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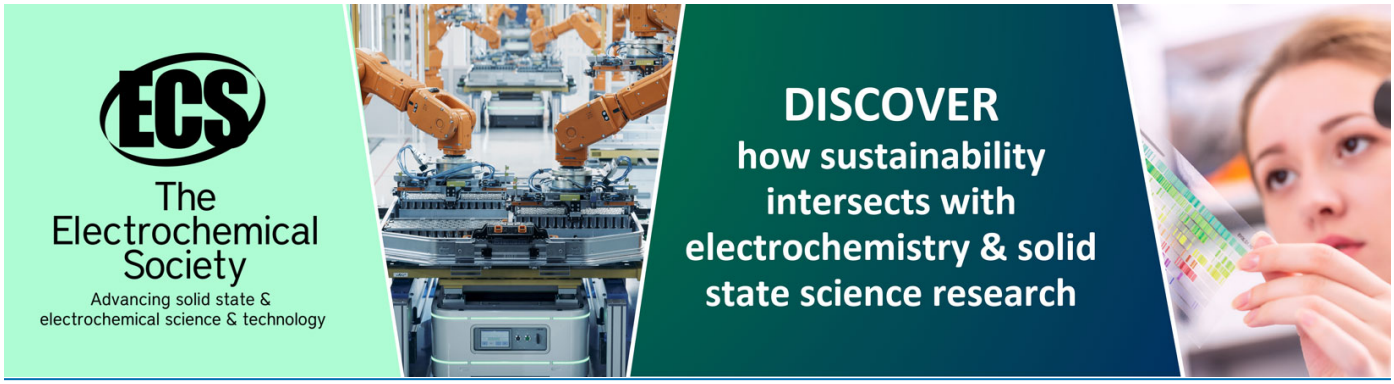

Influence of food additives for quality indicator of yeast dough

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Abstract. In this article is presented the method and technology of preparation wheat and rye dough with hemp flour, elaborated technological parameters of preparation products from yeast dough with hemp flour additive and researched its influence for the duration of the technological process of preparing buns; determined the impact of different dosage of hemp flour for organoleptic and physical and chemical indicators of quality; shown comparative assessment of amino acids' composition of developed samples with controls. Furthermore, it was found that an increase of fermentation intensity and gas formation with a concentration of up to 10% contributed to an increase in the specific volume and a change in the porous crumb structure of the bun. It's showed that an increase of dosage of hemp flour over 10% reduce porous crumb structure-specific volume and adverse effect for structural and mechanical indicators of bun's quality, such as decrease of gluten, concentration of starch, which is main source of fermentable sugars, porous crumb structure and specific volume.

1. Introduction

One of the most priority directions of technological platforms as «Healthy nutrition» and «Biotech 2030» is the development of foodstuff, which fosters the improvement of people's health and decrease risks of diseases and medication load. The development of functional foods is essential, because nowadays decreases the level of alimentary diseases, and causes a reduction of labor productivity and a declaration of economy. In our fast-moving world, some people start to think about significant principles of rational nutrition, taking into consideration the main food substances such as fats, proteins, carbohydrates, vitamins, and minerals. Furthermore, become popular functional foods which is a special food product that provide nutrients and energy, and enriched with natural components with a specific health-promoting effect

2. Materials and methods

To increase the nutritional value of bread and buns the hemp flour is used. Hemp flour is a source of non-essential amino acids such as alanine, arginine, asparagine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, proline, serine, and tyrosine. The main part of proteins composition in this flour are glutamic amino acid (5.31%), arginine (3.35%), aspartic acid (2.97%), serine (1.6%) valine (1.42%), glycine (1.2%), phenylalanine (1.14%), lysine (0.9%). Hemp flour is rich with vitamin E and contain all essential macroelements and microelements such as magnesium, potassium, phosphorus, calcium, iron, manganese, zinc, sulfur, and chlorine. Whole hemp seeds contain 25% to 35% oil, 20% to 25% protein, 20% to 30% carbohydrates.

In our experiments was used wheat flour with humidity 13% and gluten of 1st quality group, rye flour with humidity 14%, hemp flour with humidity 16%.

For research was used 3 types of buns such as: wheat-hemp, rye-hemp, and as controls used wheat-rye. In the recipe of these buns added 10% of hemp flour. The recipe dough contains flour, yeast, sugar, salt, water.

All samples were tested with organoleptic and physical and chemicals methods. State standards 26574-2017 and 26574-85 were used for determining the quality of flour. The nutritional value of the samples was measured by the calculation method.

3. Development stages of design and technological solutions

To study the influence of hemp flour for quality of buns conducted test bakes. Dough was prepared without leavened, included kneading the dough from wheat flour, rye flour, compressed yeasts, salt solution, fermentation of dough, rise of buns, and baking. The temperature of fermentation was 30-32. In the wheat flour samples was determined initial and final acidity, the intensity of acid accumulation, humidity, changes in the volume of the dough, the duration of fermentation and proofing. Hemp flour was added in the amount of 10%. The control was sample with rye-wheat flour without hemp flour.

During proofing was observed that more time takes rising of Rey-wheat control samples, in contrast, the least time takes fermentation process of Rey-hemp sample (table 1).

Table 1. Technological parameters of preparation of products from yeast dough with hemp flour.

Technological process	Rye-wheat	Rye-hemp	Wheat-hemp
Fermentation, min	40-45	30-35	35-40
Proofing, min	45	30	35
Baking, min	25-30	25-30	23-25
Temperature, ^{o}C	180	180	180

The addition of hemp flour has a positive effect on the mode of preparation of buns from premium wheat flour, rye baking flour, reduces the fermentation time of the dough, the duration of proofing and baking of dough pieces.

A comparative assessment of the amino acid composition of various types of tests is presented in table 2.

Table 2. Comparative characteristics of the amino acid composition of various types of dough.

Parameter	Rye-wheat	Rye-hemp	Wheat-hemp
Tryptophan, g	0.096	0.101	0.094
Threonine, g	0.255	0.320	0.311
Isoleucine, g	0.319	0.283	0.291
Leucine, g	0.579	0.511	0.536
Lysine, g	0.233	0.169	0.161
Methionine, g	0.139	0.132	0.130
Cystine, g	0.173	0.188	0.181
Phenylalanine, g	0.411	0.405	0.395
Tyrosine, g	0.213	0.171	0.162
Valine, g	0.379	0.274	0.290
Arginine, g	0.325	0.298	0.290
Histidine, g	0.182	0.163	0.156
Alanine, g	0.299	0.255	0.248
Aspartic acid, g	0.442	0.300	0.275
Glutamic acid, g	2.603	2.690	2.680
Glycine, g	0.302	0.263	0.258
Proline, g	0.909	0.698	0.680
Serine, g	0.417	0.204	0.195

The results of studies of the amino acid composition of the product indicate the presence of all essential amino acids, except for cystine. However, their content is 1.5-2 times lower compared to the analog.

The analysis of the obtained data shows significant advantages of the amino acid composition of the rye-hemp test in comparison with the wheat-hemp sample. These experimental test samples are characterized by a high content of lysine, methionine, valine, alanine, glycine, proline, tryptophan, and phenylalanine.

The content of essential amino acids in hemp flour supplements the product with nutritional properties.

Table 3 shows the nutritional and energy value of the developed test and control samples (rye-wheat).

Table 3. Nutritional value of samples.

Parameter	Rye-wheat	Rye-hemp	Wheat-hemp
Proteins, g	8.6	10.3	11.6
Fats, g	5.8	5.7	5.9
Carbohydrates, g	67.7	63.4	58.8
Energy value, kcal	349.6	336.4	341

The addition of hemp flour increases the biological value of rye-wheat sample proteins.

The obtained buns from wheat flour of the highest grade, rye bread flour with the use of hemp flour were evaluated by organoleptic indicators on a 75-point scale (table 4). When tasting the following criteria were applied: the shape of the product, condition of the surface of the crust, color of crust, nature of porosity, color of the crumb, the elasticity of the crumb, taste, flavor, chewability.

Table 4. Tasting evaluation of experimental samples of rye-wheat buns with the addition of hemp flour.

Parameter	Rye-wheat	Rye-hemp	Wheat-hemp
The form	5.0	5.0	5.0
The color of the peel	3.0	5.0	5.0
Surface condition	4.0	4.0	5.0
The crumb color	8.0	6.0	4.0
Porosity structure	4.0	5.0	6.0
The elasticity of the crumb	7.5	12.5	10.0
Flavor of bread	10.0	12.5	10.0
Taste of bread	7.5	10.0	5.0
Chew ability	4.0	4.0	4.0

Wheat flour buns with the addition of 10% hemp flour scored the lowest number of points (54) since the color of the crust and crumb had a brown color and a strongly pronounced taste of the additive. which is not characteristic of this type of bread. Rye flour buns with the addition of 10 % hemp flour scored the highest number of points (64.0). had an attractive appearance. delicate taste and pronounced aroma. good volume. and developed porosity. Thus. hemp flour improved the quality of buns.

The dough was prepared by mixing flour. hemp additives. thick rye sourdough. salt. sugar. yeast. and the estimated amount of water. The additive was added instead of 12% wheat flour according to the recipe. The kneaded dough was fermented to a final acidity of 8-10 Oh. divided into pieces. placed on oiled sheets. spread out. and baked at a temperature of 220°C. 12 hours after baking. bread samples were examined for organoleptic and physical and chemical parameters. The control sample was prepared without using hemp flour.

During the proofing of the test. the control sample from rye-wheat flour rose the longest. and the sample from rye-hemp flour rose the fastest. but it was inferior to the same process. which took place at

an additive concentration of up to 8-10%. The samples were denser. The volume of the rolls is smaller in comparison with the previous experiments.

The results of the organoleptic evaluation of the developed samples and the control are shown in figure 1.

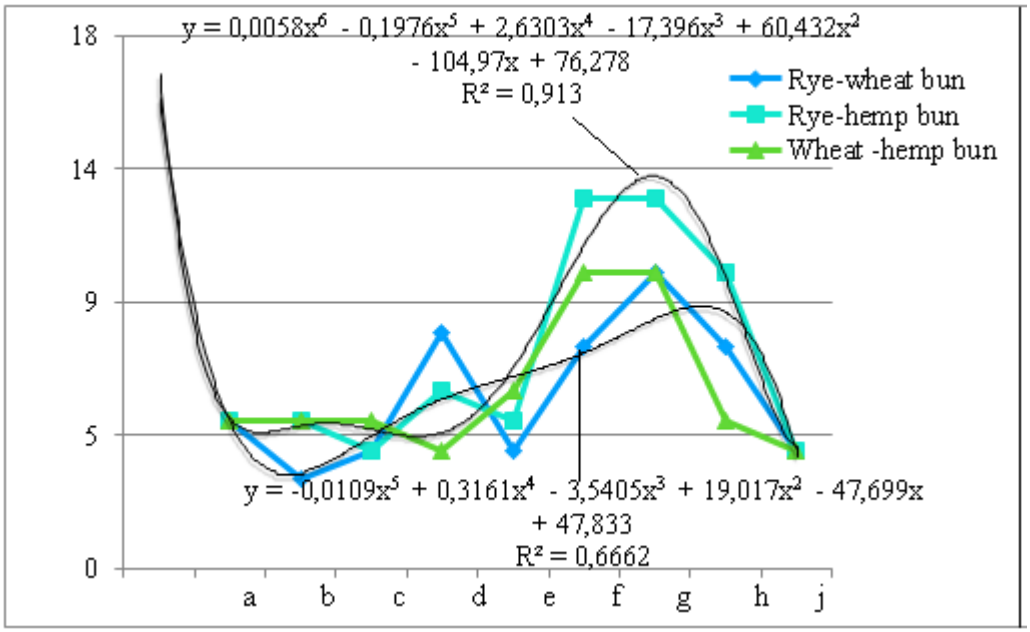

Figure 1. Organoleptic evaluation of new samples: a - the correctness of the form. b - coloring the crust. c - surface state. d - the color of the crumb. e - the structure of porosity. f - the elasticity of the crumb. g - the aroma of the bun. h - taste of buns. j – chewing.

The results of the study of the effect of hemp flour dosages on the physical and chemical quality indicators of the dough for rolls are presented in the table 5.

Table 5. Physical and chemical quality indicators of dough for buns.

Sample	Acidity, deg N	Humidity, %
Rye-wheat	0.985	49.0
Rye-hemp	1.875	49.5
Wheat-hemp	1.675	36.0

Thus. in all the samples studied. except for the rye-hemp bun with 10 % hemp flour. the specific volume and porosity increased in comparison with the control sample. This is probably due to the fact that when using hemp flour. which is rich in proteins. sugars. and minerals. the fermentation activity of yeast cells increases. As a result. the intensity of fermentation and gas formation in the dough increases. which leads to an increase in the specific volume and porosity of the bun crumb. However. increasing the dosage of hemp flour by more than 10% in the formulation leads to a decrease in porosity and specific volume. The negative effect of high supplements of hemp seed flour on the structural-mechanical indicators of the quality of the rolls can be explained by the fact that at its introduction. there is a decrease in the amount of gluten. as well as the total amount of starch serving as the main source of fermentable sugars. which leads to a decrease of porosity and specific volume of finished products and. consequently. to seal crumb buns.

4. Conclusions and recommendations

Buns with the addition of hemp flour have pleasant organoleptic properties. have a mild taste. characteristic of this type of additive. Also. this type of buns allows you to meet the daily human need for dietary fiber and protein.

The conducted research confirms the feasibility and prospects of using hemp flour in the production of rye-wheat buns. which reduces the technological process of their preparation. improves the organoleptic and physical and chemical indicators of product quality. and also increases the biological value of wheat and rye flour buns.

The recommended concentration of the additive is 10% by weight of the flour used according to the recipe.

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