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Qualitative Characteristics Of Wheat Baking Flour Manufactured At Low-Power Mill.

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ABSTRACT

Modern trends significantly reduces the cost of development and exploitation in the implementation of low-power mills grinding grain by abbreviated scheme in the country. However grinding grain by abbreviated scheme negatively influences on processing results. Nonetheless, according to the results presented in this paper, the effective management of such grinding will produce required condition flour. The main indicators of flour had been identified by experimental studies, on the basis of which a value of the production was given, about that a modern complex of technological methods with mini-mill allows to produce bread flour from wheat grain 1st and 2nd grades with the quality requirements of the standard.

Keywords: small mill, technological process, grinding of grain, productions of flour, prepared products, indexes of quality.

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INTRODUCTION

The Government Republic of Kazakhstan supported the policy of small business development. In this regard, production of flour was organized at the low - power mill in many rural regions of the country, that has improved the supply of flour in the agricultural regions of the country. Mills of rural type have widespread in the country, including the minimum acceptable set of equipment, that can provide the processing of grain into high-quality flour in complete cycle [1].

A direct-flow and continuity of all manufacturing operations are the main characteristics of the production processes of these mills. Grain and its products are moved sequentially by continuous flow of pneumatic transport from one machine to another, which makes the possibility of full mechanization and automation of the production process[2].

Grain which is processed at the low power mill directly on the place of its production is beneficial for economic reasons, such as reducing the cost of transportation and low profitability of production of flour.

After the operation of the low - power mill had been analyzed, results showed, that they do not always provide the quantity and quality of the finished product, due to the abbreviated scheme of grinding grain [3].

Therefore, study of the quality characteristics of flour, which has been produced at the low -power mill, is the main aim of this work, on this basis the extent to which the systems of manufacturing processes to ensure quality products at the level of the standard requirements must be determined [4].

Various sorts of flour, which has been produced from wheat at a small mill, were the object of the study. Indicators of grain and flour quality were appreciated according to relevant standards in the laboratory of the mill and technical laboratory of Almaty Technological University. Quality indicators of wheat party supplied by a small mill have been defined and shown in table 1.

Table 1 Quality indicators of investigated wheat samples of one party

№ Of party	Quality indicators						Vitrescence, %
	Nature, g/l	Wetness, %	Gluten, %	impurities, %			
				Weed	Grain in all	Sprouted grains	
1	744	13,2	21,4	0,5	3,0	0,8	48
2	750	13,5	24,3	0,5	2,5	0,5	51
3	769	14,0	26,2	0,3	2,4	0,4	54

Note: Party №1. - ordinary wheat; Party №2; №3 - type I wheat.

As can be seen from the table, nature of grain – 769 g/l is the maximum mark in party number three, and the minimum -747 g/l in party number two. Different implementations and composition of the impurities are the main difference between natures of grain in this parties. How much nature of grain is higher, so less shells and more endosperm are contain in the wheat. Therefore the flour properties of grains are better. Wetness of grain didn't differ significantly and fluctuated between (13,2 -14,0%) in the investigated party. Color, smell, taste were defined by appreciating quality of wheat parties in general terms, according to what parameters were normal and characteristic of grain. Wheat which had been infected by weevils, mites and other pests of grain stocks haven't been found. The quality and quantity of gluten are fluctuated from 21,4 to 26,2%, in wheat with quality not lower than the second group.

Basically the parties of wheat came in the mill with vitrescence from 54 to 48%, what is the average vitreous to be considered.

It is effective enough to clean grain by system on the mill. The content of impurities decreased average on 70-75% in three parties, after grain had been flowed through grain cleaning machine. Herewith the presence of weeds and grain impurities didn't outreach of established norms in the parties after cleaning.

The results of research, which had been conducted in laboratory of production, showed, that delivered parties of grain are different in their indicators of quality and this parties have dry state humidity [5].

Quality of grain humidity has some limits due to the fact, that such grain is milled difficult, productivity of mill is decreased and specific energy consumption on grinding is increased. Wetness of individual anatomical parts of wheat with low wetness (13,5 %) can be changed by their wetting differentiated, what is important for separation membranes effectively by quality grinding of wheat. For this equipment has established to wetting and drying of wheat in mill's set. More favorable conditions are created to holding cold air conditioning with 13,5 % wetness of wheat. Wetness of grain increased from 13,6 to 16,5% according to developed program after hydrothermal processing had been held.

Considered that the difference of quality of grain complicates and reduces the effectiveness of the recycling process in the parties, modes of operation of technological system are required adjustment. On this basis, party grinding grain was formed with weighing 2 tons and weighted average of the gluten 24,8% includes 3 components (table 1): quantity of the second gluten -21,4% (spring soft), the second – 24,4% (spring soft), the third- 26,2% (ordinary). Quality parameters of grinding parties which has been formed are shown in table 2.

Table 2: Quality parameters of grinding parties which has been formed.

Parameters	Norms of quality of grinding party	
	Standard	Factual
Nature , g/l	750	756
Wetness, %	13,5	13,6
Gluten, % quality quantity	25,0 Not lower than the 2 nd group	24,8 2 nd group
Weed impurities, %	No more than 2	0,4
Grain impurities,%	No more than 5	2,6
Vitrescence, %	50-60 soft wheat	53
Quantity of sprouted grains	No more than 3	0,6

As can be seen from table 2, grinding mixture, which was formed from three parties of wheat different by quality, meets the quality standards of grain to processed into high-quality flour [6].

Baking flour was produced together of the 1st and the 2nd sorts; quantity of the 1st sort flour – 30-32%; but the 2nd sort – 38-40%. There are 70 % of quantity of flour in this double sort milling on the whole.

The following methods of investigation, which were used to research the quality of the produced flour, are – organoleptic, physical and chemical.

Table 3: Quality indicators of flour sorts produced on the low-power mill

Indicators	Account of flour sort indicators	
	The first sort	The second sort
Taste	Typical wheat flour, without any foreign flavor, not sour and poignant.	
Smell	Typical wheat flour, without any foreign flavor, not sour and poignant.	
color	white with yellowish tint	white with yellow-grayish tint
Whiteness conv.un. of R3-BPL device	42,0	36,0
Ash content on dry substance,%	0,74	1,27
Moisture mass fraction,%	14,0	14,6
Quality of gluten by SGG, conv.un.	80	85
Quantity of gluten,%	28,6%	24,8
Particle size, residue on the silk sieve №\%	35\1	27\1
Silk sieve pass №\% not less	43\90	38\67
Falling number	205	154

Such indicators were defined as seeming, color, smell, taste by organoleptic method based on senses and analysis of average sample, which was selected by the standard method [7].

According to the organoleptic researchers all samples suit with the requirements of the standard by smell, taste and color (table 3). Sample of the first flour sort has white with yellowish tint color and slightly sweet taste, this sort hasn't any foreign smells, and. Sample of the second flour sort has white with grayish tint color, hasn't any foreign tastes and smells, crunch isn't feel when flour chews too.

Flour color substantially depends from species and sort of flour, i.e. from coloring of reprocessable grain and quantity of endosperm and bran particles content in flour. Smell of flour, which is considered like more important indicator for freshness and high quality of flour, was defined by using not much (5-10 g) of slightly warmed with breath flour. Fresh flour usually has particular weakly expressed pleasant smell. There are mustn't be mustiness, smell of mold and other any foreign smells in the flour of good quality [8].

Taste was defined by chewing small (2-3 g) quantity of flour. It is known that the flour of good quality has weakly expressed pleasant and sweetish taste. There were not detected sour, poignant or clearly sweet taste, any foreign taste as well. When the flour was chewed, teeth were not sensed any crunch. Powdered mineral impurities are the main cause of crunch in flour. As can be seen from table 3, investigated samples of wheat flour have similarities in color, taste, smell and quantity of mineral impurities content. Investigated samples of wheat bakery flour of the first and the second sorts have yellowish tint, what proves that in such flour is increased content of cellulose, but it is within acceptable limits and not a defect [9].

In conclusion the production technology is right according to results of organoleptic evaluation. Deviations from standards haven't been found, presented samples fully comply with requirements of the standard.

Such quality indicators were defined by physical - chemical method as: moistness, ash content, gluten, particle size of grinding, whiteness, metallomagnetic admixture, infestation. Research of flour samples were conducted by laboratory method. Results of physical – chemical researches are shown in table 3.

Physical – chemical investigations showed, that researched samples of wheat bakery flour of the first and the second sorts comply with requirements of the standard: by moisture mass fraction, whiteness, quality of gluten, particle size of grinding and falling number. Researched samples or flour apply to the second group by extensibility and elasticity, because they have good elasticity and average extensibility [10].

Moistness is no more than 15 % in all samples of flour. Quality of gluten in samples of the first sort flour – 28,6%, and the second – 24,8%, ash content – 0,74 and 1,27% respectively, but there is slight deviation within the allowable. Admixture and infestation content haven't been found in the flour. In this way, all researched samples of flour comply with the standard and haven't any deviations from norms.

As can be seen from table 3, investigated samples of wheat bakery flour of the first and the second sorts comply with the standard: by moisture mass fraction, , quantity of crude gluten, ash content, falling number and whiteness, what proves that production technology of flour is properly organized by low-powered mill [11].

Moistness of flour is defined by drying method in ENR, increased humidity of flour not allowed (more than 15%). Quantity of gluten is not less 28% for bakery flour. All samples of flour have light color of washed gluten. Researched samples or flour apply to the second group by extensibility and elasticity, because they have good elasticity and average extensibility.

CONCLUSION

In conclusion, the organization of flour production is right on low-powered mill according to results of conducted experimental researches. Deviations from norms haven't been found by organoleptic and physical – chemical methods and researched samples fully comply with requirements of standards of wheat bakery the first and the second sort flour.

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