

Determination of qualitative characteristics of wheat bread with plantain powder

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Abstract. The effect of plantain powder on properties of the finished bakery product is investigated in the article. The organoleptic properties of the control bread sample without using of additives and samples with plantain powder from 3% to 9% were identified. Further, the mass fraction of moisture and acidity of the control sample and wheat bread with plantain powder were determined. As a result, it was found that the additive has an effect on wheat bread and its properties. The optimal dosage is powder in an amount of 3-5% to the total flour.

Keywords: bread, functional product, plantain, vegetable raw materials, processing of vegetable raw materials, food industry, technology.

Introduction

Vegetable raw materials stipulate practical interest as a perspective component for development of functional food products. Therefore, studies aimed at creating new varieties of functional bakery products using non-traditional plant raw materials of South Kazakhstan are of theoretical and practical interest.

Development of a scientifically based technology of bread using functional plantain powder is new issue. Plantain, which grows in South Kazakhstan, is an unconventional plant raw material for bread production.

The purpose of the study is to determine the organoleptic and physicochemical properties of bread in order to clarify the influence of plantain powder on quality indicators of the finished bakery product.

Materials and methods

Experimental studies were carried out in the laboratories of M.Auezov South Kazakhstan University, LLP "Dani nan".

Generally accepted and special physical, chemical, organoleptic methods for studying the properties of finished products have been applied in the study.

In the course of the study, 5 laboratory samples of bread were applied that prepared by batter method from premium flour with the addition of plantain powder in the amount of 3-9% of the total amount of flour.

Results and discussion

Organoleptic analysis permits to determine external qualities of wheat bread. A visual method based on perception of external view and color of an object has been applied for evaluation of appearance of investigated bread samples, as well as the porosity of the crumb.

A tactual method based on perception of smell by means of olfactory organ has been applied for determination elasticity of crumb.

A table with results of study of organoleptic properties of bread with plantain powder is below.

Table 1 – Characteristics of sensory indicators of wheat bread

Indicator	Control sample (without additive)	3% of plantain powder	5% of plantain powder	7% of plantain powder	9% of plantain powder
Form	Rounded, fairly symmetrical, regular	Rounded, fairly symmetrical, regular	rounded, symmetrical, not drifted apart, without lateral protrusions	rounded, symmetrical with a slightly convex upper crust, without lateral protrusions	round, symmetrical, without cracks and explosions, not drifted apart, has no lateral protrusions
Surface of product	Matt, not burnt, cracks and explosions are absent	Matt, not burnt, cracks and explosions are absent	Matte, without large cracks and explosions, not burnt	Surface is matte, rough, without large cracks and explosions.	Matt, with a slightly convex upper crust
Colour of crust	Golden yellow	Uniform, light brown, not burnt or pale	Brown, uniform	Brown, uniform	Golden brown, without burning
Bread crumb	white color without lumps and traces of undermixing, when pressed, completely restores its original shape	beige	brown with a grayish tinge, baked, not wet to the touch, elastic, after light pressure with fingers takes its original shape	baked, not wet, without lumps and traces of undermixing	brown. The sample crumb is baked, not wet to the touch, elastic, without lumps and traces of undermixing
Porosity	Non-uniform and there are large pores on the cut	More uniform	developed, without emptiness and hardened spots, pores are small, thin-walled	Uniform, small spores, good elasticity, residual deformation is absent	Developed, without emptiness and hardened spots

Taste of bread	savorless, there is no crunch on the teeth when chewing	savorless, there is no crunch on the teeth when chewing	Pleasant, weakly expressed taste of additive	Good elasticity, residual deformation is absent	Sweetish taste
Smell	Pleasant, peculiar to the given kind of product, without outside smells	Pleasant, peculiar to the given kind of product, without outside smells	Pleasant, slightly expressed smell of additive	pleasant taste, without the presence of crunch on the teeth when chewing	Pleasant taste of additive

So, it may be concluded that samples of bread with adding of plantain powder had more intensive colour of crust, mouth-filling taste and aroma due to presence of tannins, organic acids, as well as contained enanth-ethyl and pellargon-ethyl ethers, which have a specific aroma characteristic of plantain powder.

In addition, in products with plantain powder the crumb porosity compare with control sample is smaller, more uniform and thin-walled, without emptiness and signs of cores in bread (non-loosened areas of the crumb); the color of the crumb is darker - from beige (addition of 3%) to light brown (addition of 5-7%) or brown (with the addition of powder in the amount of 9%); the crumb of fresh bread is soft, well-baked, not sticky and not wet to the touch, elastic, after light pressure with a finger it takes its original shape.

Also, a more intense color of the upper crust, a pleasant light aftertaste and a mild aroma of plantain powder are noted.

It should also be noted that with increasing amount of additives, finished products acquire a sweetish taste, which can be explained by the high content of sugars in ripe fruits - glucose, fructose, sucrose (up to 10.85%).

Determination of physicochemical parameters was carried out 3 hours after the products left the oven and no later than 24 hours, according to requirements for wheat bread made from high-quality flour.

The mass fraction of moisture is an indicator for assessing the quality of finished products. By the mass fraction of moisture in bread, it is possible to judge its energy value. The higher mass fraction of moisture, the lower content of dry substances of bread and the lower its energy value.

High moisture reduces calorie content and deteriorates quality of bread. Bread becomes heavier and less absorbed by the body. Such bread is more quickly exposed to mold, diseases and easily deformed. Low moisture content of bread leads to the fact that it becomes dry, quickly stale, and its taste deteriorates. Moisture content of different products ranges from 34 to 51%.

Mass fraction of bread is determined for calculation its yield and checking correctness of conducting of technological process - accuracy of dosing of basic raw material, flour and water. When mass fraction of moisture of bread is increased for 1%, its yield will rise for 2-3%.

Determination of mass fraction of crumb moisture was carried out by drying out of the sample in a drying oven at definite conditions and expressed in percentage:

Humidity (W) in percentage is calculated by the equation:

$$W = \frac{m_1 - m_2}{m} \cdot 100\% \quad (1)$$

where m_1 - weight of casserole before drying, g;

m_2 — weight of casserole after drying, g;

m — mass of sample, g.

The arithmetic average of results of two parallel determinations is taken as the final result.

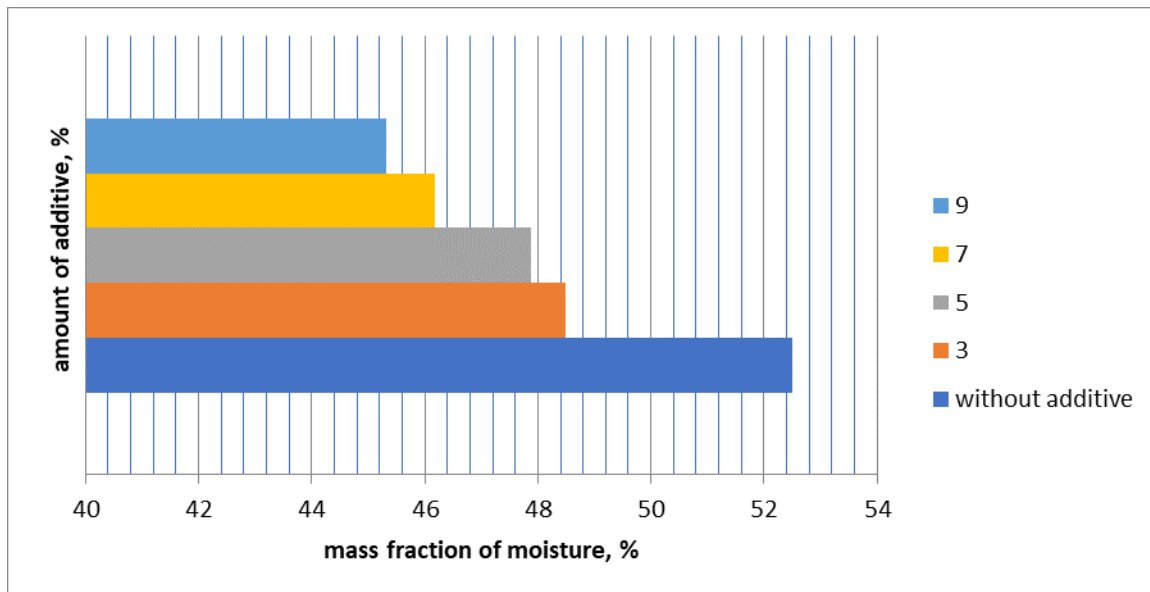


Figure 1 - Mass fraction of bread moisture

Based on the data obtained, a diagram of dependence of moisture content on the amount of applied powder is presented (Fig. 1).

According to Figure 1, it can be seen that with increasing of amount of added plantain powder, the moisture content of the finished products decreases, which permits to make a conclusion about increasing of amount of dry substances, as well as an increasing of energy value of bread.

Acidity of bread was determined in order to assess the correctness of the technological process, also the taste of wheat bread. Acidity of bread is mainly stipulated by products obtained in a result of dough fermentation process. Acidity is expressed in degrees of acidity.

Acidity of flour was calculated by the equation:

$$X = \frac{V \cdot 250 \cdot 100}{25 \cdot 50 \cdot 10} = 2V \quad (2)$$

where: V — volume of 0,1 mol/dm³ alkali solution spent for titration, cm³;

m — weight of bread sample, g;

100 — coefficient for conversion per 100 g of product;

10 — the coefficient for converting 0.1 mol/dm³ of sodium hydroxide solution into 1 mol / dm³ solution.

Based on the data obtained, a diagram of dependence of acidity on amount of added powder is presented (Fig. 2).

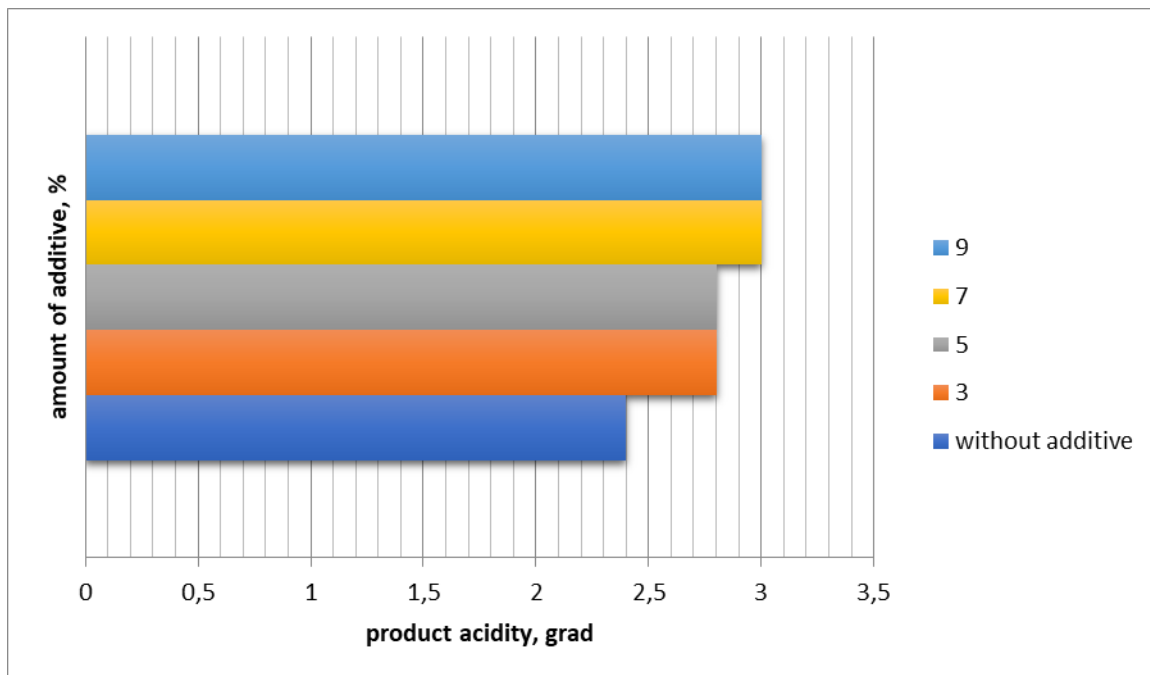


Figure 2- Bread acidity

It is seen from Figure 2, that with addition of 3% of plantain powder the acidity of finished product increased for 0.2 grad compare to the control sample without additive. When 5% plantain powder is added, the acidity of the finished product also increases by 0.2 degrees compared to the control one. Adding 7 and 9% of plantain powder to the total mass of flour increases the acidity of the bread by 0.4 degrees in comparison with the control sample.

According to the data obtained, it can be concluded that an increase in the amount of added additives increases the acidity of finished products slightly. All the values obtained are within the limits of the norms, the indicator of which should not exceed 3g, for bread made from wheat flour of the highest grade, in accordance with the requirements of the standards.

Conclusion

A study of influence of plantain powder on properties of wheat bread was carried out. Analysis of finished samples of the studied bread showed that bread samples with addition of plantain powder have a more intense color of crusts, a rich taste and aroma. In addition, products with addition of powder have a finer, more uniform and thin-walled crumb porosity, without emptiness and signs of cores in bread. In this case, the crumb acquires a darker color - from beige to light brown or brown. It was also revealed that with increasing of amount of added powder, finished products acquire a sweetish taste.

When studying the effect of plantain powder on physicochemical indicators of quality of finished bread, it was found that with an increase in amount of additive, the moisture content of finished products decreases, which indicates an increase in content of dry substances, as well as an increase in energy value of bread. It was found that acidity index of finished bread also increases with rising of amount of applied powder. This improves the freshness of bread.

According to organoleptic and physicochemical indicators of quality of bread with additives, the optimal doses of plantain powder in the amount of 3-5% to the total mass of flour have been established.

References

1. <http://www.hlebopekar.ru/hleb/> Date of treatment 04/21/2021
2. <http://polzaivred.net/polza-ajvy/> Date of treatment 04/21/2021
3. <http://www.hlebtver.ru/good-to-know/1794/> Date of treatment 04/21/2021
4. Plotnikov P. M., Kolesnikov M. F. 350 varieties of bakery products.-M.: Pishchepromizdat, 2017. - 312 p. (in Russian)
5. Roiter I.M. Handbook of bakery production. Volume 2: Raw materials and technology. - M: Bukinist, 2015. - 366 p. (in Russian)
6. Jeffrey Hamelman. Bread. Technologies and recipes. - M: Profession, 2018. - 432 p. (in Russian)
7. hlebinfo.ru/prostoy-domashniy-chiliyskiy-hleb.html Date of treatment 04/21/2021
8. hlebinfo.ru/znamenitiy-irlandskiy-ovsyanyiy-hleb.html Date of treatment 04/21/2021
9. Lichko N.M. Processing technology of crop production M.: KolosS, 2013. - 552 p. (in Russian)
10. Ivanova T.N., Zhitnikova V.S., Levgerova N.S. Technology for storage of fruits, berries and vegetables - Orel: Orel State Technical University, 2019. -- 203 p. (in Russian)
11. Boronoeva G.S., Dorzhiev V.V., Halapkhanova L.V., Bilgaeva T.A., Zayatueva M.G. Modern technologies for production of bread, confectionery and pasta // Laboratory practicals / - Ulan-Ude: VSGTU, 2014. - 32. (in Russian)
12. Smirnova N.A., Nadezhnova L.A., Selezneva G.D., Vorobyova E.A. Merchandising of grain and confectionery goods M.: Economics, 2014 - 352p. (in Russian)
13. Obrezkova M.V., Egorova E.Yu., Guryanov Yu.G. Grain and grain products. Book 2. Bakery and pasta. Technology and quality assessment - Biysk: BTI AltGTU, 2015. -- 140 p. (in Russian)
14. Kolesnik A.A., Elizarova L.G. Theoretical foundations of commodity science of food products -M: Economics, 2017. - 296 p. (in Russian)
15. http://health-diet.ru/base_of_food/sostav/22.php Date of treatment 04/21/2021
16. Panov D.P. Enrichment of food products for mass consumption / D.P. Panov // Food ingredients, raw materials and additives. - 2017. - No. 1. - pp. 30-31. (in Russian)