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THE INFLUENCE OF ULTRAHIGH FREQUENCIES ON THE PROTEIN COMPLEX OF WHEAT GRAIN

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ANNOTATION

The article is devoted to the study of flour produced by disinfected microwave for the baking properties of grain. The study of methods aimed at ensuring the quality and safety of grain products. Pest control measures for grain storage facilities are complex, costly and require a complete shutdown of production. Today, measures for disinsection of grain storage enterprises are relevant. Disinsection of grain is a complex, expensive process that requires a complete stop of production. Therefore, methods using microwave radiation, electric fields and other physical methods that do not require stopping production are of considerable interest.

Keywords: microwave, pests, power, wheat, humidity, gluten.

BUG'DOY DONINING OQSIL KOMPLEKSIGA O'TA YUQORI CHASTOTALI NURLARNING TA'SIRI

ANNOTATSIYA

Ushbu maqola dezinsektsiyalangan o`ta yuqori chastotali nurlar ta`sirida zararsizlantirilgan donning pishirish xususiyatlarini o'rganishga bag'ishlangan. Shuningdek, don mahsulotlarining sifati va xavfsizligini ta'minlashga qaratilgan usullarni o'rganish. Don saqlash korxonalarida zararsizlantirish tadbirlari murakkab, qimmat va ishlab chiqarishni to'liq to'xtatishni talab qiladi.Hozirgi kunda g'alla saqlash ishlab chiqarish korxonalarini dezinfeksiya qilish choralari-tadbirlari dolzarb hisoblanadi. Donni dezinfeksiya qilish - ishlab chiqarishni jarayonini to'liq to'xtatishni talab qiladigan murakkab, qimmat jarayondir. Shu sababli, o`ta yuqori chastotali mikroto`lqinlar, elektr maydonlar va ishlab chiqarishni to'xtatishni talab qilmaydigan boshqa fizik usullardan foydalanish samarali hisoblanadi.

Kalit so`zlar: mikrotolqin, zararkunandalar, quvvat, bugdoy, namlik, kleykovina.

ВЛИЯНИЕ СВЕРХВЫСОКИХ ЧАСТОТЫ НА БЕЛКОВЫЙ КОМПЛЕКС ЗЕРНА ПШЕНИЦЫ

АННОТАЦИЯ

Статья посвящена к изучению муки выработанной обеззараженной СВЧ на хлебопекарные свойства зерна. А также, исследованию методов, направленных на обеспечение качества и безопасности зерновых продуктов. Мероприятия по дезинсекции предприятий по хранению зерна являются сложными, дорогостоящими и требует полной остановки производства. На сегодняшний день актуальным является мероприятия по дезинсекции предприятий по хранению зерна. Дезинсекция зерна сложный, дорогостоящий процесс, который требует полной остановки производства. Поэтому значительный интерес представляют методы с использованием СВЧ - излучений, электрических полей и других физических методов, не требующих остановки производства.

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Ключевые слова: микроволны, вредители, мощность, пшеница, влажность, клейковина.

The production, processing and storage of grain plays an important role in the economy of any state and the life of society. Grain is the main raw material for the production of flour, compound feed, cereals on which, without exaggeration, the entire industry depends. With the acquisition of independence, the Republic has consistently pursued a course of achieving grain independence, reviving the production of sugar and other food products. In connection with the ongoing agrarian reform in the Republic, there have been significant changes in the structure of sown areas for grain crops and adjusted accordingly for cotton [1].

Providing the grain processing industry with high quality raw materials is a very serious task. The most important condition for obtaining high-quality grain is the fulfillment of technological requirements for each individual operation, and this requires the organization of on-farm control. This is the only way to achieve the rise of agriculture, improve the quality of grain and the productivity of all industries, as well as meet international standards. [2].

Today, measures for disinsection of grain storage enterprises are relevant. Disinsection of grain is a complex, expensive process that requires a complete stop of production. Therefore, methods using microwave radiation, electric fields and other physical methods that do not require stopping production are of considerable interest.

These methods are one of the most promising, environmentally friendly, operating continuously and allowing to reduce the cost of pest control while increasing its effectiveness. [3].

In the research, the task was set to identify the most acceptable technological parameters for processing raw materials from microwave and microwave fields. The task included the determination of the optimal parameters of the duration of exposure time, power value, the amount of gluten and the IDC (measurement of gluten deformation), at which the studied raw material was subjected to processing. Wheat of the 2nd class was used as the initial object. [10].

Consequently, in studies aimed at identifying the most acceptable value of the supplied power, two weighed samples of raw materials were weighed for each experiment. One sample was processed in a microwave field apparatus, the second served as a control.

The action of microwave for disinfection of grain exhibits heat treatment, which in turn leads to protein denaturation. Heating breaks hydrogen bonds and disrupts the interaction of hydrophobic groups. During thermal disinfection, the denaturation process occurs depending on the moisture content of the grain, temperature and duration of exposure.

When the minimum and average values of exposure and power are combined, a low temperature of 28-54ºC is created. The first signs of denaturation are observed, which are manifested in the form of a change in the extensibility of gluten. The extensibility increases, and its parameters acquire a value corresponding to another quality group. In this case, the GDM (gluten deformation meter) is higher than 95, instead of 80. The grain belongs to the III quality group. Gluten is characterized as unsatisfactory weak. Such flour is not suitable for bakery production, but in confectionery production it is precisely such flour that is needed..

When the temperature rises to 61ºC, which is caused by a combination of average operating parameters, a further denaturation process is observed, the viability slightly decreases.

When heated to a temperature of 71ºC and above, it becomes crumbly and often does not wash off at all.

The results of studies on the influence of the magnitude of power, time, gluten and IDC are shown in the table 1. Influence of the duration of microwave exposure on the effectiveness of disinfestation at a power of 180 watts.

Table - 1.

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The influence of the magnitude of power, time, gluten and IDC

№	Mode of action		Grain heating temperature t, °C	Gluten	
	Duration of time, s	Specific power W / dm³		Quantity gluten free, %	GDM indicator
1	40	180	28	25	80,3
2	80		42	25	80,2
3	120		49	23	80
4	160		54	23	75
5	Control		61	25	80

The method for determining the content of wet gluten is defined in accordance with 13586.1-68 standard. Crude gluten is a plastic-elastic substance composed of gliadin and gluten. The essence of the method is as follows:

A dough is prepared from a sample of wheat; the gluten substance is released by washing the dough; excess moisture is removed; raw gluten is weighed.

The effect of thermal disinfection with microwave energy changes the quality and quantity of the gluten complex (Table 1).

The destruction of the gluten complex occurs at a temperature of 75° C and above, which corresponds to modes 5-7 has a slight deterioration. Due to the porosity, the volume of baked goods is reduced. And the porosity, in turn, depends on the gas-holding capacity of the protein-protealytic complex. Under the influence of the modes of options 3-4 (temperature 49-54°C), the gluten is weakened. These modes are recommended. When processing grain with an GDM of 0-15 units. (unsatisfactory strong quality group), GDM indicator from 20-40 units. (satisfactory strong quality group) in the production of mills for the confectionery industry, where wheat with an IDC of 45-75 units is used. good, in the production of grinding, GDM is used with an indicator of 80-100 units. (satisfactory strong quality group). The mode of options 1-2 (heating to a temperature of 28-42°C), on the contrary, strengthens the gluten. Decontamination modes affect the technological properties of grain, causing various changes in the quality of gluten. Thus, depending on the purpose of using the batch of flour produced, the GDM indicator can be adjusted in accordance with the quality group (Table 2).

Table - 2

Determination of the quality of gluten on the device GDM -1.

Deformation capacity, units.	Quality group	Characteristics of gluten
0-15	III	Unsatisfactory strong
20-40	II	Satisfactory strong
45-75	I	Good
80-100	II	Satisfactory weak
105 and higher	III	Unsatisfactory weak

1. As a result of the studies carried out, the effect of disinfecting regimes on the protein-gluten complex of grain, it was found that the specified parameters cause changes in the quality of gluten.

2. By adjusting the GDM index of grain by the action of microwave energy, it is possible to produce flour with certain technological qualities.

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3. The influence of microwave radiation on the main parameters of grain, which determines the production of food products from it, that meet safety and quality requirements in accordance with the current standard, has been established.

The main physical and chemical indicators of the quality of bakery products in accordance with the requirements of the standards are: humidity, acidity and porosity of the crumb. The crumb of bread obtained from grain, neutralized by treatment with electromagnetic waves of ultra-high frequency from pests of grain stocks, was studied for baking properties. Tin and hearth bread were chosen as the object of study. From 1st grade flour produced from grain disinfected by microwave electromagnetic fields. We used grain processed at microwave radiation power W=180 W/m2, processing time τ=100, 120, 140, 160 s. Bakery quality indicators of finished products were determined using generally accepted methods.

In table table -3 shows the porosity values of bread crumb depending on processing modes.

Table - 3.

Bread crumb porosity indicators (obtained flour from disinfected wheat grain using EMF microwave radiation at a power of 180 W/dm^3)

№	Samples	Duration of time, s		
		120	140	160
1	Sample-1	73,3 %	72,5 %	71,1 %
2	Sample-2	72,6 %	71,8 %	71,0 %
3	Sample-3	71,4 %	71,5 %	69,7 %
4	Control	68,2 %	68,02 %	68,0 %
5	Average value	72,4 %	71,87 %	70,65 %

From the table -3 it can be seen that the quality indicators of the porosity of the crumb of bread from neutralized grain using EMF microwave radiation, processed in the time mode from 120 to 160 s, at a power of 180 W/dm^3, the porosity of the bread decreased slightly 71.1 -73.3%, but the bread the volume turned out to be no less than the control sample. The porosity is developed, and an increase in the duration of the technological process in comparison with the control sample was not detected for these options during the technological process.

Table - 4.

Bread crumb moisture indicators

(obtained flour from disinfected wheat grain using EMF microwave radiation at a power of 180 W/dm3)

№	Samples	Duration of time, s		
		120	140	160
1	Sample-1	43,4 %	43,0 %	43,3 %
2	Sample-2	43,2 %	42.6%	43,02 %
3	Sample-3	43,0 %	42,6 %	42,03 %
4	Control	45,0 %	45,0 %	45,01 %
5	Average value	43,2 %	42,7 %	42,6 %

From the table 4 it can be seen that the moisture content of the product after treatment in EMF microwave radiation is different. In all variants, the humidity of the dough is maintained up to 45%.

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This is a positive point that has a positive effect on the technological process of making bread, since its dimensional stability, gas-holding capacity and bread yield increase.

Table - 5.

Bread crumb acidity indicators

(obtained flour from disinfected wheat grain using EMF microwave radiation at a power of 180 W/dm3)

№	Samples	Duration of time, s		
		120	140	160
1	Sample-1	$1,8^0$	$1,6^0$	$1,5^0$
2	Sample-2	$1,5^0$	$1,3^0$	$1,4^0$
3	Sample-3	$1,3^0$	$1,2^0$	$1,2^0$
4	Control	$3,0^0$	$3,0^0$	$3,0^0$
5	Average value	$1,5^0$	$1,4^0$	$1,4^0$

The data given in table -5 show that during the control period from 120-160 s there is a decrease in titratable acidity by 1,2,3 degrees, at 180 W/m2. For first grade flour, the standard acidity level is no more than 3.0 degrees.

Thus, the expediency of the supplied power range W=180 W/dm^3, the time τ=160 s is optimal for preventing pests of grain stocks, but this range does not affect the baking properties of flour disinfected by EMF microwave radiation. It has been established that the treatment of contaminated grain with microwave EMF does not have a negative impact on the quality and baking properties of bread products.

It was established that in experimental samples the organoleptic indicators of color, smell, taste meet the requirements of regulatory and technical documents. In disinfected flour at a power of 180 W for 100 sec, 120 sec, 140 sec, 160 sec. porosity, humidity, acidity met the requirements of 5669-96 “Method for determining porosity”, 21094-75 “Method for determining moisture” and 5670-90 “Method for determining acidity” standarts [11,12].

Thus, the feasibility of the supplied power range at 180 W/dm^{3}for a duration of 160 seconds is justified. (since in this range there is 100% disinfection) is optimal for preventing pests of grain stocks, but this range does not affect the baking properties of flour produced by disinfected microwave.

Baking data confirmed the effectiveness of using microwaves for disinfection. This will reduce the cost of disinsection of grain in flour milling production. The use of microwaves for the disinfection of grain mass will eliminate the use of expensive foreign chemicals from production and is economically feasible, given the relatively high cost of this method.

It has been established that microwave treatment of contaminated grain does not have a negative impact on the quality and baking properties of bread products. Analysis of experimental studies revealed the optimal parameters for processing contaminated grain with microwave irradiation. Thus, it is advisable to first expose raw wheat stored for storage to microwave irradiation in order to neutralize it from a complex of barn pests. Research carried out in this direction can serve as a theoretical basis for the creation and implementation of microwave installations capable of disinfecting grain from the entire variety of barn pests both during storage and during its loading onto vehicles. The advantage of this technology is its environmental friendliness, safety and efficiency.

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