Using gene fund of wild relatives for common wheat improvement

Abstract. The article describes the research results, the method of distant hybridization can provide to get new genotypes with new parameters, high-yielding, immune, with a high content of protein in the grain and adapted to environmental conditions.

Key words: distant hybridization, drought resistance, forming, quality, density, cross-breeding, hybrids.

Introduction

A large variety of agroecological zones of wheat cultivation and breeding intensification puts before scientists of Kazakhstan a number of challenges: the varieties creation that combine high yield with complex resistance to diseases, to withstand adverse conditions (drought, the harsh winters) and high quality grain.

It is no coincidence that the most perspective breeding programs of the world along with the use of classical breeding methods, selection and hybridization, intraspecific wheat crosses are also used genetic methods with representatives of related genera of wheat – Aegilops, Agropyron, Secale, Elymus genotype carriers and other signs and properties.

It is the only method of creating fundamentally new plants that combine their hereditary basis of the most valuable features and characteristics of cultivated and wild plants.

Powerful formative process created by distant hybridization, is the source of unique forms and replenishing gene fund of cultivated plants [1, 2, 3]. In this paper, we analyzed the older generation hybrids \( (F_4-F_{10}) \) constant \( 2n = 42 \) forms, in combination (T.aestivum L x Aegilops triaristata Wild) according to the method described in UPOV, remembering the diversity of wheat on morphological characters [4, 5].

Results and their discussion

In our experiments in crossing varieties of common wheat (Triticum L.) with Aegilops triaristata Willd species, there was a completely different character formation. In the first generation is dominated by signs of wild forms. And only through cytogenetic analysis of ploidy \( 2n = 42 \) (in \( F_4 \) and back crossing in \( F_4 \)) pollen of common wheat significantly shifts forming toward the formation of wheat and new varieties forms of common wheat.

These lines were chosen on the base of cytogenetic analysis. In hybrid lines for \( F_4 \) on constancy \( 2n = 42 \), and starting in \( F_4 \) for their relatively good agronomic traits, such as tillering, spike density, height, hardiness, quality, maturity, disease resistance, and others. Housekeeping valuable traits...
for use in breeding programs. Presented new forms have not been previously known in the science.

F₃ (Bezostaya 1 x Aegilops triaristata Willd) x Bezostayal (1633-26) variety (Triticum aestivum L.) – compactoides. Form of the spike is compact, it means that shortened spike is compact, the transition from soft to dwarf wheat. Spike is white, red grain, glumes are not downy. The bush type is erect, no erected flag leaf is missing, sheet waxy film is weakly expressed. Plant height is 105.2 cm, productive tillering 4.2 pc. Spike length is 8.4 cm, color is white, density of 22.0 units (very tight). In spike -70.0 pieces grains, weight of 1000 grains was 45.8. Spiklet glume: shoulder shape is straight, wave form is short, blunt. Grain yield was 58.4 t/ha, with yields of standard varieties Almali 62.2 t/ha. Protein in the grain is 18.2%, starch – 54.4, grain hardness -73, sedimentation – 74, gluten – 34.5. Winter resis-ted plant, the percentage of surviving plants after overwintering very high 92-98%. In the heading stage and milk stage is resistant to stem and yellow rust. Susceptibility to leaf rust is 1-3 score. Resistant to mildew and septariose, dusty, smut.

F₅ (Erythrospermum 350 x Aegilops triaristata Willd) x Almali (2003-2) Variety (Triticum aestivum L.) – preude-gluca-ferrugineum. Color of spike scales is smoky gray on a red background, the inflyant presence – absence, the presence of Ligula – absence, name of the variety on V.F. Dorofeev et al. – Pseudocaesium (Greb) Manst. The bush type is erect, non erect flag leaf is missing, waxy film on the leaf sheaths is average. Plant height is 110.3 cm, productive tillering – 3.7 pc., spike is spinous, pyramidal. Spike length – 15.0 cm; density – 20.0 units. 70.0 grains per spike piece., weight of 1000 grains – 46.7. Grain yield – 68.7 t/ha, with yields of standard varieties Almali – 62.2 t/ha. Protein in the grain – 18.3%, starch – 53.8; grain hardness – 73, gluten – 36.4; sedimentation -75. The plant is winter resis-ted, the percentage of surviving plants after overwintering is high about- 98%. In the heading stage and milk stage is resistant to stem and yellow rust. Susceptibility to leaf rust is 1-3 score. Resistant to mildew and septariose, dust and smut.

F₇ (Erythrospermum 121 x Aegilops triaristata Willd) Erythrospermum x 121 (2005-3) Variety (Triticum aestivum L.) – quasi-erytrospermum, spike is white, the spines color - white, the inflyant presence – absence, the presence of Ligula – absence, name of the variety on V.F. Dorofeev et al. – Kabu-licum (vav) Manst. Spikelet glumes not pubescent, the type of plants directly stoyashy, italic flag leaf is missing, waxy film is weak. Plant height -108,2cm, productive tillering - 4.1 pc., spike spinous, the spike length -11.4 cm, the shape of the spike is prismatic, the spike density - 22.0; in the spike 60.4 piece, grain weight of 1000 grains - 62.8. Spikelet glume: shoulder oblique, acute tooth - long, until the end of the keel pronounced. Grain yield – 62.8 t/ha, with yields of standard varieties Almali -62.2 t/ha. The protein content -19.1%, starch – 53,3; grain
hardness-85, gluten -35.7; sedimentation – 80. The plant is winter resisted, the percentage of surviving plants after overwintering is high -97%. In the heading stage and milk stage is resistant to stem and yellow rust. Susceptibility to leaf rust is 1-3 score. Resistant to mildew and septariose, dust and smut.

F_{7} ([Erythrosernum 121 x Aegilops triaristata Willd] Erythrosernum x 121 (2005-4) variety (Triticum aestivum L.) – maesto-milturum - (spike white, red corn, spike beardless). Color of spike scales is smoky gray on a red background, the inflyant presence – absence, the presence of Ligula – absence. The plant is erect, tall -107.4 cm, sloping flag leaf is missing, productive tillering - 4.1 pc. Spike length - 16.0 cm, number of spikelets per spike developed to 22.2-pcs. Number of grains per spike 88, 1 pcs., weight of grains per plant - 7.2 g, weight of 1000 grains-48.9, grain yield is 52.4 t/ha, at the standard-50.2 kg/ha. The protein content -22.6%, gluten-40.8%, grain hardness – 79, sedimentation – 83. The level of plants stability in this combination was high-97.2%. Plant resistance to lodging, hardy, the percentage of surviving plants after overwintering is high - 98%. In the heading stage and milk stage is resistant to stem and yellow rust. Susceptibility to leaf rust is 2 points. Resistant to mildew and septariose, dust and smut.

References