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Kazakhstan Wheat as Raw Material for Deep Processing.

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ABSTRACT

The Republic of Kazakhstan is one of the three grain countries in the CIS. The total area of agricultural land in the country is 86 million hectares, of which 21.9 million hectares are arable lands. According to statistics, the country produced annually, at least 2 times more grain than is needed for domestic use. Because of the remote location of Kazakhstan on open seas transporting grain to world markets is expensive and because of the shortage of grain cars barely makes it quite competitive Therefore, grain producers in Kazakhstan are looking for ways its alternative use and enhance the value of products from cereal to receive value-added products (increase in value) and more higher profits.

Keywords: wheat, agriculture, raw, processing, material, land, grain

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INTRODUCTION

The most effective solution in this way is a complex and deep processing of grain, which is to separate the grain on the important parts of the components and their further use. This is due to the fact that because of its chemical composition grains are an excellent raw material within the objectives of deep processing [1, 2]. Dry matter crops by 90-95% represented organic compounds are proteins and other nitrogenous substances, carbohydrates (sugar, starch, cellulose and pectin), fats (Table).

The average chemical composition of agricultural crops, in% (by B.P. Pleshkova)

Components	Grains and legumes, NE%						
	corn	sorghum	barley	rye	wheat	rice	peas
Starch	67-76	58-76	56-68	57-66	58-76	64-77	50
Starch	9-13	10-14	11-13	7-13	10-25	8-7	25-32
Cellular tissue	2,5-3	1,5-3,5	1,9-6,3	22-2,8	22-33	9,4	5-7
Pentosans	4-4,5	2,1	9-12	9-11	5-8	1,5	-
Sugar	2-3,5	3-5	3-5	3-6	32-43	3,6	-
Fats	4,5-7	3-6	1,7-2,2	1,7-22	1,7-2,3	2,0	13-2,9

Proteins play a crucial role in all metabolic processes. Proteins perform structural and catalytic functions are also one of the major storage plant substances. The protein content in vegetative plant organs typically 5-20% of their mass, in the seeds of cereals are 6-20%, and in the seeds of oilseeds and legumes are 20-35%.

Carbohydrates in plants presented sugars (monosaccharaides and oligosaccharides containing 2-3 monosaccharide residues) and polysaccharides (starch, cellulose, pectin).

Sugars contained in small amounts in all grain crops. The predominant in most plants monosaccharaides are glucose and fructose, and oligosaccharides are disaccharide sucrose.

Starch contained in small amounts in all green parts of plants, but as the major storage carbohydrate accumulated in tubers, bulbs and seeds. Based on the dry weight, e.g., rice seeds of barley and malting it are 70-80%. In other cereal grain starch is usually 55-70%. Between protein and starch in plants, there is an inverse relationship in the protein-rich seeds of leguminous plants starch less than in the seeds of cereals; even less starch in oilseeds.

Starch is easily digestible the organism of humans and animals carbohydrate. In the enzymatic (under the action of amylase enzymes) and acid hydrolysis it decays to glucose [3].

As annually renewable natural biodegradable polymers are capable to acquire as a result of processing the required consumer properties, starch is widely used in food and technical industries, pharmaceuticals and medicine.

The technology of deep processing of raw grain is to divide it into three main fractions:

- The protein fraction;
- Starch fraction;
- Cellular tissue or cellulose fraction.

The current technology for the processing of grain directed mainly to the selection of the other main components, and then uses the protein fraction.

One of the most significant product release protein fraction of wheat is the gluten (known overseas as the "vital-gluten"). Its value to date on world markets is $ 1,500 per ton.

The use of dry wheat gluten allows adjusting the quality of raw materials, improving product quality, and in many cases, reducing production costs. Gluten was first obtained from wheat kernels in 1845 in

England. Currently, the International Association of wheat gluten made about 90% of the total amount of gluten in the world. Natural wheat gluten recognized as safe (GRAS №21 CFR p.184.1322) for use as a protein fortifier flour, natural filler, stabilizer and binder, and is fully compliant with the Code FAO / WHO Committee "Expert on Food Additives," the World Health Organization. Natural wheat gluten is protected by the Code standards wheat gluten and approved for use by most countries around the world [4].

Main areas of its application:

- Flour milling industry;
- Baking industry,
- Food industry is production of meat, dumpling dough and substitute milk protein;
- Feed mill industry is pet food, fish food (fisheries).

To determine the most potential types of grain raw materials for deep processing products we carried out a sampling of spring and winter wheat in Kazakhstan. Investigated spring wheat varieties: "Astana" (super-elite, 2 and 3 reproduction), "Kazakhstan's 10", "Kazakhstan Early ripe", "Yrym", "Cair" and winter wheat varieties "Almaly" (1 and 2 rep.); "Sapaly" (1 and 2 Rep.).

Qualitative characteristic of spring wheat varieties is characterized by the following parameters: Temperature Humidity from 10.0% to 11.4%; nature is 736 g / liter is 778 g / l; amount of gluten is 18.8% - 36.9%; gluten quality of 40 units. GDI -1 to 69 units. GDI-1, which corresponds to groups I and II quality; Protein content is 8.8 to 18.0%, the starch content is 50.3% - 62.2%; foreign material content is 0.08% - 0.54%, the grain impurities is 0.04% -0.66%.

Winter wheat varieties were characterized by the following qualities-governmental indicators: humidity -10.1% - 10.5%, nature - 708 g / l - 730 g / l; amount of gluten - 20.5% -24.0%; gluten quality of 45 units. GDI-1 to 55 units, GDI-1, which corresponds to groups I and II quality; Protein content - from 10.1 to 11.6%, the starch content - 55.2% - 56.0%; foreign material content - 0.02% - 0.66%, impurity content of the cereal - 0.06% -0.38%.

Figure 1 shows the interdependence of gluten and starch in the grain of spring wheat. In the spring wheat varieties "Cair" and "Yrym" starch content higher than that of other varieties, the gluten below, i.e. of these varieties were produced more starch, and varieties of "Astana" super-elite, "Astana" 2 reproduction, "Astana", 3 Reproduction, "Kazakhstan-10" and "Kazakhstan Early ripe" received more gluten and less starch, as they have high gluten . Similarly, an analysis of winter wheat varieties "Almaly" 1 reproduction, "Almaly" 2 reproduction, "Sapaly" 1 reproduction, "Sapaly" 2 reproduction (see Figure 2). From these wheat obtained more starch and less gluten.

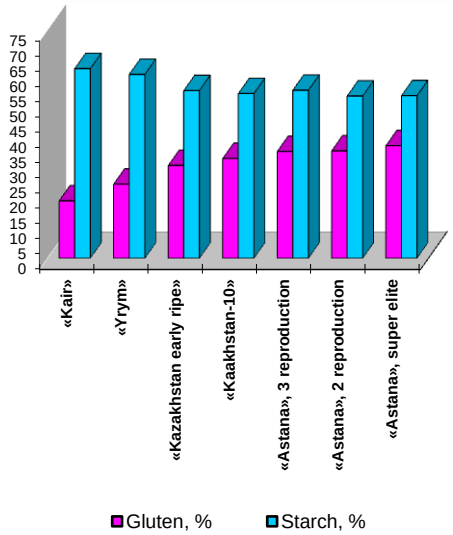

Figure 1: Contents of gluten and starch in the grain of spring wheat.

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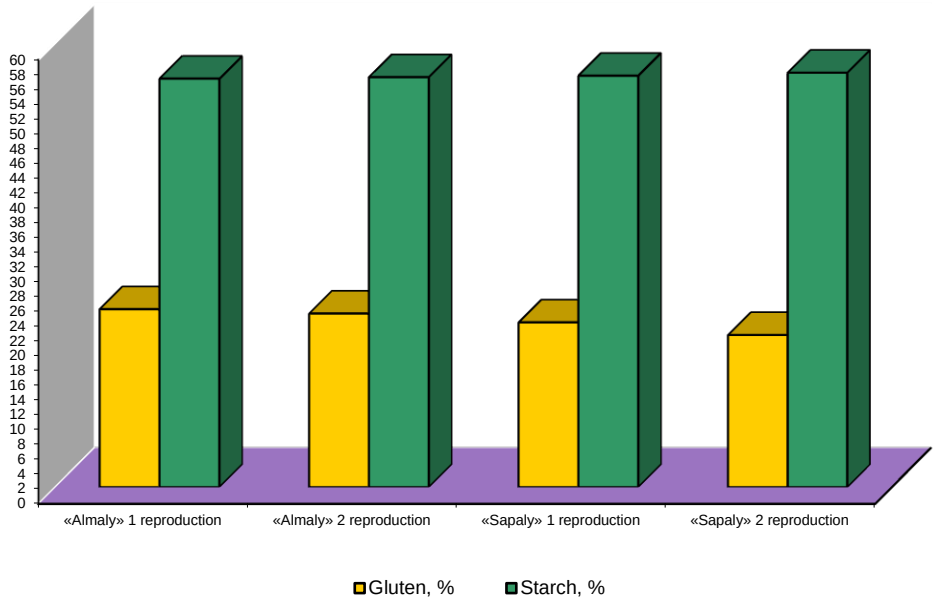

Figure 2: The content of starch and gluten in the winter wheat.

In developing the technologies of deep processing of wheat is not necessary to take into account, that one of the characteristics of wheat starch is split of starch into two classes are A starch and B starch [5].

A starch is 15 - 20% of the total, with granules of 2 - 15 microns, is very dirty pentosans, fiber, lipids (fats) and proteins. This type of starch should be used for the production of ethanol.

A starch, with grain size of 20 - 35 microns, much cleaner, its characteristics it is not inferior to the cornstarch, which is considered the high quality. During the processing of these two types of wheat starch obtained separately, and it is clear that they are re-mixing illogical. The most promising is to use starch for manufacturing A sweeteners, primarily glucose-fructose syrup.

At the same time, A starch can be used for producing various kinds of innovative products. For example, starch obtained from lactic acid, from which in turn can be obtained a product with high added value, as lactate [6].

Ethyl lactate is a derivative of lactic acid. This environmentally friendly solvent that is not produced in the CIS countries and in some characteristics superior to traditional solvents produced from petroleum.

Modern scientific research can produce lactate low cost. Thanks to new technologies lactic acid fermentation, separation and conversion of ethyl lactate production cost dropped to $ 0.6 / kg, at an average cost of solvents in Kazakhstan $ 1.5 / kg. Lactate can replace conventional solvents in 80% of all applications.

Thus, the technology of deep processing of grain crops requires further deep learning.

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