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Development of Technology of Nonconventional Types of Flour from Cereals with Natural Iodine-Containing Structure

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Abstract: A study is considered the perspective directions in improvement of technology of nonconventional types wheat flour with a natural iodine-containing composition from soy, haricot, oats, corn for receiving bakeries of a functional purpose for prevention of diseases of a thyroid gland, oncological diseases which are had a wholesome effect on improvement of the memory and normalization of a metabolism in an organism.

Key words: Mill installation, composite flour, bakery, technology, microelement, research, quality

INTRODUCTION

Now, the problem of iodine-deficit in a human body is particularly acute. Deficit of iodine is supplied through the food stuff containing iodine microelements. In the Republic of Kazakhstan, on average, consumption of microelements of iodine makes 40-60 mg kg^{-1}. According to the World Health Organization (WHO) daily consumption of microelements of iodine has to be not >150-200 mg on kg.

According to the conclusion of "Berlin-hemi" deficit of iodine in an organism leads to such diseases as: the craw, oncological tumors, increases risk of spontaneous abortions at women, a stillbirth of children, the birth of backward child (endemic cretinism), myoma, a women mazopathy. At children, it is expressed in bad progress at school, loss of interest in knowledge, level of intellectual development (the Intelligence Quotient of "IQ" is directly connected with iodine (Anonymous, 2012).

Know-how of iodine and ferriferous flour consists in the invention of a unique mill on processing of cereals with the natural iodine-content.

This equipment will allow to receive flour with the high content of iodine, iron, vitamins of group "B" (The patent No. 790 for the useful model "Universal Grain Processing Machine ZPM-0.1") (Tatenov, 2012).

MATERIALS AND METHODS

The most great demand arises because of big deficit of iodine and iron and other microelements in the organisms of population of RK. Information on the level of provision with iodine microelements on the countries is shown in Fig. 1.

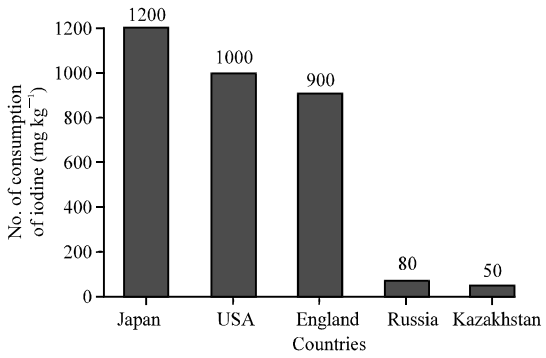

Fig. 1: Number of consumption of iodine in various countries per day

In Kazakhstan, it is especially possible to note the East Kazakhstan region: Kurchanov City, Beskaragay region, Tarbagatay area where the provision with microelements of iodine fell to 15-25 mg kg^{-1} (data of endocrinological indications of Sanitary and Epidemiologic Station of East Kazakhstan region).

The simplest way of prevention of iodine-deficit it is considered the use of iodinated salt that is the only available way of prevention of iodine-deficit at the population (Almaty, 2008). Iodination salt doesn't solve a iodine-deficit problem at the population of Kazakhstan as it has a number of serious shortcomings: an additive of chemical iodine in salt is unhealthy as iodine is in salt in the form of an unstable chemical compound and completely escapes at a temperature of 38°C, there is the expiry of date from 3-6 months and on the expiry of date of the specified term iodinated salt turns in usual at heat treatment, i.e., at the cooking 60% of iodine are lost and surplus of salt is harmful to an organism, in general at some diseases salt is contraindicated.

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For the solution of this problem, there was a need of use of the bakeries containing in composition the natural macro and microelements, for example: bread, cereal porridges, cereals, macaroni and wads. It is known that in grain of wheat is 8 mg of iodine, however, in flour it is absent completely. Microelements of iodine escape at heat and hydro treatment in the processing of a grain grinding which is applied in all flour-grinding installations. All important for a human body natural structured elements in rather high concentration contain in such cereals as oats, corn, soya.

RESULTS AND DISCUSSION

In this regard, there was a need of change of a construction of the mill equipment which will keep the microelements of iodine and iron which are already put in a natural condition, vitamins of group B, E, C, β-carotene, PP and won't allow burned taste of the vegetable oils which are in grains of corn, soya, haricot, oats.

This technology assumes replacement of the mill rollers on the cutting rollers with adaptation to the construction. This industrial prototype will add the existing mill equipment. At prime cost, the construction won't exceed the existing analogs. The prime cost of flour, received on this equipment from the iodine-containing cereals is considerable below of prime cost of usual wheat flour and granularity of a grinding doesn't differ. The offered universal construction is presented in Fig. 2 and 3 (Tatenov, 2012, 2007).

This construction has: the case (1); the reel (2) formed of a steel hollow shaft with holed (10) with the knives (3) fixed on its external surface; the electric motor with a belt drive (4); ferrule (5); steel knives (6 and 7). The case 1 has: the top part (8) executed in the form of the semi-cylinder with an internal abrasive covering and the lower part (9). The top part (8) fixed with possibility of turn on 180° is carried out a role of cover of case (1).

The meshy ferrule, executed in the form of the semi-cylinder (5) is rigidly fixed in the lower part (9). In parallel concerning, each other steel knives (6 and 7) are located between top (8) and the lower (9) parts of the case (1). Two rows of knives (3) are located on an external surface of a shaft of the reel (2) in staggered-order. The reel (2) is leant on bearings (11) and is connected to the electric motor (4) through a belt drive. A loading branch pipe for loading of grain (12), an exhaust branch pipe for unloading of flour (13) and a branch pipe for unloading of a peel and blowing of a stream of air (14) are installed in the case (1).

The offered design works as follows: grain moves through a loading branch pipe (12) in a working zone of the machine between the ferrule (5) and the reel moving it (2).

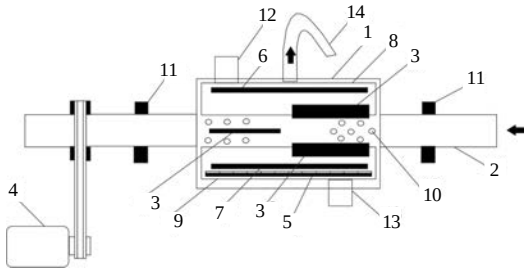

Fig. 2: Scheme of construction unit of grain processing part

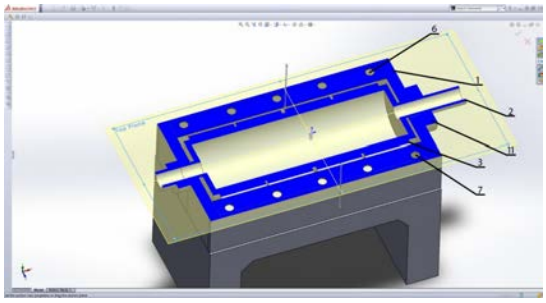

Fig. 3: Type of a horizontal section of construction unit of grain processing part

Grain is peeled and grinded as a result of friction with an abrasive surface of the top part (8) of the case (1) and a meshy surface of the ferrule (5) and also is grinded at strikes of grains on knife blades. Also, the stream of air promotes movement and friction of grain and also cooling of the processed weight for an iodine evaporation exception which occurs in the usual mills, based on application of the pressing-out rollers. The natural stream of air giving in the case (1) is carried out through openings (10) due to centrifugal effect.

This construction belongs to grain processing area, in particular, to devices for a peeling, grinding, dry processing of a surface of grain and also receiving flour from grain for the purpose of preservation of natural microelements, for example, iodine and iron and can be used in the grain processing industry and agriculture (Tatenov and Askarova, 2014a).

Today, around the world there is no production technology of food with the natural structured in it high content of iodine and iron.

Know-how of iodinated, ferriferous flour consists in the invention of a unique mill on processing of cereals with a natural iodine-containing. This equipment will allow receiving flour with the high content of iodine, iron, vitamins of group "B".

According to World Health Organization for adults and children, daily consumption of iodine has to be not

<150-200 mg on food kilogram. According to the conclusion of "Berlin-hemi" a deficit of iodine in an organism leads to such diseases as: the craw, oncological tumors, risk of spontaneous abortions is increased at women, stillbirth and the birth of mental defectives children, myoma, mazopathy. At children, it is expressed with bad progress at school, loss of interest in knowledge, the level of intellectual development (Intelligence Quotient of "IQ") is directly connected with iodine. According to data of World Health Organization, daily consumption of iodine on kilogram of food makes 40-60 mg and it is many times less norm.

Iodinated salt doesn't solve a problem of iodine deficit as the additive of chemical iodine in salt is unhealthy and completely disappears at a temperature of 38°C. It is necessary to use other popular product which is used in really big volume, for example bread. It is known that in grain of wheat there are 8 mg of iodine, however, in flour it is absent completely. Microelements of iodine disappear due to thermo-hydro-processing during grain regrinding which is applied in all flour-grinding cars. And also these important for human body natural and structured elements in rather high concentration contain in such cereals as oats, corn, soya.

On this effective debugged technology, there was an experience of production. The bakery production, baked of flour, which was received on this technology on a unique construction was laboratory confirmed and was highly appreciated by scientists and production managers not only on the high level of the content of natural iodine and iron but also on magnificent tastes. The deep chemical and biological analysis was shown (Academy of Nutrition of the Republic of Kazakhstan) that the baked bread with additives of flour of soya, corn and oats had the result with the high content of iodine and iron having kept all other useful microelements and also there was recorded a lack of harmful microelements arsenic, mercury, cadmium and lead.

In general, within the project, this developed technology will be widely applied at flour-grinding complex for production of wheat flour, corn, oat, soya flour and their mixes.

From the developed mill installation the results of the conducted researches received from cereals of soya, oats, corn, haricot gave a positive effect. The bakery production, baked of flour on the offered innovative technology in lab conditions was highly appreciated by scientists and production managers not only on the high level of the content of natural iodine and iron but also on magnificent tastes (Tatenov and Askarova, 2014b).

The deep chemical and biological analysis, received in research laboratory "Kazakh Academy of Nutrition"

Fig. 4: Process of baking of bread with an additive of soya, corn and oat flour at "Information and Educational Technologies" LLP

LLP of the Republic of Kazakhstan, showed that the made bread with additives of flour of soya, corn and oats, received by the offered method, showed the high content of iodine and iron, having kept all other useful microelements and lack of harmful microcells; arsenic, mercury, cadmium and lead (Fig. 4).

CONCLUSION

Now, all existing flour-grinding mills on their construction give big heating between the rotating rollers with a speed of 3000 revolutions per minute where there is made a grinding of grains of all types of cereals. At such speed of rotation, the rollers heat up to temperature of 100-150°C and because of such heating microelement of iodine disappears. But in grains of soya, corn, oats and haricot it is contained a lot of vegetable oil, microelements of iodine, iron, β-carotin and other types of B vitamins in a natural condition.

In this regard, there was a need of change of construction of the mill equipment which will allow keeping all microelements contained in a natural condition and doesn't give change of lipidic structure of corn, soya, haricot, oats which are in grains.

This technology assumes replacement of the grinding rollers by the cutting rollers with adaptation to the construction. This industrial prototype will add the existing mill equipment.

At prime cost, the construction won't exceed the existing analogs. The prime cost of flour, received on this equipment from iodinated cereals is considerable below cost of usual wheat flour where granularity of a grinding doesn't differ. The social effect is a prevention of the diseases arising due to deficiency macro and microelements of iodine and iron.

Economical effect is a reduction of prime cost of flour and bakeries due to use of the innovative mill ZPM-01 installation in the Republic of Kazakhstan and Abroad.

In the perspective as a result of the received researches, production, on the offered installation of nonconventional types of flour with the high composition of microelements of iodine and iron has to turn into mass production and has to be duplicated on regions of Kazakhstan for prevention of a iodine-iron-deficit of the population of the Republic of Kazakhstan.

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