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EXTENDING THE SHELF LIFE OF A POTATO SEMI-FINISHED PRODUCT WITH THE HELP OF NATURAL PRESERVATIVES

Research article

Abstract

Perishable food is food which shelf life's duration is not more than 5 days. Therefore, extending the shelf life of perishable products is necessary. This action is needed, for example, for the transportation of products over long distances and their further sale. Food spoilage can be caused by microorganisms, enzymes or improper storage. Lower temperatures and preservatives are often used to increase the shelf life, and the preservatives can be chemically synthesized or natural. The aim of the article is to find ways to extend the shelf life of semi-finished potatoes using natural preservatives. Moreover, it is aimed at finding ways using natural preservatives. The research is carried out on the potato salad example. The graphs and tables show the results of the experiments. The results showed that 6% vinegar is the most suitable for extending the shelf life of semi-finished potatoes.

Keywords: semi-finished potato; table vinegar; prolongation of shelf life; natural preservatives; modified atmosphere (CO_2, N_2).

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УВЕЛИЧЕНИЕ СРОКА ГОДНОСТИ КАРТОФЕЛЬНОГО ПОЛУФАБРИКАТА С ПОМОЩЬЮ КОНСЕРВАНТОВ ЕСТЕСТВЕННОГО ПРОИСХОЖДЕНИЯ

Научная статья

Аннотация

Скоропортящиеся продукты - продукты, срок хранения которых не превышает 5 дней. Поэтому продление сроков годности скоропортящейся продукции является необходимым. Это нужно, например, для транспортирования продукции на дальние расстояния и ее дальнейшей реализации. Порча продуктов может быть вызвана с помощью микроорганизмов, различных ферментов или неправильного хранения. Для увеличения срока годности часто служат пониженные температуры и консерванты, причем консерванты могут быть химически синтезированными или же натуральными. Цель статьи - найти способы продлить срок хранения картофельного полуфабриката с использованием натуральных консервантов. Исследование проводится на примере картофельного салата. На графиках и в таблицах представлены результаты экспериментов. Результаты показали, что уксус 6% наиболее пригоден для продления срока годности картофельного полуфабриката.

Ключевые слова: картофельный полуфабрикат; столовый уксус; пролонгирование срока годности; естесственные консерванты; модифицированная газовая среда (CO_2, N_2).

1. Introduction

Perishable products - products, the shelf life of which does not exceed 5 days [1], [3].

It is very important to guarantee food safety avoiding changes over time.

Food spoilage can be caused by:

-microorganisms (bacteria, mold);

-enzymes;

-macroorganisms (insects, larvae, mice, etc.);

-environmental conditions: light, temperature, humidity, oxygen.

For storing perishable food, it is best to use refrigerators or freezers that maintain a low ambient temperature. One of the ways to preserve food can be drying. For example, a study has been carried out that has shown that partially dried cherry tomatoes (up to a water activity of 0,746 to 0,868) and vacuum packed can be stored at 4-30^{o}C for 60 days [10].

In addition to long shelf life, the researchers are trying to reduce the loss of nutrients from the product and prevent changes in taste [11].

Another possibility is to include chemical additives such as salt or acids in the food to prevent the growth of microorganisms. This allows food to retain its nutritional value for longer.

Perishable food products after opening the package during the sale must be sold within no more than 12 hours from the moment of opening under the established storage conditions (temperature, humidity) [1].

Repackaging or repacking of perishable food products after opening is not allowed. The package changing after breaking the integrity of the primary packaging of the manufacturer is prohibited. In organizations that sell food products, packaging also cannot be changed to establish new expiration dates for a product.

Salads and vinaigrettes are perishable products, the storage period of salads with dressing is not more than a day [1]. There is a need for products that will meet safety requirements for a longer time and at the same time will not lose consumer properties.

Consider the use of natural preservatives to extend the shelf life of salads [7]. The most famous natural preservatives are acetic acid, citric acid, garlic, and some spices that are widely used in eastern countries for the disinfection and food storage (ginger, turmeric, hot red pepper, black pepper, garlic) [7], [8].

Aim: Extension of the shelf life of the salad without loss of organoleptic and physico-chemical qualities and properties, with the use of preservatives of natural origin. Ensuring the safety of lettuce with an extended shelf life.

To achieve this goal a three-stage experiment was conducted. As a research object, one-component potato salad was chosen. The choice of the object of study was made due to the fact that potatoes are included in the recipe of most boiled vegetables salads [4], [8].

Early harvest Riviera potatoes were taken for the study. This is a variety for dining purposes. The pulp is yellow. Starch content is 13-16%. It was grown in the northwest region. The tubers are oval, with a creamy pulp. The skin is light beige and slightly rough.

For salads, table varieties of potatoes with an average starch content of 12-16% are chosen. If there is a lot of starch, potatoes will darken quickly, while impairing the organoleptic characteristics of the product.

Stage I is aimed at choosing a natural preservative, providing long-term storage of salad.

Stage II is aimed at determining the maximum shelf life of the salad with the selected preservative.

Phase III: physico-chemical, microbiological studies.

2. Results

2.1. Stage I

A technological scheme for the production of potato salad was developed by organoleptic method [2] at the first stage of the experiment (Figure 1), the antimicrobial effect of some natural preservatives in salad dressing was analyzed [7], [8]. Vinegar with concentration of 3% and 6% was made from 9% vinegar by adding water.

Options for refills for experimental samples:

- Vegetable oil + table vinegar 3 %, 6 %, «Dyadya Vanya» 9 %
- Vegetable oil + grape vinegar «Dyadya Vanya» 6%
- Vegetable oil + apple vinegar «Dyadya Vanya» 6%
- Vegetable oil + balsamic vinegar Kuhne Italian original 6%
- Vegetable oil + ginger
- Vegetable oil + turmeric
- Vegetable oil + red hot pepper
- Vegetable oil + mix of peppers
- Vegetable oil + granulated garlic
- Vegetable oil + citric acid

As a preservative table vinegar was experimentally selected. The use of spices and other types of vinegar as preservatives showed its inconsistency during long-term storage. Components contained in spices do not ensure the safety and freshness of the salad.

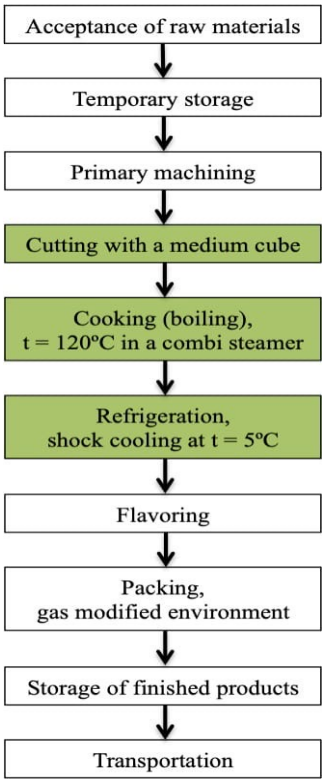


Figure 1 – Technological scheme for the production of potato salad

2.2. Stage II

Four samples were selected for the second stage of the experiment. The control sample is a potato salad without dressing, and three samples with the addition of table vinegar in concentration of 3.6, and 9% as a preservative. Samples are packed in modified atmosphere [4], stored at +2 .. + 4 C with daily sensory evaluation. Organoleptic analysis is carried out without the use of devices, only using the senses of the taster. The assessment was based on the degree of boiled potatoes, their smell, taste and color.

According to the results of the second stage, the maximum storage period is seven days, with the addition of 6% table vinegar to salad dressing. Due to greater activity table vinegar concentration of 9% gives the potato a pronounced sharp sour taste, 3% table vinegar's antimicrobial activity is not enough for long-term storage.

2.3. Stage III

At the third stage, we will check the safety of the samples taken on the seventh day of storage by physico-chemical [6] and microbiological methods [5], [6]. Prepare three samples. Sample №1 –controlled, without refueling. Sample №2 - the ratio in the dressing vegetable oil: table vinegar 6% 1:1. Sample №3 - the ratio in the filling of vegetable oil: table vinegar 6% 2:1. Samples are shown in Figure 2. On the seventh day of storage, we evaluate the organoleptic characteristics of the samples [2].

Figure 2 – Samples of stage III

In all samples, we determine the content of dry substances [6], the total titratable acidity [6] on the day of the laying of the samples and on the seventh day of storage, the change in pH during storage [6].

The method for determining titratable acidity is based on neutralizing the acids contained in the product with a sodium hydroxide solution in the presence of phenolphthalein indicator. Two parallel measurements were carried out at 3%, 6% and 9% of the concentration of table vinegar.

The dry matter content is determined by drying the sample in a drying oven. The method is based on the release of gyroscopic moisture from the object under study.

The active acidity of the samples is determined using a pH meter.

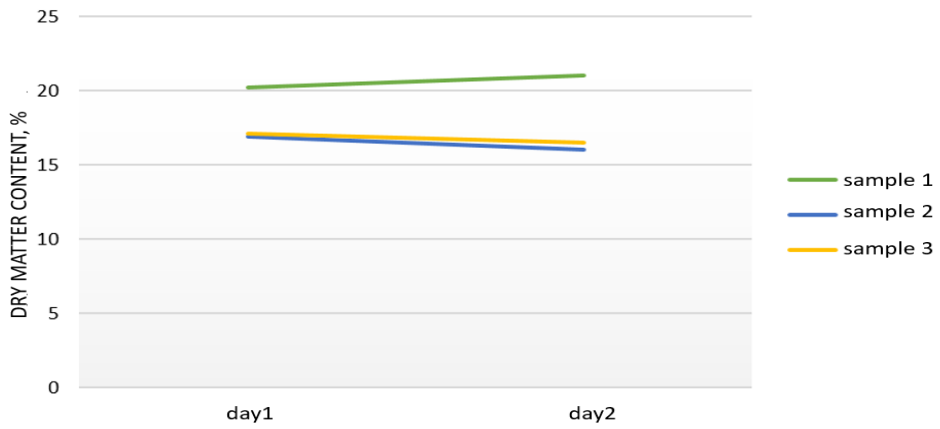
The solids content and the value of total titratable acidity during storage did not change significantly. The pH value in the control sample shifted to the alkaline side from 6 to 8. In the Samples with vinegar, the values remained approximately at the same level from 4.2 to 4.7.

The results of determining the total acidity are presented in table 1.

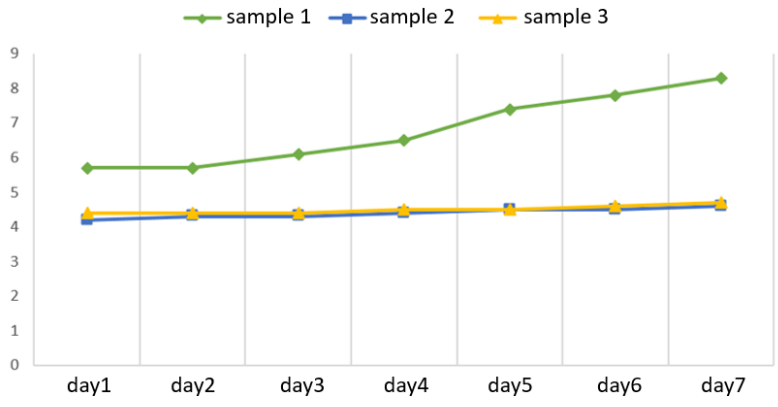
Table 1 - Determination of total titratable acidity

	1 dimension			2 dimension		The average value of the total titratable acidity,%
	NaOH ml for titration	Estimated total acidity,%		NaOH ml for titration	Estimated value of total acidity%	
1	2	3		4	5	6
Sample storage day						
Sample #1 Control	2,000	0,030		2,100	0,033	**0,032**
Sample # 2 1:1	5,000	0,075		5,200	0,078	**0,076**
Sample # 3 2:1	5,300	0,080		5,200	0,780	**0,770**
Seventh day storage						
Sample #1 Control	2,400	0,036		2,300	0,035	**0,036**
Sample #2 1:1	5,500	0,083		5,700	0,085	**0,084**
Sample #3 2:1	5,800	0,087		5,900	0,089	**0,088**

The dynamics of pH values and the content of solids is presented in Figure 3a, 3b.



a



b

Figure 3 – *a* – change in dry matter content during storage, *b* – the change in pH

Fixed smears were prepared using methylene blue dye. The prints were examined through the «Biomed 2» immersion objective at x100 magnification. In the microbiological smear method, no imprint changes were found during storage in samples with vinegar. In the control sample in the field of view, single microorganisms are rounded [5]. The results of the microbiological study are presented in Figure 4a, 4b, 4c.

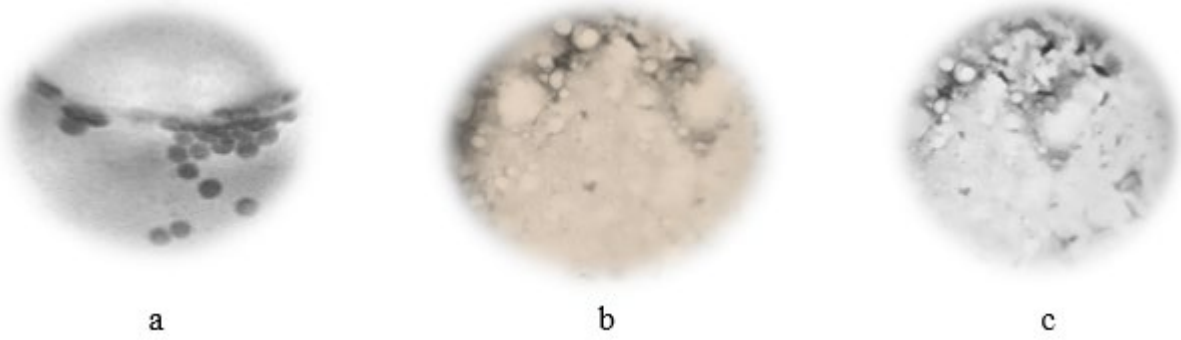


Figure 4 – Fingerprints 7 day storage *a*) sample number 1 *b*) sample number 2 *c*) sample number 3

3. Conclusion

During the three-step experiment, the optimal technological scheme for the production of single-component potato salad of long-term storage was chosen [4]. The method of extending the shelf life is chosen: exposure to low temperatures; application of "cook&chill" technology [4]; the use of a natural preservative - table vinegar 6%; packaging is gas modified environment.

The maximum storage period of potato salad at a temperature of +2 .. + 4oC in individual packaging in the presence of gas-modified environment for seven days is set. It was experimentally found that not seasoned potato salad in the presence of gas-modified environment is stored for no more than three days.

In a series of tests, table vinegar at a concentration of 6% was chosen as a preservative to ensure long-term storage and safety of potato salad.

The results of organoleptic evaluation of samples using table vinegar 6% were confirmed by studies of physico-chemical and microbiological methods.

Conflict of Interest

None declared.

Конфликт интересов

Не указан.

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