https://www.proconference.org/index.php/usc/article/view/usc33-00-042
DOI: 10.30888/2709-2267.2025-33-00-042

UDC 664.66

JUSTIFICATION OF THE SHELF LIFE OF FUNCTIONAL PREBIOTIC SEMI-PRODUCT

Slashcheva A. V.
c.t.s., as.prof.
ORCID: 0000-0002-8195-8944
ResearcherID H-6972-2018
Mykhailo Tugan-Baranovsky Educational and Scientific Institute of Economics and Trade, Kryvyi Rih National University, Kryvyi Rih, Tramvaina str., 16, 50005

Abstract. *It was determined that the recommended storage period of functional prebiotic semi-product in hermetically packed parchment bags is 12 months at a temperature of 18…20°C and humidity not exceeding 70%. It was determined that during the specified storage parameters, microbiological indicators do not exceed the maximum permissible level, and organoleptic indicators do not change during the specified storage time: the semi-finished product has a pleasant taste and smell, a creamy color, without foreign inclusions and lumps.*

Key words: *functional prebiotic semi-product technology, microbiological indicators, organoleptic characteristics, storage, shelf life.*

Introduction.

In recent years, scientists have increasingly paid attention to issues related to the expansion of the range of functional food products in restaurant establishments. Particular attention is paid to meat food products with the addition of plant raw materials. Functional food products based on plant raw materials should perform not only energy, plastic, but also regulatory functions, protect the human body from the effects of adverse factors [1].

Grinding of substances, including organic ones, leads to disruption of the crystalline structure of the surface layers of solids. Destruction (lattice) is accompanied by the formation of uncompensated valences on new surfaces – that is, free radicals. The role of powder products in the technology of food production is constantly increasing. This is stimulated in two ways – firstly, due to the industrialization of food production, and secondly, due to the decentralization and fragmentation of enterprises. Both of these circumstances encourage the development of the powder industry [2].

Particular attention is paid to the use of chicory root and Jerusalem artichoke tubers as an additive in the production of food products in catering establishments and the food industry. In this regard, our research was aimed at developing a semi-finished

product in the form of a powder mixture made from plant raw materials: Jerusalem artichoke tubers and chicory root, which contain a prebiotic substance - inulin and dietary fiber, and creating culinary products using it [3]. When using such plants as chicory root and Jerusalem artichoke tubers in food technology, which include dietary fiber – inulin, the nutritional and biological value of products increases, the level of calcium absorption increases, the water-absorbing capacity of the product, viscosity, plasticity, normal functioning of the gastrointestinal tract is maintained, their guaranteed quality during storage is ensured, that is, together with the enrichment of the product, the technological task of forming the necessary consistency and improving the functional and technological properties of products is solved [4].

However, the above-mentioned products considered in this section, which are made with the addition of Jerusalem artichoke, chicory root, and inulin extracted from these plants, have some disadvantages: during heat treatment, part of the inulin is lost, since it cannot withstand high temperatures, which leads to the loss of prebiotic action; obtaining inulin from Jerusalem artichoke and chicory root plants is a very laborious method, requiring high costs, which is subsequently reflected in the cost of the product; the concentrations of these plants or inulin powder do not always provide the manufactured product with a functional effect (i.e., a prebiotic effect), since the daily need for the functional ingredient is 15-50% [5].

Thus, the use of these plants is one of the promising tasks for scientists in terms of the production of functional products that have a prebiotic effect and are recommended for implementation in restaurant establishments, especially food products made from meat raw materials, which have a predominant place and demand among consumers in our country.

Main text.

The proposed technology of the semi-finished product requires the determination of its storage period based on comprehensive studies of the following indicators: organoleptic and microbiological during the storage period, which we assume in order to obtain optimal requirements and storage periods for the quality of the manufactured functional prebiotic semi-product.

The research data are given in Table 1 and 2.

Table 1 – Change in microbiological indicators FPSP

Indicators	According to regulatory documentation	Before storage	After storage for 6 months	After storage for 12 months
BGCP in 0.001 g	Not allowed	Not detected	Not detected	Not detected
Staph. aureus in 0.01 g	Not allowed	Not detected	Not detected	Not detected
Pathogenic microorganisms, including salmonella in 50 g	Not allowed	Not detected	Not detected	Not detected
KMAFAM, CFU/g not more than	$1,0\times10^6$	$1,1\times10^3$	$1,5\times10^3$	$2,3\times10^3$
Number of mold fungi, in 1 g, no more	$1,0\times10^3$	$2,5\times10^2$	$2,2\times10^2$	$1,5\times10^2$
Bacteria of the genus Proteus, in 0.1 g	Not allowed	Not detected	Not detected	Not detected

The semi-finished product was stored at a temperature of (18…20)°C and a humidity of no more than 70%, which was hermetically packed in parchment bags.

It was determined that during storage, microbiological indicators have an exponential dependence. According to the research data, it was found that the pathogenic group of microorganisms is absent, and the number of microorganisms of the KMAFAM group and mold fungi does not exceed the maximum permissible level.

According to table 2, it was determined that the organoleptic indicators did not change during the storage time: hygroscopic powder, without lumps, pleasant taste and smell, cream color, without foreign inclusions.

Analysis of the data obtained indicates that the recommended storage period of the semi-finished product from Jerusalem artichoke and chicory is considered to be 12 months at a temperature of 18…20°C and a humidity of no more than 70%.

Table 2 – Change in organoleptic and physicochemical parameters of FPSP during storage

Indicators	After technological processing	After storage for 6 months	After storage for 12 months
Organoleptic indicators			
Appearance	Dry, homogeneous, finely dispersed mass without foreign inclusions and lumps	No changes detected	No changes detected
Color	Creamy with a light yellowish tint, uniform throughout the entire volume of the mixture	No changes detected	No changes detected
Taste	Clean, sweetish without any foreign taste	No changes detected	No changes detected
Scent	Clean, without foreign odor, a slight aroma of Jerusalem artichoke is allowed	No changes detected	No changes detected
Physico-chemical indicators			
Mass fraction of dry matter, %	94,3	No changes detected	No changes detected

The resulting semi-finished product has a powdery consistency, so its humidity is an important indicator. Based on the above, we conducted a study on the influence of relative humidity on the physical parameters of the semi-finished product from Jerusalem artichoke and chicory. It is known [6] that when storing dry plant powders in a significant relative humidity of (70…85) %, their hygroscopicity decreases, the mass of the powder increases, the structure becomes non-crumbly, and lumps are formed.

Fig. 1 shows changes in FPSP humidity depending on the relative humidity of the air.

It was determined that the FPSP humidity increases from 6 to 8% depending on the relative humidity of the air (70…80)%, the structure of the semi-finished product is friable. When the humidity increases to more than 80%, the humidity increases from

10 to 12%, the semi-finished product becomes less friable and lumps are formed.

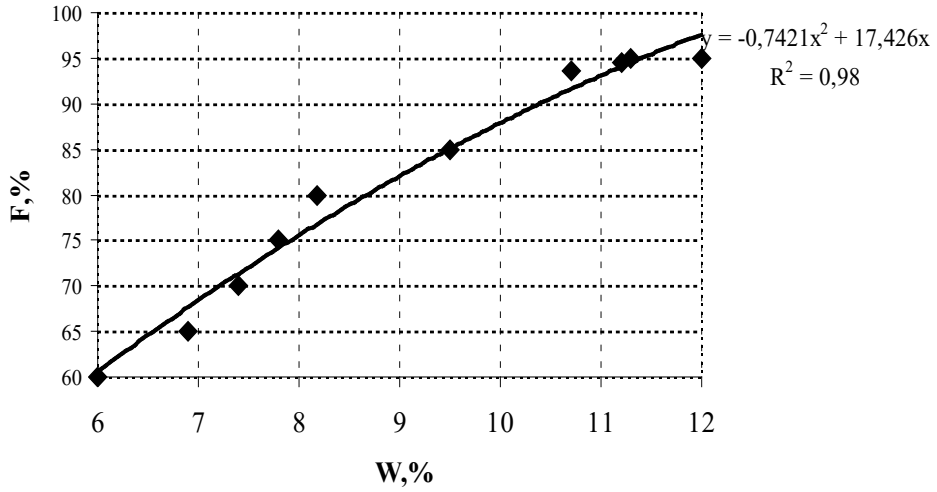

Figure 1 – FPSP humidity depending on relative air humidity: F – relative humidity,%; W – FPSP humidity, %

Thus, we believe that for storage of FPSP it is necessary to use airtight containers and store it at a relative humidity of 70%.

Summary and conclusions.

It was determined that the recommended storage period of FPSP in hermetically packed parchment bags is 12 months at a temperature of 18…20°C and humidity not exceeding 70%.

It was determined that during the specified storage parameters, microbiological indicators do not exceed the maximum permissible level, and organoleptic indicators do not change during the specified storage time: the semi-finished product has a pleasant taste and smell, a creamy color, without foreign inclusions and lumps.

References:

1. Diez, S., Tarifa, M. C., Salvatori, D. M., & Franceschinis, L. (2024). Functional Ingredients Based on Jerusalem Artichoke: Technological Properties, Antioxidant Activity, and Prebiotic Capacity. *Biology and Life Sciences Forum*, vol. 40 (1), pp. 24. https://doi.org/10.3390/blsf2024040024.

2. Li, Xueqin; Haiyan, Guo; Yang, Gang; Zhang, Yanzong; Zeng, Yongmei; Shen, Fei. (2015). Thin-Layer Drying of Jerusalem Artichoke Tuber Slices and Sugar

Conversion as Affected by Drying Temperature, *Journal of Biobased Materials and Bioenergy,* vol. 9, pp. 456-462. https://doi.org/10.1166/jbmb.2015.1543.

3. Dubkova N. Z., Kharkov V. V., Vakhitov M. R. (2021). Using Jerusalem artichoke powder in functional food production, *Foods and Raw Materials*, vol. 9 (1), pp. 69–78. https://doi.org/10.21603/2308-4057-2021-1-69-78.

4. Kleessen B., Schwarz S., Boehm A., et al. (2007). Jerusalem artichoke and chicory inulin in bakery products affect faecal microbiota of healthy volunteers, *British Journal of Nutrition,* vol. 98(3), pp. 540-549. https://doi.org/10.1017/S0007114507730751.

5. De Mastro, G., Manolio, G. and Marzi, V. (2004). Jerusalem artichoke (helianthus tuberosus l.) and chicory (cichorium intybus l.): potential crops for inulin production in the mediterranean area, *Acta Hortic*, vol. 629, pp. 365-374. https://doi.org/10.17660/ActaHortic.2004.629.47/.

6. Summer Rashid, Allah Rakha, Masood Sadiq Butt, Muhammad Asgher. (2018). Physicochemical and techno-functional characterization of inulin extracted from chicory roots and Jerusalem artichoke tubers and exploring their ability to replace the fat in cakes, *Progress in Nutrition,* vol. 20, suppl. 2, pp. 191-202. https://doi.org/10.23751/pn.v20i2-S.6527.

Article sent: 20.09.2025 г.