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## EVALUATION OF THE AMOUNT AND QUALITY OF GLUTEN IN GRAIN OF DIFFERENT TYPES

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Gluten is a complex of grain protein substances capable of forming an elastic mass when swollen in water. Gluten determines the gas-holding capacity of the dough, creates its mechanical basis and determines the structure of the baked bread. The content of crude gluten in wheat grains ranges from 5 to 36% [1].

This is a special group of proteins found in the seeds of some cereal plants. It also contains starch, nitrogenous substances, sugar and minerals. The synonym of the name is the well-known gluten. From the Latin language, the term is translated as "glue". Indeed, the properties of these substances are extremely similar [4].

Gluten is found in wheat, rye, oats, and barley. It is thanks to gluten that oatmeal is extremely viscous, and from wheat flour you can make a natural glue - paste [2].

The research was conducted on the basis of the "Gardens of Ukraine" AF located on the territory of the Krasne united territorial district of the Krasnograd district of the Kharkiv region in the village of Krasne.

AF "Gardens of Ukraine" is an enterprise engaged in the purchase and storage of grain, directly determining the quality of raw materials, which is the grain of various crops at the initial stage of production. Physico-chemical, micro-biological, organoleptic research methods were used during the examination.

**Determination of the amount of gluten in grain.** To determine the gluten content, take 30-50 g of wheat grain from an average daily sample, clean it of impurities, grind it in a laboratory grinder so that when the ground grain is sifted through a wire sieve No. 067, the residue does not exceed 2%, and the passage through a kapron sieve No. 38 is not less than 40%. The ground grain is thoroughly mixed, a 25g measuring spoon is taken, mixed in a porcelain mortar, 14ml of water (18-20°C) is poured in and kneaded until a homogeneous dough is obtained. The dough is rolled into a ball, placed in a cup, covered with glass and left for 20 minutes to swell the proteins. The amount and quality of gluten during washing are affected by the temperature of the water, the composition and the time the ball of dough is left to rest. After 20 minutes, in a tub of water or under a weak stream of water from a tap, the gluten is washed over a sieve, kneading it with your hand first carefully, and then more intensively, until the water is clean [7].

**Determination of gluten quality.** To determine the quality of gluten from the washed sample, take a weight of 4 g, roll it 3-4 times with your fingers, roll it into a ball and put it in a cup of water for 15 minutes (if the ball does not roll, then such gluten is classified as group III in terms of quality). Next, use the IDK-1 device (gluten deformation indicator), which is turned on 15-20 minutes before the beginning of the

determination. First, press the "Brake" button, raise the punch to the upper position. Place the gluten in the center of the instrument table and, after pressing the "Start" button 37, release it. 30 seconds after the "Countdown" lamp lights up, the display on the indicator scale is removed. Next, press the "Brake" button and raise the punch to the upper position. The display is analyzed by gluten quality groups [3].

Our goal was to investigate the content of crude gluten in wheat and barley grains. Table 1 shows the standard values of the amount of gluten in grain.

Table 1

**Standard values of content (%) of gluten in grain**

Category	Crude gluten content in grain
High content	more than 30
Average content	26-29,9
The content is below average	20-25,9
Low content	below 20

In the course of our research, it was established that the wheat and barley samples studied belong to grains with a high gluten content (Table 2).

Table 2

**Evaluation of grain by the amount of gluten**

Type of grain	Raw gluten content in grain, %
Wheat	47,1
Barley	38,2

As can be seen from the data in the table, wheat grain contains significantly more gluten than barley grain, which is quite natural and is explained by the individual characteristics of wheat as a grain crop. Its content reached 47.1%, while the gluten content in barley grains was slightly lower and was at the level of 38.2%. But comparing the obtained data with the indicators of the standard, it can be concluded that the studied grain, both wheat and barley, has a high content of gluten and corresponds to the highest category.

Along with the quantity, the quality of gluten is evaluated. There are several indicators of gluten quality:

- Color - light or dark. The first testifies to high quality, the second to poor quality.
- Elasticity – the ability to return to its original state after stretching and compression.
- Extensibility – the ability to stretch in length. It can be short, medium or long.

Depending on this indicator, gluten is divided into 3 types, where the first is the best, the third is the worst [5].

Various factors affect the amount and quality of gluten in grain. Among them are features of the variety, conditions of growing, processing, and storage (humidity, temperature, germination, pests). Also, washing conditions, water temperature, etc. can affect the indicators [6]. Table 3 shows standard indicators of gluten quality.

In the course of our research, it was established that the tested wheat and barley grain samples belong to the first and second quality groups in terms of gluten content (Table 4).

Table 3

**Standard indicators of the quality of gluten in grain**

Indicator of the device in conventional units	Група якості клейковини	Характеристика клейковини
From 0 to 15	3	unsatisfactory strong
0-40	2	satisfactory strong
45-75	1	good
80-100	2	satisfactory weak
105 and more	3	unsatisfactory weak

Table 4

**Assessment of grain quality by gluten**

Type of grain	Indications of the IDK-1 device (in units)	Gluten quality group	The color of gluten	Characteristics of gluten
Wheat	52	1	light	good
Barley	43	2	light	satisfactory strong

As we can see from the data in Table 5, the quality of raw gluten was characterized by elastic properties. Since the examined wheat grain had an indicator of the IDK-1 device - 52 conditional units, which indicates good quality of gluten, its good elasticity and extensibility, which allowed the formed lump to stretch well and return to its original state. That allowed the wheat grain to be classified in the first quality group in terms of gluten quality.

At that time, the barley grain sample had slightly reduced values of the indicators of the IDK-1 device and reached a mark of 43 conditional units, which according to the standard corresponds to the second quality group. And the gluten itself, according to its characteristics, acquired a light color and, when stretched and pressed, was noted for its satisfactory and powerful properties. That is, the lump made of barley grain was stretched quite well, but it was less elastic. Compared to a lump of wheat grain, it returned to its initial state somewhat worse.

**Conclusions:** Conducted studies of the quantity and quality of gluten content in wheat and barley grain indicate high-quality grain. Because wheat and barley samples showed high gluten content - 47.1 and 38.2%, respectively, which corresponds to the highest category of grain with high gluten content. According to its quality, the studied grain can be classified as wheat in the first category, and barley in the second. Since according to the indicators of elasticity and extensibility of gluten, it can be attributed to good and satisfactory strength, respectively, which was also confirmed by the indicators of the IDK-1 device - 52 and 43 conditional units, respectively.

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