

RESEARCHING METHODS FOR DRYING FRUITS AND VEGETABLES

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ABSTRACT

Nowadays, a high level of growth is observed in the areas of growing agricultural products, processing, and producing 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 machinery and technologies using efficient, energy-saving, renewable energy sources necessary for the production of dried fruits and vegetables in the export sector.

Key words: *drying, radiation, dried fruits, raw, biochemistry, solids, processing, elastic pulp, sealed containers, technological process, washing machine, density, cutting, processing, smell, preparation, canning, calibration, grinding.*

АННОТАЦИЯ

В настоящее время наблюдается высокий уровень роста в сферах выращивания сельскохозяйственной продукции, переработки, производства импортозамещающей продукции. Производство консервированной и сушеной сельскохозяйственной продукции является одной из ведущих отраслей пищевой промышленности. При сушке сельскохозяйственной продукции применяются сложные конструкции, энергоемкие приемы и технологии. Соответственно, важно создавать современные машины и технологии с использованием эффективных, энергосберегающих, возобновляемых источников энергии, необходимых для производства сушеных фруктов и овощей в экспортном секторе.

Ключевые слова: *сушка, облучение, сухофрукты, сырье, биохимия, сухие вещества, переработка, эластичная мякоть, герметичная тара, технологический процесс, моечная машина, плотность, нарезка, переработка, запах, подготовка, консервирование, калибровка, измельчение.*

INTRODUCTION

The industrial production of dried fruits with the use of technological equipment for preparing fruits for drying and drying itself is becoming more widespread. Artificial drying provides high quality finished products. The quality of dried fruits largely depends on the commercial and biochemical properties of raw materials. One of the main and general requirements for raw materials suitable for drying is a high content of solids, sugar and acids, which provide a good taste of the product. Specific requirements are imposed on certain types of raw materials: for example, apples must have a pulp that does not darken in the air; stone fruits must have a low content of seeds and large fruits. Small and medium-sized farms and peasant farms in the southeast of Uzbekistan annually produce more than 290 thousand tons of fruits, berries, grapes. Moreover, the gross harvest of these products tends to grow steadily. Part of agricultural raw materials is used for the preparation of canned products, but a significant part of this crop dies due to the impossibility of its prompt processing. The population of the region traditionally prepares dried fruits and mainly for family consumption. Based on the above factors, for our region, the least costly and effective way of drying fruits and vegetables is solar drying, one of the oldest methods of preserving various agricultural products, widely used in many parts of the world with a warm, dry climate and hot summers. The relevance of using this method of drying today for Uzbekistan is increasing due to the rise in energy prices. At the same time, the solar drying of products in the open air has a number of disadvantages. The main ones are the duration of the drying process, contamination of the dried products, large areas for the placement of dried products and rather high labor costs for this process. In addition, the drying of fruits and berries is of a short-term and seasonal nature, and, accordingly, the equipment purchased is economically unjustifiably idle for a long time, especially in winter and spring.



Figure 1. Drying process of fruits

DISCUSSION AND RESULTS

For drying, mainly sour and sweet-sour apples with a solids content of at least 12% are used. Raw materials intended for drying should not contain fruits that are broken, rotten, damaged by pests or with other defects. Depending on the method of preparation for drying, the following types of dried cultivar apples are distinguished: peeled with a removed seed chamber and treated with a solution of sulfurous acid or fumigated with sulfur; not peeled with a removed seed chamber and treated with a solution of sulfurous acid or fumigated with sulfur; uncleaned and untreated [1]. Dried apples, obtained with preliminary cleaning and treatment with a sulfuric acid solution, have an attractive appearance, white color with a creamy tint, a pronounced taste and aroma of fresh apples. The chemical composition of dried apples depends on their variety and place of cultivation. On average, they contain 35-40% sugars, acids (in terms of malic) 1.5-4%. The moisture content is not more than 20%. Drying time - 4-5 hours. The best for drying are large plums with juicy fleshy pulp and a small stone, containing a large amount of solids. Plums for drying are harvested at the stage of technical maturity. Raw materials received for processing are sorted by quality, while unripe, cracked and pest-infested fruits are removed, then they are sized for two sizes, which are then processed separately. Plums are washed in fan washers or under the shower [2]. Since their fruits have a dense skin covered with a wax coating that delays the evaporation of moisture during drying, it is advisable to blanch the raw materials in boiling water for 20-30 seconds, or in a boiling 0.1% alkali solution, for 15-20 seconds. followed by washing in water. Preliminary blanching of plums significantly speeds up their drying, as during blanching the skin becomes thinner and covered with a network of small cracks, which contributes to intensive evaporation of moisture. The plums treated in this way can be dried at a high (75-80°C) temperature of the heat carrier at the beginning of the process, which in turn contributes to the intensification of drying without the risk of cracking the fruits and losing juice. The duration of drying plums depends on the variety, size, degree of maturity, method of preliminary preparation, drying modes, etc. Prunes obtained with preliminary blanching are of higher quality than those dried without processing. The dried product, made from plums of the Hungarian Italian variety with preliminary blanching, has a uniform black color, a shiny surface, excellent taste and a pronounced smell of prunes.

Pears, for the production of dried pears, the best varieties are Ilyinka, Lesnaya Krasiva, Williams summer, Bottle, Balerkutsa, etc. Pears must be harvested at the stage of biological maturity, contain at least 12% solids and comply with the requirements of the current standard. The sequence of technological operations for

preparing raw materials for drying is as follows: they are washed, sorted by size [4, 3]. Pears with a diameter of more than 55 mm should be cut into halves or slices. Sliced fruits are collected in a collection filled with 0.1% citric acid solution or 1-2% common salt solution. Then they are fed for laying on sieves, which are mounted on trolleys. Pears are dried for 4-6 hours to a moisture content of 24%. Compliance with the drying regime contributes to uniform moisture transfer throughout the thickness of the fruit and prevents the formation of a crust. Properly dried pears have a uniform surface and elastic flesh.

Berries. Cultivated and wild berries are used for drying. They dry strawberries, raspberries, black currants, gooseberries, blueberries, blackberries, mountain ash, etc. Berries are sorted by quality, while removing rotten, green, overripe, crumpled fruits, impurities and stalks. Raspberries and blackberries are cleaned from pedicels [5].

Dill, as a spicy herb, it only matters at a young age, so it is sown and harvested several times during the season (every 15-20 days). The most important component of dill is essential oil, which is a colorless or greenish-blue liquid with a density of 0.906-0.933 g / cm³ and obtained by water distillation of dill seeds and other parts of the plant. Its yield is up to 2.5%.

Celery, it contains a special essential oil - sedanomid, which gives all parts of the plant a specific spicy smell, and a large amount of protein, mineral salts, and vitamins. For drying, root and leaf celery is used.

Parsley. The most common of the spice plants. Valued for its aroma, taste and high content of vitamins A and C. There are root and leaf parsley. In root parsley, root crops are used, which, when dried, on a white root, in leaf parsley, leaves, which contain especially a lot of vitamin C [6].

For drying of all crops, young, fresh, tender stems with green leaves, separated from rough petioles, are selected. From the moment of collection of raw materials to its processing, one should strive to preserve essential oils and vitamin C in it, since all vegetable crops and their greens are sensitive to storage conditions and terms. Blanching of spicy greens is usually not used, as it causes a large loss of soluble and aromatic substances, sticking of leaves and slows down the drying process. Drying of spicy herbs is carried out at an air temperature of 55-60 °C, drying time - 1.0 - 1.5 hours. Ready dried herbs should have a moisture content not higher than 14%. We can dry it up to 6-7%, in which case it must be packed in sealed containers.

Garlic, garlic of all botanical varieties is used for drying. Garlic is subdivided into arrows, with an arrow in the center of the bulb and non-arrows without a colored stem. The bulb of garlic consists of several juicy cloves (cloves) of various sizes. Each tooth is covered with a dense shell. The teeth are held together by a shortened

stem (bottom), which has roots, and are covered in several layers with common dry shells (scales) of various colors and shades [7]. The garlic bulb contains about 40% dry matter, most of which are carbohydrates. Garlic contains a significant amount of essential oils, which determine its characteristic taste and smell, as well as phytoncides, which give it bactericidal properties. Garlic contains vitamins C, PP, B1, B2. Garlic is widely used in salting and pickling vegetables, in the production of food concentrates, sausages; well preserved when dehydrated. The technology of dried garlic consists of the following operations: breaking the bulbs into cloves and cleaning them, weeding out the scales and arrows, cutting the cloves into thin petals, and drying the pieces.

The drying speed and quality of the dried product is greatly influenced by factors such as the size of the cut pieces, the presence of scales on its surface, pre-treatment before drying and the air temperature during drying [8].

Drying various fruits and vegetables with the air-solar method

Table 1

№	Fruit variety	Drying time, days
1	Apricot halves (drying for dried apricots)	8 - 9
2	Apricot whole fruits (drying for dried apricots)	15 - 18
3	Grapes treated in an alkali solution	12 - 18
4	Raw grapes (drying in the sun)	48 - 55
5	Cherry	14 - 15
6	Pear halves	15 - 22
7	Melon	8 - 12
8	Figs	8 - 12
9	Peaches halves	10 - 12
10	Plum treated in alkali solution	15 - 17
11	Plum without treatment	20 - 25
12	Apples	9 - 10

Peeled teeth are cut into thin pieces (petals) 2-3 mm thick. Vegetable cutters with horizontal and vertical arrangement of knives can be used for cutting.

CONCLUSION

An indispensable condition for high quality grinding of the product is the good condition of the cutting knives and their uniform wetting with water. Cutting the product with simultaneous spraying with water helps to wash off pieces of cell sap

from the surface, which prevents them from sticking together during drying and darkening. Chopped garlic without preliminary blanching is subjected to drying at a temperature of 50-65 °C to a moisture content of not more than 8%. Store the product in an airtight container. Dried garlic with a higher moisture content is poorly stored, its pieces stick together, soften and darken significantly.

REFERENCES

1. Chagin O.V., Kokina N.R., Pastin V.V. Equipment for drying foodstuffs. - Ivan. chem. - technol. un-t.: Ivanovo. 2007.
2. Kiseleva T.F. Drying technology: Educational and methodological complex, - / Kemerovo Technological Institute of the Food Industry. - Kemerovo, 2007.
3. Khmeleva V.N., Leonova G.V., Barsukova R.V., Tsyganka S.N., Shalunova A.V. - Ultrasonic multifunctional and specialized devices for the intensification of technological processes in industry, agriculture and households.- Barnaul: AltSTU, 2007
4. Abduraxmonov, O. R., Soliyeva, O. K., Mizomov, M. S., & Adizova, M. R. (2020). Factors influencing the drying process of fruits and vegetables. *ACADEMICIA: "An international Multidisciplinary Research Journal" in India*.
5. Narziyev, M. S., & Ismatova, N. N. (2022). Functional Properties of the Processing Soybeans Products. *Eurasian Research Bulletin*, 7, 171-175.
6. Mizomov, M. S. (2022). Analyzing Moisture at the Drying Process of Spice Plants. *Texas Journal of Agriculture and Biological Sciences*, 4, 84-88.
7. Djuraev, K., Yodgorova, M., Usmonov, A., & Mizomov, M. (2021, September). Experimental study of the extraction process of coniferous plants. In *IOP Conference Series: Earth and Environmental Science* (Vol. 839, No. 4, p. 042019). IOP Publishing.
8. Ibragimova X.I., Tursunova A.A., Baranova M.P., Improving the Reliability of Power Supply Systems, *Middle European Scientific Bulletin*, Volume30 2022, ISSN 2694-9970, <https://cejsr.academicjournal.io>.