INTERNATIONAL MULTIDISCIPLINARY JOURNAL FOR RESEARCH & DEVELOPMENT
SJIF 2019: 5.222 2020: 5.552 2021: 5.637 2022:5.479 2023:6.563 2024: 7,805
eISSN :2394-6334 https://www.ijmrd.in/index.php/imjrd Volume 11, issue 04 (2024)

VACUUM FREEZE-DRYING TECHNOLOGY FRUITS, BERRIES AND VEGETABLES

M.I.Abdurakhmonova
Senior lecturer, department of "Information-communication systems of controlling technological processes" Bukhara engineering-technological institute, Bukhara city, Uzbekistan
Kulieva N.G.
Assistant, department of "Information-communication systems of controlling technological processes" Bukhara engineering-technological institute, Bukhara city, Uzbekistan. E-mail: nodira.kulieva@mail.ru

Annotation: Today, a high level of growth is observed in the areas of growing agricultural products, processing, and production of import-substituting products. The production of canned and dried agricultural products is one of the leading branches of the food industry. When drying agricultural products, complex structures, energy-intensive techniques and technologies are used. Accordingly, it is important to create modern equipment and technologies using efficient, energy-saving, renewable energy sources necessary for the production of dried fruits and vegetables in the export sector.

Keywords: Drying, vacuum , dried fruits, unprocessed, biochemistry, form, aroma, color, taste, biotechnological products , technological process, washing machine, density, cutting, processing, smell, preparation, canning, sizing, grinding.

The quality of dried fruits largely depends on the commercial and biochemical properties of the raw materials. One of the main and general requirements for raw materials suitable for drying is a high content of dry substances, sugar and acids, which ensure a good taste of the product.
Specific requirements are imposed on certain types of raw materials: for example, apples must have pulp that does not darken in the air, stone fruits must have a low seed content and large fruits, and others.
Vacuum freeze-drying , or freeze-drying, is based on a technology that has been successfully used for many years in the food and pharmaceutical industries to produce heat-sensitive products: vaccines, pharmaceuticals, biotechnology products, food and beverages. Technology Vacuum freeze drying is characterized by high speed, oxygen deficiency and low drying temperature, which ensures structural integrity and preservation of most of the original properties of raw materials - shape, aroma, color, taste, texture, biological activity, nutritional value, vitamins and minerals.

Vacuum freeze drying is a dehydration process in which a pre-frozen product is heated under deep vacuum conditions (the product is on a tray between heating elements), and moisture in the form of ice (solid phase) is immediately sublimated into a gaseous state, bypassing the liquid phase.

The vacuum freeze drying process is divided into three stages: freezing, primary drying and secondary drying:

In the first stage, the material is frozen completely until ice forms, and the water vapor pressure must be below the triple phase point (4.58 mm Hg , 0 ° C).

At the second stage, primary drying occurs by sublimation of ice. The pressure in the drying chamber is significantly lower than the vapor pressure of the ice, due to the vacuum. The product heats up and the sublimation process begins - water vapor from inside the product rises to its surface and is then collected on a condenser. At the same time, pores form in the product due to the space that was previously occupied by ice crystals.

At the secondary drying stage, residual water is removed by desorption from the dried product layer - this stage is carried out by increasing the temperature and by reducing the steam pressure in the drying chamber.

Over the past few years, the vacuum freeze drying method has been increasingly used for the production of dried fruits, along with traditional drying methods. Some experts believe that in the future, vacuum freeze-drying will replace traditional methods associated with heating processed products, which coagulates proteins and inevitably leads to loss of nutritional properties. While vacuum freeze drying retains most of the original properties of raw materials - shape, aroma, color, taste, texture, biological activity, nutritional value, vitamins and minerals, and the products remain “raw” from the point of view of view of freshness.

One of the many scientific studies on this topic analyzed the effect of vacuum freeze-drying a number of fruits and vegetables (strawberries, limes, oranges, black currants, broccoli and red peppers) on their nutritional characteristics. The results showed that strawberries retained 100% of their vitamin C and phenolic content after treatment, with only an 8% loss of “total antioxidant capacity.” For comparison, in simply refrigerated strawberries after 7 days of storage, the loss of vitamin C was about 19%, and the “total antioxidant capacity” was 23%, in addition, studies found a significant loss in phenolic components – 82%.

In addition, studies have been conducted to study the effect of storage duration (vacuum freeze-drying) of products on the preservation of their nutritional properties. In particular, experiments were carried out in agriculture to determine the preservation of the nutritional characteristics of vacuum freeze-drying strawberries for 12 months. The studied samples were analyzed once a

quarter for a year for the content of vitamins and minerals. Thus, the loss of vitamin C in products was only 1.8% per month.

References

1. Chagin O.V., Kokina N.R., Pastin V.V. Equipment for drying food products. - Ivan. chem. - technol . University: Ivanovo . 2007.
2. Khmeleva V.N., Leonova G.V., Barsukova R.V., Tsyganka S.N., Shalunova A.V. - Ultrasonic multifunctional and specialized devices for intensifying technological processes in industry, agriculture and households.- Barnaul: AltSTU, 2007
3. Internet sites