

SHORT COMMUNICATION

Biological Characteristics and Economic Signs of Newly Created Grain Varieties

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Grain has the highest production in the world agricultural system. Wheat is the most widely cultivated crop among grain plants. Wheat is the main food crop.

Wheat is one of the first plants cultivated and planted in the world. It was cultivated in Western Asia in 700-800 years BC, and later spread to Asia, Southern Europe and North Africa.

The basis of agricultural production consists of obtaining high-yield crop varieties and accurate establishment of promising varieties seed growing. Today, certain problems exist in the forming of grain plants seed farming, as in the major part of the agricultural crops. If we take into account that the grain production is considered the essential sector in accordance with the food safety of the country, thus the significance of the grain production increase is being highlighted. Scientific investigation of the exist situation indicates that the achievement of high yield is impossible without applying high yielding variety and high-quality seed, in spite of high grade agro technology application in the yield formation.

In Azerbaijan, autumn wheat cultivation is privileged. Soft wheat is mostly used during autumn cultivation. Thus, wheat bread flour is made entirely from soft wheat and it is more endurable to hard climate conditions.

Azerbaijan has about one million hectares of grain area. Wheat is in the first place in this sphere. There are 22 botanical types of wheat, of which soft and hard wheat varieties are the most widespread.

Soft wheat (*Triticum aestivum* L) spike has both awned and awnless forms, the color of the grain is red, brown and white. It is planted both in autumn and spring. Soft wheat is mainly used in baking.

Spike of the hard wheat (*Tr. durum*) is full, the grain is oblong, light or dark amber in color, the spike is awned, the awns are longer than the spike, and the grains are arranged in rows along the axis of the spike. In recent years, soft wheat varieties – “Nurjahan”, “ADAU-100”, and “*Kismet*” *triticales* variety obtained by “Laboratory for cereals and legumes” staff of Azerbaijan State Agricultural University, were regionalized and recorded in the state register, and the authors were granted a patent and authorship certificate. Therewith, approximately 400 wild and cultivated varieties of grain plants, species diversity, hybrid samples and varieties are available in the genetic resources of our university

The basis of the methodology of the research work consists of generally accepted “Methodology of Conducting Selection Work”.

Persistence against lodging based on the methodical instructions of the Institute of Agriculture (1977), reports of the level of infection with rust diseases were made according to the modified scales of Cobb recommended in the international guidelines of CIMMYT, ICARDA [1].

Resistance of samples to powdery mildew were studied in accordance with the methodological guidelines composed on a basis of 9-point scale developed [2] and proposed [3], which is widely used in European countries.

Resistance to septoria disease was determined on the basis of a 9-point scale developed by A.L. Sari and J.M. Presscott [6], based on the level of infection along the layers of plants with both species of the

pathogen (The Septoria Tritici and Stagonospora Nodorum). Contagion with smut disease was evaluated by Krivchenko V.I. etc. (1988) methods. Contagion with diseases was carried out based on the methods of International Plant Breeding Centers.

At full maturity, sample sheafs were taken in appropriate nurseries and structural analyzes were carried out. Thus, the length of the plants, the productive bush, the length of the spike, the number of spikelet and grains in one spike, the mass of grains and the mass of 1000 grains were determined.

Grain quality analyzes were conducted on the basis of generally accepted "Methodical guidelines for grain quality assessment" (1977). Determination of the sedimentation index was carried out using the Pumpyansky method, determination of total nitrogen was carried out using the Keldal method.

Phenological observations in the field conditions from the seedling to the full ripening phase were made according to Kuperman [4];

The height of the plant was determined on the basis of "Methodology of field experiments on research works in the field of cereal grain plant selection".

The variety "Nurjahan" was obtained by individual selection from the local gene pool samples of Azerbaijan belonging to militum species diversity in the collection nursery of the field laboratory "Grains and Legumes". The variety is typical for autumn, short (80-90 cm), resistant to dormancy and diseases, with high bushing ability.

Pre-planting agrotechnical measures are carried out in the experimental field of our university. For planting gene pool samples, the field is plowed to a depth of 25 cm, then the soil is softened with a disc trowel to a depth of 6-8 cm. Then, with planting-beds are made one meter wide and 20 meters long, rows are opened in planting-beds (17 cm between rows, 5 cm between plants in a row). Sowing is done by hand. In the experimental field, one row is left empty between each planted variety and samples. After the seed is sown, the field is irrigated.

In the experiments, phenological observations, maintenance works were carried out in accordance with the stages of plant development. Vegetation water and feeding fertilizer were given. At the beginning of wax maturity in individual nurseries, an assessment was made for leaf diseases and infestation with pests.

Measured with the "Wile 200" device for moisture and natural weight determination in the Seed Development laboratory of our university, the natural weight was defined 780 g, gluten 26-34%, protein 13.5-15.5% (analyzer infratec TM-1241), flour yield 70-80%, weight of 1000 grains 44 -48 gr.

The potential yield is 75-80 s/ha, the sowing rate is 180-200 kg/ha, and the vegetation period is 220-230 days.

If 5-12 fertile stems are formed in the plant, such varieties are considered productive varieties, 3-4 fertile stems - medium varieties, and weak varieties with 1-2 fertile stems. The length of the spike is also an indicator of yield, the longer the spike, the more spikelet and number of grains.

"Nurjahan" variety is considered a yielding variety as it produces 5-7 fertile stems.

Soft wheat variety "ADAU-100" was obtained through individual selection from the Azerbaijani local gene pool samples of the Ferrigineum variety in the collection nursery of the "Laboratory for cereals and pulses" field laboratory. The variety is typical for autumn, short (85-90 cm), resistant to dormancy and diseases.

Measured with the device "Wile 200" in the Seed Development laboratory of Azerbaijan State Agricultural University, the natural weight is 800 g, the weight of 1000 grains is 46 g, gluten is 25-31%, protein is 13-14%, (analyzer infratec TM-1241), flour yield is 75-80%. The norm of sowing is 160-180 kg, the vegetation period is 215-225 days.

The organism does not have signs given at a specific rate, but there is no arbitrary change of form in the organism either. Autumn, summer, winter resistance, more or less bushiness, being spiky, resistance to disease and so on are not given to the genetic basis, these are the result of the development of the genetic basis under one or another external environmental conditions that participate in the formation of the specific characteristics of the organism. Based on this, we have analyzed the spikes to study the yield of the forms involved in the experiment. Spike analysis is significant in the form evaluation.

Spike length: this feature is a very important indicator. As the spike length changes, other structural elements of the product also change. The length of the spike affects changing the number of spikelet and grains in the spike. The reason is that these signs are closely related to each other.

Yield indicators of "Nurjahan" and "ADAU-100" varieties are as follows.

Table 1: Grain yield and structural analysis of product components

| Varieties | Spike weight, (g) | | Spike length, (cm) | | The number of spikelets, unit | | The number of grains in the spike, unit | | The mass of the spikelet in the spike, (gr) | | The number of grains in a plant (unit) | | Grain mass contained in a plant (gr) | | The absolute mass of grain (gr) | | Grain yield, (g/m ²) | |
|-------------|-------------------|------|--------------------|------|-------------------------------|------|---|------|---|-----|--|-----|--------------------------------------|------|---------------------------------|------|----------------------------------|------|
| 2 | 3 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | |
| Years | 21 | 22 | 21 | 22 | 21 | 22 | 21 | 22 | 21 | 22 | 21 | 22 | 21 | 22 | 21 | 22 | 21 | 22 |
| "Nurja Han" | 3,47 | 3,52 | 11,7 | 11,9 | 17,8 | 17,9 | 51,2 | 57,8 | 2,6 | 2,7 | 193 | 198 | 10,0 | 10,4 | 47,7 | 47,9 | 635 | 66,3 |
| "ADAU-100" | 3,18 | 3,48 | 10,0 | 10,2 | 17,8 | 17,8 | 49,8 | 52,5 | 2,2 | 2,2 | 182 | 190 | 11,0 | 11,1 | 46,0 | 47,2 | 620 | 64,5 |

In this vegetation year, the structural analysis of the yield components of the varieties was carried out and these results were compared with the grain yield.

Table 2: Correlation relationship between yield and product components.

| Characters | Spike weight | Spike width | Spike length | The number of spikelets in a spike | The number of grains in the spike | Grain mass per spike | Grain yield |
|------------------------------------|--------------|-------------|--------------|------------------------------------|-----------------------------------|----------------------|-------------|
| Spike weight | 1 | | | | | | |
| Spike width | 0,461** | 1 | | | | | |
| Spike length | 0,452** | 0,295 | 1 | | | | |
| The number of spikelets in a spike | 0,572** | 0,230 | 0,488** | 1 | | | |
| The number of grains in the spike | 0,255 | -0,046 | 0,102 | 0,277 | 1 | | |
| Grain mass per spike | 0,847** | 0,324* | 0,337* | 0,522** | 0,387* | 1 | |
| Grain yield | -0,151 | -0,077 | 0,020 | -0,079 | 0,220 | -0,075 | 1 |

*Correlation is significant at the 0.05 level.

** Correlation is significant at the 0.01 level.

Subsequently, it can be indicated that, a significant correlation exists among the spike width, height, the number of spikelets in a spike, the number of grains in the spike, grain mass and spike mass. Grain yield in soft wheat is related not with the spike mass and grain mass per spike, but closely with the number of grain in a spike.

As these varieties survive the winter well, their fruitful bushing is higher than other varieties.

The wintering period lasts about 2-3 months, which is 25-40% of the vegetation, with the rise of temperature in early spring, the vegetation period begins in the plant.

Tube emergence begins in March, spikes begin at the end of April, beginning of May according to the observations made in our experimental field, wax ripening in wheat occurred in June, and full ripening in July.

The mild winter season, long and relatively cold and humid spring season in the tillering phase affected the morphobiological characteristics, height indicators, disease resistance of the studied optimal climatic conditions of soft wheat varieties, and caused the extension of milk-wax ripeness phases.

The quality indicators of the varieties were studied in the grain quality laboratory. The climate-year indicators are different compared to last year, and this fact affected the quality indicators of the genotypes.

Table 3: Quality and yield indicators of wheat varieties

| no. | Name of varieties | Mass of 1000 grains, g | | Glassiness, % | | Gluten % | | Deformation Coefficient of Gluten | | Protein, % | | Spiking | | Yield, s/ha | |
|-----|-------------------|------------------------|------|---------------|------|----------|------|-----------------------------------|------|------------|------|---------|------|-------------|------|
| | Years | 21 | 22 | 21 | 22 | 21 | 22 | 21 | 22 | 21 | 22 | 21 | 22 | 21 | 22 |
| 1 | "Nurjahan" | 47,7 | 47,9 | 100,0 | 95,5 | 34,1 | 34,0 | 67,9 | 69,9 | 15,2 | 15,4 | 01.V | 03.V | 75,2 | 76,5 |
| 2 | "ADAU-100" | 46,0 | 47,2 | 100,0 | 95,0 | 29,0 | 28,4 | 100,7 | 95,7 | 14,3 | 14,5 | 30.IV | 01.V | 62,2 | 68,9 |

In the current year, the spring vegetation of plants coincides with the period of abundant rains, which created favorable conditions for the development of leaf diseases. However, the yellow rust infection of the studied varieties was weak.

Table 4: Disease resistance level of studied varieties (average for 2021-2022)

| Diseases | O | R | MR | MS | S |
|-------------|----|---|----|----|----|
| Yellow rust | 6 | 9 | 29 | 39 | 6 |
| Brown rust | 36 | 2 | | 43 | 19 |

The varieties disease resistance level

The "Kismet" triticale variety obtained in our experimental area was obtained from the juncture of wheat and rye. Triticale is a combination of the Latin words *Triticum* (wheat) and *secale* (rye) and means wheat-rye.

The first triticale was obtained in 1875 by the Scottish scientist A.V. Wilson, but this hybrid did not prove itself because it was highly sterile.

Although juncture between wheat and rye has a 100-year history, the chromosomal nature of wheat-rye hybrids was studied only in 1930 by Russian scientists G.A. Levitsky and G.B. Venetskaya.

The grain of the "Kismet" triticale variety is elongated like rye, winters better than winter wheat, and is resistant to frost, dormancy and disease. It grows faster than wheat in early spring and ripens 5-6 days later than winter wheat. Vegetation period is 230-260 days. The activity of photosynthetic enzymes of "Kismet" triticale variety in all development phases is higher than that of wheat and rye.

According to the structure of the spike, it differs from the spikes of wheat and rye, so that it is longer than the spike of wheat and shorter than the spike of rye.

"Kismet" triticale contains 1.5% more protein than wheat and 34% more than rye. The amount of gluten in grain is 2-4% lower than that of wheat. That is why it is rarely used in baking, but quality bread is obtained when 20% triticale flour is mixed with 80% wheat flour.

The weight of 1000 grains of "Kismet" triticale spike is 45-50 g, the amount of protein in the grain is 12-13.5%, gluten is 15-22%. Its composition is rich in amino acids. The rate of sowing is 120-180 kg, the average yield is 75-120 cents/ha. The height of the "Kismet" triticale plant is 110-160 cm, the spike is light yellow and brown in color.

Its total production also increases in connection with some agro technical measures due to the surplus in fruitfulness. Primarily, it is determined by the variety composition of the varieties used in production and rezoned. A good variety is readily available in grain-growing regions for each farm as a source of yield growth. [3]

The highest indicator of grain filling of the spike of the "Kismet" variety occurs when fertilizer is applied. The grain filling of the spike is on average 10.1; 15.6 and 17.6% are more.

The mass of 1000 grains of the "Kismet" variety is much higher than that of the control variant.

It can be deduced according to the crop structure analysis of triticale variety that the application of some agro technical measures has an essential role in the formation of yield indicator.

It should be noted that, "Kismet" variety could be called semi-intensive in accordance with its height.

"Kismet" triticale variety demonstrated a positive reaction to the application of some agro technical measures, led to an increase in yield and green mass.

If we scrutinize the effect of agrotechnical measures on the results of triticale sheaf analysis, we will see that when sowing on October 10, October 20 and October 30, the height of the plant is 128, 141, 130 cm; total bushing 5.0, 5.1 and 4.5; productive bushing was 3.6, 4.2 and 3.7. When sowing rates are 2.5 mln, 3 mln and 3.5 mln. grain per ha, the height of the plant become 148, 137, 136 cm; total bushing 5.9, 5.7 and 5.6; the yield performance of bushing was 4.4, 4.8 and 3.8.

Consequently, according to the conducted experiments it can be noted that, nitrogen fertilization at the time of sowing in October, increases the validity rate of yield bushing respectively 15.0 – 19.4% (N_{60}) 16.44 – 25.4% (N_{90}), in all sowing norms options compared to control (without fertilizer) variant. The amount of productive bushing in the version of the norm of 5 million seeds/ha of three-part nitrogen (N_{90}) as an additional feed, 3; 3.5 and 4 million seeds/ha are equivalent to the sowing rate and two-part nitrogen (N_{60}) feeding options. Optimal sowing rate of the high performance bushing is with fertilizer (N_{60}) 2.5 and 3 mln. seeds/ha in average sowing period.

In our republic, the cultivated areas of the "Kismet" triticale variety are increased every year. As an animal feed it has a great potential in grain and fodder production. The amount of digestible protein and lysine is higher than that of wheat and barley. Therefore, the "Kismet" triticale variety is more widely used in cattle-breeding.

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