American Journal of Biodiversity
https://biojournals.us/index.php/AJB
ISSN: 2997-3600

Experimental Results on Preparation and Drying of Carrots

Khudayberdiev Tokhirjon Latifovich
Candidate of science, associate professor

Toshpulatova Dilafruz Askarali kizi
Doctoral student, Namangan State Technical University

Received: 2025, 03, Oct
Accepted: 2025, 04, Nov
Published: 2025, 06, Dec

Annotation: The article presents the results of experiments on the preparation of carrots and the convection drying mode. The technological scheme of production of dried carrots and quality analysis are considered.

Keywords: carrots, raw materials, washing, calibration, cutting, drying, mode, temperature, sorting.

In the Republic of Uzbekistan, consistent measures are being taken to reform the agricultural sector, introduce market mechanisms and modern technologies into the sphere. In particular, a cluster system has been established, taking into account modern requirements, sowing crops have been diversified.

This increases the productivity and income of agricultural producers. More than 80 types of domestic products are exported to 66 countries of the world. By the decree of the head of state dated October 23, 2019, the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030 was adopted. According to this document, for production with high added value, fruit and vegetable clusters are organized taking into account the size of attracted investments.

The clusters envisage the implementation of 96 projects for the processing, storage, and drying of products with a volume of 430 thousand tons. For the current year, it is planned to export products worth USD 410 million.

It is known that dried fruits and vegetables have a high energy value, as they contain a significant amount of sugars, nitrogenous substances, organic acids, pectin, and mineral substances, as well as good storage and transportability. They require less storage space, can be used to supply northern regions, and can also be used as raw materials for the production of food

concentrates in other food industries. Therefore, drying fruit and vegetable products with the maximum preservation of microelements in them is a very urgent task.

It is known that carrots are rich in carbohydrates (up to 8%), carotene (up to 20%), and other minerals, vitamins A, C, PP, etc. In Uzbekistan, carrots such as Mushak 195, Red Mirzoi 228, Yellow Mirzoi 304, Nurli 70, Nanteskaya 4, Shantane 2461 are grown. Carrots are widely used by the population and therefore are grown on an area of 19-21 thousand hectares per year, and the average yield is 13-15 t / ha.

Carrots have many varieties intended for various purposes - long-term storage, drying, freezing, processing into juices, mashed potatoes, for canning, as well as for baby food - in all cases, carrots must be prepared for a given purpose.

For long-term storage, carrots are sorted and cleaned from soil, stones, and sand by a dry method using vibratory conveyors, roller calibrators. If the carrots will be stored packaged in trays, bags, bags in refrigerators, they must be washed, stones, sand removed, and passed through a hydro cooler to ensure a high-quality appearance and long-term storage.

In other processes, carrots go through all the stages of washing, sorting, grading, removing ends, chopping, and other stages, depending on the receipt of the desired end product. However, in practice, our carrots are not stable for long-term storage. In this regard, scientists of the Department of Storage Technology and Primary Processing of Agricultural Products of the Namangan Engineering and Technological Institute are conducting research work on drying carrots by convection in the conditions of the production enterprise Afruz Kamol Nabi LLC (Namangan city), which is equipped with modern equipment. Based on our experimental studies, we give recommendations on the technology of drying carrots in a convective way. Requirements for raw carrots. For drying, carrots are used that have large or medium root crops of a rounded, flat-rounded, or flat shape with a sweet pulp of a uniform color. Carrot roots must be fresh, whole, without damage by agricultural pests, with the length of the remaining petioles not exceeding 2 cm. The pulp must be juicy, light brown. The size of carrots by the largest transverse diameter is 4-8 cm. The content of root crops with deviations in size, with mechanical damage more than 3 mm deep, with healed cracks, no more than 5% is allowed.

Technology system

The production of dried carrots consists of the following operations:

Washing at a ratio of water to product 3: 1; calibration when cleaning with a steam-water thermal method for three sizes according to the largest transverse diameter (small - passage through holes 6 x 6 cm, medium - passage through holes 9 x 9 cm, and large - exit from the calibrator); scalding 90 s at a pressure of 0.3 MPa; manual post-treatment; inspection; cutting into columns with a thickness of 3x7 mm, cubes with an edge size of 5-10 mm or plates with a thickness of no more than 5 mm and a width of 9-12 mm; blanching (for steam-peeled carrots) with steam at a temperature of 85-90 ° C for 8-12 minutes; treatment with 0.5% pectin solution (for steam-peeled carrots) by abundant spraying; drying; sorting; packaging. We present the proposed technological scheme for the preparation and drying of carrots introduced in the production enterprise "AFRUZ KAMOL NABI":

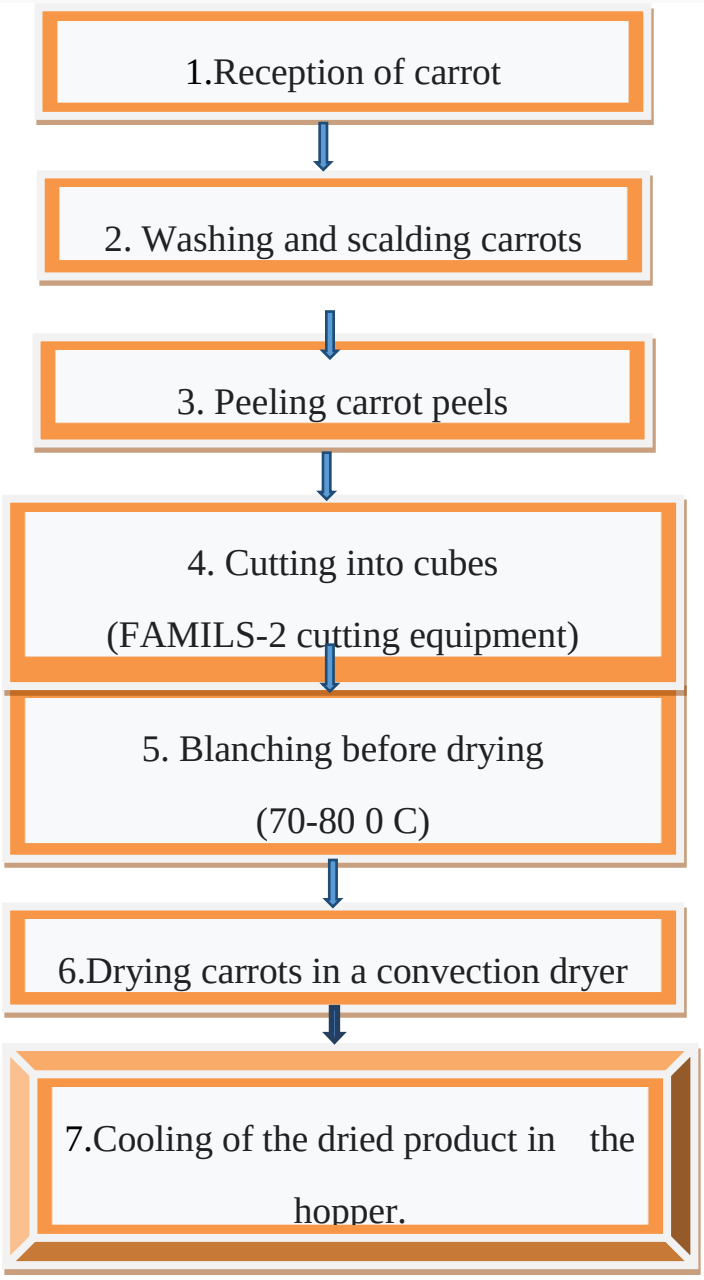

Fig.1.Technological scheme for the preparation and drying of carrots.

Dried carrots, cut in the form to a residual moisture content of 11-13%, 8% or 6-7% on conveyor belt dryers.

To prevent the carrots from sticking to the tapes, the first and second tapes are lubricated with vegetable oil at the rate of 2 kg / t.

Drying parameters depend on the shape of the cut and the final moisture content of the product. Drying of columns and cubes with a face size of 6x6x6 mm to a moisture content of 8 and 6-7% is carried out in one stage, and for cubes with a size of 8x8x8 mm - in two stages. First, it is dried to a moisture content of 14%, kept for a day, and then dried to a moisture content of no higher than 8%.

Before sorting, dried carrots are passed through a sieve to separate particles less than 5 mm. Pieces with black spots, remnants of the skin are selected and passed through a magnetic catcher.

For packaging, carrots are served in bulk if they are intended for the production of vegetable mixtures, food concentrates, or for export.

Quality indicators. Dried carrots are available in grades 1 and 2.

Form - shavings, cubes, plates. Chips less than 5 mm in length are allowed in the largest dimension - 5%, the number of greenish pieces with black spots and remnants of the skin for grade 1 is 3%, for grade 2 - 7%, the number of pieces with white veins for grade 1 is 5%, for grade 2 - ten %.

Color - brown in different shades.

Consistency - shavings and elastic plates, for dried carrots of low humidity - fragile, cubes - hard.

Foreign tastes and odors are not allowed.

The content of metal impurities is not more than 0.01%.

Boil-through during storage up to 1 year - no more than 25 minutes.

For the production of 1 ton of dried carrots with a moisture content of 13-14%, 8-9 tons of raw materials with a dry matter content of 15% are consumed.

Fig. 2. General view of a convective dryer.

The results of experiments and operating modes of the dryer when drying carrots are shown in Table 1.

Table 1.Experimental results and modes of convective drying of carrots.

Drying parameters	Drying chopped carrots				
	Columns mm		Cubes, mm		
	5 x7		8x8x8	6x6x6	5x5x5
	to humidity,%				
	13-14	6-7	13-14	8	8-13
Specific load, kg / m2	12,5	11	17-22	11	4,5
Belt movement speed, m / min: the first second third fourth	0,38 0,26 0,15 0,12	0,13 0,09 0,07 0,05	0,19 0,13 0,10 0,08	0,13 0,09 0,07 0,05	0,19 0,13 0,10 0,08

Air temperature above the ribbons, 0C: first second third fourth	70 75 65 60	75 70 55 40	70 75 65 55-60	75 70 55 40	55-60 55-60 50 45-50
Relative humidity, %	40	35-40	40-45	35-38	35-38
Air consumption, m3 / h	8000	5000	5000	5000	5000
Drying time, h	3,5	4,2	4,2	3,0	3,0

Based on the results of research work in the production enterprise "Afruz Kamol Nabi" LLC (Namangan city), the proposed modes and parameters of equipment for convective drying of carrots were applied.

References:

1. Худайбердиев Т.Л., Тажибоев Г.Г. “Сушка сельхозпродукции с использованием современного оборудования”. Россия.-Международный научный журнал «Молодой учёный” №23 (209), июнь 2018 г. стр. 278-281 (ISSN 2072-0297).
2. Худайбердиев Т., Мелибоев М. **“**Мева-сабзавотларни қуритиш қурилмасини такомиллаштириш ва “Optima Fruit Service**”** МЧЖ да жорий этиш**”.** Наманган давлат университети Илмий ахборотномаси, 2019 йил, 2-сон, 2-қисм.
3. Худайбердиев Т., Мухаммаджонова Д., Камолиддинов М. Корхоналарда мева-сабзавотларга ишлов бериш жиҳозлари шарҳи. НамМТИ, Илмий-техника журнали.- Наманган, №1, 2019. 65-70 б.
4. Худайбердиев Т., Мелибоев М. **Э**кспериментальные исследования по сушке овощей. НамМТИ, Илмий-техника журнали.- Наманган, №1, 2019. 73-76 б.
5. Худайбердиев Т.Л., Маматов Т.Б. “Кичик корхоналарда сабзавотларни конвектив усулда қуритиш технологиясини асослаш ” Монография.
6. Наманган муҳандислик-технология институти.Тошкент, ”Навруз” нашриёти, 2019 й.102 бет.
7. Худайбердиев Т.Л., Тажибоев Г.Г. “Факторы влияющие на процесс сушки плодов и овощей”. Сборник материалов Международной научно-технической конференции. Наманган, Наманганский инженерно-строительный институт, 28-30 ноября 2019 года. 278-281стр.
8. Худайбердиев Т.Л., Обиджонов А.И. “Сушка плодо-овощных продукций конвективным методом”. Polish science journal. International science journal. Issue n1(22). Warsaw: sp.zo.o. “Iscience” 2020. 174 s.
9. Xudayberdiyev T., Kamoliddinov M., Muxammadjonova D. Изучение технологии сушки плодов и овощей. AGRO ILM. Agrariqtisodiy, ilmiy-amaliy jurnal. 1(64) son, 2020 y.Toshkent. 48-50 bet.
10. Худайбердиев Т.Л., Абдусаломов Г.Г. Исследования по конвективной сушки столовой свеклы. ISCIENCE. IN.UA. 46-Международная научная конференция “Актуальные вызовы современной науки”. Сборник научных трудов. Выпуск 2(46), Переяслав, Украина, 26-27февраля 2020г. 51стр.
11. Худайбердиев Т.Л., Абдусаломов Г.Г. Ош лавлагини қуритиш учун қирқиш қурилмаси ўлчамларини назарий асослаш. НамМТИ илмий техник журнали. 2020 йил. Том-5, 1-сон.191-195 бетлар.

12. Худайбердиев Т.Л., Мирзатиллаев М.И. Технология подготовки и сушки моркови. Наманган муҳандислик-технология институти. Қишлоқ хўжалиги Халқаро илмий анжуман мақолалар тўплами. 25-26 сентябр 2020 йил.1-қисм. 373-бет.
13. Худайбердиев Т.Л., Жамалов А.Б. “Олма ва сабзини лентали қуритгичда қуритиш технологияси ва қуёш коллекторидан фойдаланишни асослаш”. Монография. Наманган муҳандислик-технология институти. Тошкент, ”Навруз”нашриёти, 2020 й.102 бет.
14. Xudayberdiyev Toxirjon Latifovich. “Construction technology of convective drying of onions and cabbage”. Monography (Namangan Institute of Engineering Technology). LAP LAMBERT**.** 2021 yar.105 s.
15. Xudayberdiyev T.L., Azambaev M.G. Danakli mevalarni quritish usullari sharhi. FarPI Ilmiy-texnika jurnali.Maxsus son. 2021y.138 b.
16. Худайбердиев Т.Л. Сушка корнеплодов конвективным способом в производстве. NamMTI Ilmiy-texnika jurnali.Maxsus son. 2021y. 210-215 b.
17. Xudayberdiyev T.L. Qishloq xo’jaligi mahsulotlarini quritish texnologiyasi va jihozlari. -(Darslik) Toshkent, Muxr press, 2022.-218 b.
18. Xudayberdiyev T.L., Tuymuradov Z.X. Ishlab chiqarishda sabzini quritish texnologiyasi. Farg’ona politexnika instituti Ilmiy – texnikaviy jurnali. 2022 yil. T.26, №1, Maxsus son, 261– 265 sahifalari.
19. Худайбердиев Т.Л., Эркинова Ш.З. Ускорение процесса сушки винограда. CENTRAL ASIAN JOURNAL OF EDUCATION AND INNOVATION, 2(4), 88–90. https://doi.org/10.5281/zenodo.7827253.
20. Xudayberdiev T.L., Turg’unboeva N. Piyozning kesish qalinligini quritish tezligiga ta’siri. PEDAGOGICAL SCIENCES AND TEACHING METHODS: a collection scientific works of the International scientific conference (17 June, 2023) – Daniya, Copenhagen:2023. Part 24 **–** 240p.
21. Т.Л. Худайбердиев, Г.Г.Тожибаев. Очиститель корнеплодов от остатков грязи и почвы. // Universum: технические науки. Москва. Выпуск: 12(117), Декабрь 2023. Часть 5, 38-41 стр.
22. Т.Л. Худайбердиев, Г.Г.Тожибаев. Бланширование винограда для сушки. // Universum: технические науки. Москва. Выпуск: 12(117), Декабрь 2023. Часть 5, 41-44 стр.