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**Аннотация:** В этом исследовании изучалось влияние времени обработки ультразвуком на стабильность и антиоксидантную активность двойной эмульсии, наполненной фукоиданом. Увеличение продолжительности обработки ультразвуком с 4 до 10 минут значительно повысило устойчивость эмульсии к расслоению (с 60% до 93%) и повысило антиоксидантную активность ДФПГ (с 60% до 92%). Оптимизированная 10-минутная эмульсия, обработанная ультразвуком, имела небольшой размер капель 460 нм. Исследования выполнены при финансовой поддержке гранта РФФ 22- 76-10049.

**Ключевые слова:** Фукоидан, двойная эмульсия, антиоксидант, ультразвук.

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## CHANGES IN QUALITY INDICATORS OF SPROUTED WHEAT GRAINS IN BREAD PRODUCTION

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**Abstract:** Grain bread is the most important source of dietary fiber, vitamins, trace elements and amino acids. In terms of nutritional and biological value, this bread is superior to all traditional types of bread, especially bread baked from high-quality flours. The article presents the results of a study of organoleptic, chemical and microbiological indicators of sprouted wheat grains for further use in bread production.

**Key words:** sprouted grain, grain bread, wheat, microbiological indicators

*Introduction.* Traditional types of bread are baked from flour together with the crusts, removing all or part of the membrane, the embryo, the grain layer in the aleurone

- B vitamins, vitamin E, tocopherols, dietary fiber and valuable mineral components - iron, magnesium and phosphorus. The producers of Presenter Global have set themselves the task not only of improving the organic quality of the bread, but above all of preserving its natural and nutritious nutrients. Sprouted wheat grains are of particular interest; their use makes it possible to diversify the range of products, give products an original flavor range and enrich them with biologically active substances.

Currently, despite the undoubted high nutritional values, products obtained from sprouted grains are not sufficiently represented on the Kazakh market.

In this regard, the creation of a wide range of new products that rationally use valuable cereal components and significantly reduce production costs is an important and urgent issue. In this regard, the technology of producing bread with additional cereal components is becoming increasingly widespread.

The use of sprouted grains in bread production is a promising direction. Sprouting converts indigestible substances into an accessible form and increases the amount of vitamins and minerals. In terms of nutritional and biological value, cereal breads are superior to all traditional types of bread, especially those made from high-quality flours, in terms of fiber, vitamins, trace elements and amino acid content. Bread made from sprouted wheat (*Triticumaestivum L.*) has the highest value. This is because when the grain is sprouted, indigestible compounds are converted into simple compounds and it contains large amounts of vitamins, amino acids, minerals and easily digestible carbohydrates. However, food products to which sprouted grains are added are characterized by their tendency to promote microbial contamination, which limits the expansion of the use of sprouted grains in bread production. Therefore, the development of bread production technology using sprouted wheat (*Triticumaestivum L.*) is of great importance today [1].

In connection with the above, food service technicians are faced with the challenge of developing new technologies for sprouting wheat grains [2-5].

#### *Materials And Methods*

Organoleptic, physicochemical studies were carried out in accordance with the requirements of GOST 13586.3-2015; GOST 13586.5-2015; GOST 10967-90; GOST 10846-91; GOST 29033-91; GOST R 52934-2008; GOST 10844-64. The study of the conditions and storage periods of sprouted wheat grain was carried out in accordance with TR CU 021/2011 and MU 4.2. 727-99 at a temperature of  $(4\pm 2)$  °C,  $(9\pm 1)$  °C.

Germination was carried out under the following technological conditions: temperature 28-30°C, humidity 70-90%. The time of grain germination was measured. The main controlled indicator of wet sprouted grain was the presence of an embryonic root no more than 2 mm long in 90% of the seeds.

Thus, according to Table 1, the indicators of wheat grain correspond to the norm. According to Table 2, the chemical properties of sprouted wheat grains are higher than those of dry grains. Especially, higher levels of protein and carbohydrates. According to the indicators in Table 3, the microbiological indicators of sprouted wheat are within the normal range and therefore it can be recommended to use sprouted grains as an additive in bread technology to increase the nutritional value of the final product.

*Results.* Thus, the studies have shown that sprouted wheat grain has high nutritional value. The resulting sprouted wheat grain has high organoleptic

characteristics.

Table 1

Determination of organoleptic characteristics of sprouted wheat grains

| Indicators | Dry wheat grain   | Sprouted wheat grain   |
|------------|---|--|
| Smell      | the condition of the grain is healthy, has normal characteristics characteristic of healthy grain                 | the condition of the grain is healthy, has normal characteristics characteristic of healthy grain  |
| Taste      | normal, characteristic of healthy grain of this type  | normal, characteristic of healthy grain of this type   |
| Color      | light yellow  | dark yellow with brown undertones  |
| Appearance | Grain mass horizontal. Grain shape: spherical, slightly flattened. Grain size: coarse. Grain surface: dry, smooth | Grain mass: horizontal. Grain shape: spherical, slightly flattened, with white buds shorter than 2 mm. Grain size: coarse. Grain surface: matted, wet with cracks. |

Table 2

Determination of the chemical properties of wheat grain

| Content indicators: | Dry wheat grain,% | Sprouted wheat grain, % |
|---------------------|-------------------|-------------------------|
| cellulose           | 1,84±0,05         | 2,3±0,05                |
| protein             | 10±0,05           | 15±0,05                 |
| fat                 | 2±0,002           | 2,4±0,002               |
| carbohydrates       | 63,5±0,03         | 70±0,03                 |

Table 3

Microbiological parameters of sprouted wheat grains

| Index                                    | Test results       | Acceptable indicators          |
|--|--------------------|--------------------------------|
| KMAFAnM, CFU/g                           | ≤4*10 <sup>4</sup> | No more than 5*10 <sup>4</sup> |
| Coliforms (coliforms) in 0.1 g           | Not detected       | Not allowed                    |
| Pathogenic, including salmonella in 25 g | Not detected       | Not allowed                    |
| Mold, CFU/g                              | ≤50                | No more than 50                |

This technology can be used in the public catering system to obtain food products of increased nutritional value.

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## **ИЗМЕНЕНИЕ ПОКАЗАТЕЛЕЙ КАЧЕСТВА ПРОРОШЕННОГО ЗЕРНА ПШЕНИЦЫ В ПРОИЗВОДСТВЕ ХЛЕБА**

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**Аннотация:** *Зерновой хлеб - важнейший источник пищевых волокон, витаминов, микроэлементов и аминокислот. По своей пищевой и биологической ценности этот хлеб превосходит все традиционные виды хлеба, особенно хлеб, выпеченный из высококачественной муки. В статье указаны результаты исследования органолептических, химических и микробиологических показателей пророщенных зерен пшеницы для дальнейшего использования в производстве хлеба.*

**Ключевые слова:** *пророщенное зерно, зерновой хлеб, пшеница, микробиологические показатели*

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