Study of improving the quality of bread and wheat-aegilops hybrids with the biotechnological ways

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Abstract. The great need of the people to bread demands to increase high qualitative grain plants. At present time for solving these problem different methods of biochemistry, genetics and molecular biology are widely used in the process of selection. To investigate biochemical peculiarities of wheat-aegilops hybrids and to define the correlative relation between these characteristics. To investigate the technological peculiarities of wheat-aegilops hybrids and to define the relation between their main biochemical and technological characteristics. The conclusion of this investigation showed the followings-the wheat-aegilops hybrids according to their morphological and biochemical characteristics have approached to wheats. The electrophoretic spectres of the wheat-aegilops hybrids which have stable for their morphological characteristics are homogeny and heterogenic. Hereditarily some group protein components have passed to their tribes from their parents. But spontaneous hybridisation results in taking part the components of other unknown wheats in these electrophoretic spectres. There is a relation between the electrophoretic spectres and the indications of the grain quality.

1. General characteristics of investigation
The study of theoretical and practical importance of biochemical part of wheat - aegilops hybrids that is the product of gender distant hybridization, including its biotechnological peculiarities, also the relations of protein components and grain’s quality is very necessary.

Purpose of the work - is the study of peculiarities of Triticum and Aegilops intergeneric hybridization with the biotechnological and biochemical ways and perfection of bread baking technique.

General amount of nitrogen in grain was according to the Keldal methods, amount of starch was according to the Evers method, amount of lysine and tryptophan were according to the N.P.Yarosh [1], the amount of protein fractions were according to the Osborn method [2], electrophoresis of spare proteins and enzymes were investigated according to the methods developed in All-Union Institute of Genetics and Selection, in the laboratory of Genetic Biochemistry, physical and technological indicators were carried out according to the standard methods. [3]

2. Progress of research work
During the course of experiment has determined that the main studying aspects are the following. (Table 1)

2.1. Amount of protein in the grain
Protein is one of the main qualities of grain. In the external environment affects to the amount
of protein. However, protein is a sign transferring along with hereditary.

In the T. dicoccum v. atratum x Ae.ovata hybrids, the price of protein has changed between 15, 29-16, 38% during 3 years. In the hybrids’ line of number 5 and 6 the amount of protein was higher than the standard varieties. Number 1 and 5 hybrid lines, has changed little under the influence of climatic conditions. The coefficient of variation of the hybrid combination (CV %) were between 2.25-8.18%.

In the T.durum v.leucurum x Ae.ventricosa hybrid combination the average price of protein was between 15,36-19,13%. Number 11 hybrid line was having the highest protein (19,13%). Coefficient of variation among the hybrids changed between 2.09-10.5%.

To the highest protein of Teyakan 60 x Ae.ovata hybrid combination includes the 13, 14 and 15 of the hybrid lines. The average price of 16, 88-18, 98%, of protein hybrids within three years were between 3.8-9.

94%. Number 14 hybrid line has been more resistant to the effects of climatic conditions.

In the line of hybrid number 16, in the Teyakan 60 x Ae.ventricosa hybrid combination the standard amount of protein was higher than the standard sorts (16.18%), and the coefficient of variation was 1.7%.

In the whole hybrid line, which includes to Ae.ventricosa x Teyakan 60 hybrid combinations, the average price for a standard sort was higher within three years. The amount of protein in these hybrids changed between 15, 01-17, 64%, and coefficient of variation changed between 4, 26-9,93%.

Number 11, from hybrid combination of T.durum v.leucurum x Ae.ventricosa, and the number 14 from the Teyakan 60 x Ae.ovata hybrid combination in the durum wheat the quality of the bread is near the soft wheat in the hybrid lines. In the T.durum v.leucurum x Ae.ventricosa hybrid combination between the bread volume and protein correlation coefficient have been positive during two years (2014, 2015), (r = + 0.955, r = + 0.920). The coefficient of correlation between the amount of bread and gluten was positive (r = + 0.948, r = + 0.588), but between the amount starch in bread volume was negative (r = -0.921, r = - 0.696). [4]

2.2. Physical indicators

In the studied wheat-aegilops hybrids, in the hybrid lines weight of 1000 grains that looks like durum wheat vitreous and soft wheat grain was relatively higher in comparison with similar lines.

In the hybrid line of number 3, including to the T.dicoccum v.atratum x Ae.ovata hybrid combination the weight of 1000 grains reached to 64.9%. Most hybrids like hard wheat, soft wheat hybrids, in the hybrid lines of number 21, 22 and 23, weight of 1000 grains was higher than standard sorts.

Between the amount of protein of vitreous and weight of 1000 grains has observed the correlation. In the hybrid combinations of Teyakan 60 x Ae.ovata (r=+0.635) və Ae.ventricosa x Teyakan 60 (r=+0,538) the proteins and weight of 1000 grains was positive, and in the other combinations the correlation observed negative. The majority of wheat hybrids like the sort of East, from the hybrids like soft wheat number 19, 20, 21, 22 and 23, including to the Ae.ventricosa x Teyakan 60 hybrid combination the vitreous was higher than the sort of standart Bezostaya I. Hybrid combinations in the T.durum v.leucurum x Ae.ventricosa (r=+0,368) and Teyakan 60 x Ae.ovata (r=-0,215) the amount of protein between the vitreous observed with the weak positive correlation.

2.3. Amount of ash element

The main mineral elements of grain are potassium and phosphorus. Amount of mineral elements of the grain depending on growing years and geographic factors are different.

Amount of ash elements was 1.84 - 2.48%, in a solid wheat forms, and in soft wheat form amount was 1.92 - 2.25% in a hybrid lines in studied wheat - Aegilops hybrids. Amount of ash changes under the influence of climate. Only in the combination T.dicoccum v.atratum x Ae.ovata
hybrids amount of ash elements were less, because of standard sorts, but in other combinations were more.

2.4. Amount of starch

Technological quality of grains directly depends on amount of starch. In the hybrid lines that are similar to the soft wheat in the investigated hybrids the starch was 55.13% - 61.4%, in the hybrid lines to be similar to solid wheat was 55.63 - 65.36%. In the solid wheat hybrids has observed negative correlation in the amount of bread and starch, but in the soft wheats' hybrids observed positive correlation.

2.5. Amount of gluten

It is the most important biotechnological indicator of wheat quality Beside 4 No. of the T. dicoccum v. atratum x Ae. ventricosa x Teyakan, and 19 No. hyper lines of 60 combination the amount of gluten was higher than the standards sorts. In the hybrid line No. 22 the amount of gluten reached to 52.96% in Ae.ventricosa x the Teyakan 60 hybrid combination.

In the hybrid combination of Teyakan 60 Ae.ovata the amount of gluten was 43, 83-49, 43%, and the coefficient of variation was small too.

In the hybrid combinations T.durum v.leucurum x Ae.ventricosa (r=+0.886) and Ae.ventricosa x Teyakan 60 (r=+0.946) were more connection. The amount of gluten determines with the IDK-I device. According to this device gluten’s quality has been "solid" and "good". [5-6]

2.6. Bread quality

The volume of the bread is an important biotechnology. The larger volume of bread would be more porous and can be digesting better by the body. [7]

In studied hybrids, both hard and soft wheat hybrids lines the qualities of bread were near and higher than the standard sort. In the hybrid lines that is similar to the soft wheat the quality of bread was better than the lines of heavy wheat line. No. 5 including to the hybrid combination of T.dicoecicum v.atratum x Ae.ovata, No. 16, including to the hybrid combination Teyakan 60 x Ae.ventricosa, No. 22 hybrid lines the average quality of bread and volume of bread was higher than the standard sort Bezostaya I. (Table 2)

| Table 1. In the wheat-aegilops hybrids the amount of bread and coefficient correlation between some biochemical indicators |
|--------------------------------------------------|
| Names of hybrid combinations | 2014 | 2015 |
| | Gluten | Starch | Ashes’ elements | Gluten | Starch | Ashes’ elements |
| Tt.dicoccum v.atratum x Ae.ovata | -0.187 | -0.0082 | -0.192 | +0.255 | -0.407 | +0.416 |
| T.durum v.leucurum x Ae.ventricosa | +0.948 | -1.021 | -0.979 | -0.699 | -0.699 | +0.956 |
| Teyakan 60 x Ae.ovata | -0.807 | +0.840 | -0.199 | +0.193 | +0.193 | -0.188 |
| Ae.ventricosa x Teyakan 60 | -0.378 | -0.497 | +0.082 | +0.378 | +0.378 | +0.182 |
Table 2. Bread quality of the wheat-aegilops hybrids

| №  | Years | Bread amount sm^3 | Per price | Bread amount sm^3 | Per price | The correlation coefficient for bread amount |
|----|-------|------------------|-----------|------------------|-----------|---------------------------------------------|
|    |       |                  |           |                  |           |                                             |
| 1. | 2014  | 470              | 3,4       | 430              | 2,8       | 6,29                                        |
| 2. | 2015  | 410              | 3,1       | 470              | 3,8       | 8,13                                        |
| 3. | 2014  | 400              | 2,7       | 470              | 3,6       | 16,8                                        |
| 4. | 2015  | 420              | 2,7       | 460              | 4         | 6,43                                        |
| 5. | 2014  | 460              | 3,3       | 600              | 4,8       | 18,6                                        |
| 6. | 2015  | 440              | 4         | 500              | 4         | 9,02                                        |
| 7. | 2014  | 400              | 3,63      | 460              | 4         | 9,87                                        |
|    |       |                  |           |                  |           |                                             |
| 8. | 2014  | 400              | 3         | 410              | 3,7       | 1,7                                         |
| 9. | 2015  | 420              | 3         | 410              | 3         | 1,7                                         |
| 10. | 2014 | 390              | 3         | 430              | 2,4       | 6,89                                        |
| 11. | 2015 | 520              | 4,4       | 480              | 4         | 5,56                                        |
| 12. | 2014 | 410              | 2,9       | 440              | 4,1       | 4,99                                        |
|    |       |                  |           |                  |           |                                             |
| 13. | 2014 | 500              | 3,4       | 470              | 3         | 4,37                                        |
| 14. | 2015 | 480              | 4,4       | 470              | 4,1       | 1,49                                        |
| 15. | 2014 | 500              | 3,4       | 400              | 4         | 15,71                                       |
|    |       |                  |           |                  |           |                                             |
| 16. | 2014 | 500              | 5         | 540              | 4,6       | 5,43                                        |
|    |       |                  |           |                  |           |                                             |
| 17. | 2014 | 480              | 4,4       | 530              | 4,3       | 7,0                                         |
| 18. | 2015 | 460              | 4,3       | 420              | 3,1       | 6,43                                        |
| 19. | 2014 | 590              | 4,9       | 430              | 4,4       | 22,18                                       |
| 20. | 2015 | 430              | 3,1       | 530              | 4,4       | 20,16                                       |
| 21. | 2014 | 460              | 3         | 480              | 4,3       | 3,0                                         |
| 22. | 2015 | 540              | 3,6       | 600              | 4,9       | 7,44                                        |
| 23. | 2014 | 500              | 3         | 460              | 4,5       | 9,87                                        |
|    |       |                  |           |                  |           |                                             |
| 24. | 2014 | 450              | 2,8       | 510              | 4,6       | 8,84                                        |
| 25. | 2015 | 420              | 3         | 430              | 3,4       | 1,66                                        |
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