно з попереднім. Теоретично та експериментально вивчається кінетика процесу конвективного зневоднення та вибираються оптимальні режими, в результаті чого споживання енергії зменшується на 50%. Завдяки дослідженням гравіметричних та калориметричних властивостей антиоксидантних рослинних матеріалів вперше було доведено, що термічна стійкість антиоксидантної композиції на основі червоного буряка вища, ніж термостійкість компонентів окремо і настає пізніше, ніж у моносировини; питоме споживання тепла під час зневоднення набагато менше, ніж витрати на зневоднення окремих компонентів суміші. Розроблена енергоефективна теплова технологія отримання антиоксидантного порошку з червоного буряка із максимальним збереженням бетаніну 95-97%.

Монографія призначена для працівників підприємств харчової промисловості, науковців, аспірантів та магістрів інженерно-технічних спеціальностей.

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Introduction.

Nutrition is a key moment in the life of every living organism. Food is a leading place in everyone's life. The same with the development of the food industry increases the requirements for food products.

One of the main requirements is the naturalness and quality of food. On August 2, 2019, the Law of Ukraine "On Basic Principles and Requirements for Organic Production, Circulation and Labeling of Organic Products" enters into force. Thus, organic is agricultural products, including food and feed obtained as a result of organic production (certified activities related to agricultural production (including all stages of the technological process, namely: primary production, preparation, processing, mixing and related procedures, filling, packaging, processing, restoration and other changes in the state of production), which is carried out in compliance with the established requirements [1].

Recent research in the field of food production has shown new useful properties of food products of plant origin. Today, both the nutritional value and the biological activity of plant raw materials are very important. After processing, vegetables and fruits should contain as many natural nutrients as possible. Therefore, natural products with a high content of biologically active substances are of great importance in light of the serious side effects associated with the use of food additives of chemical origin.

Natural pigments are also natural food ingredients that attract considerable attention as antioxidants that have a beneficial effect on human health and disease prevention. Due to the fact that such diseases as cardiovascular and oncological diseases are widespread in Ukraine today, the task of food industry workers to replace synthetic food ingredients as much as possible (preservatives, flavors, sugar substitutes, dyes, etc.) to more natural ingredients that will have a positive effect on the human body. For example, natural dyes of food plant raw materials should be used as dyes.

The problem of processing, drying and use of vegetable raw materials with full preservation of its functionality is very important due to the wide range of its use in the food and pharmaceutical industries. One of the most effective ways to increase the shelf life of food is to dry it to equilibrium humidity. When drying, the weight of the product is significantly reduced, which reduces the cost of transportation, packaging and reduces the need for storage space.

Drying antioxidant vegetable raw materials based on red beetroot in order to reduce energy consumption and preserve betanine is a difficult task. The main advantages of dehydration are a significant reduction in product weight, which reduces the cost of transportation, packaging and reduces the need for storage facilities.

An important emphasis when drying antioxidant plant raw materials is the maximum preservation of biologically active substances, macro- and micronutrients, reducing energy consumption and the cost of the final product. The quality and biological value of dried products depends on the preparation of raw materials for drying, the drying temperature, the duration of thermal exposure to the product. Thus, the task is to develop new and improve existing methods of drying vegetable raw materials, which will reduce energy consumption, intensify the process, avoid environmental pollution and maintain high quality properties of the finished product.