Inheritance And Transmission Of Valuable Agricultural Traits In F1-F2 Hybrids Obtained By Crossing Soft Wheat With Short-Stem Donors

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ABSTRACT
It consists in creating varieties of winter soft wheat that are resistant to dormancy, diseases and pests, resistant to adverse climatic conditions, productive, with high grain qualities for irrigated areas, developing a scientifically based accelerated breeding scheme for growing seeds with high fertile and productive qualities, as well as developing effective agricultural techniques for new varieties.

Keywords: Initial material, selection, shear-wheel wheat, winter wheat, early ripeness, creating varieties,seeding rate, agricultural technology, fertilizers.

INTRODUCTION

Wheat (Triticum aestivum L.) is considered the main food crop in the world, and the demand for it is increasing parallel to its production. According to the "FAO" international organization, the total cereal production worldwide is about 2.45 billion tons, of which 2.194 billion tons are attributed to grain crops (wheat, barley, rye, oats, triticale, rice, maize, sorghum, millet, and others), while 256 million tons correspond to leguminous crops. Utilizing the genes that control the short stem trait in soft wheat for breeding high-yielding varieties with good grain quality, disease and pest resistance, lodging resistance, and adaptability to adverse environmental factors is of significant scientific and practical importance.

Wheat is grown in approximately 130 countries worldwide. In major wheat-producing countries such as the USA, Russia, Ukraine, France, Italy, Spain, Poland, China, Syria, and Japan, substantial scientific research is being conducted to create high-potential varieties by effectively utilizing genetic patterns and advanced technologies of breeding from the genes that control short stature in wheat.

The aim of the research is to develop irrigated autumn-sown soft wheat varieties that are resistant to lodging, diseases, and pests, capable of withstanding adverse climatic conditions, high-yielding, and exhibiting superior grain quality. This includes establishing scientifically grounded rapid seed production schemes for breeding materials with desirable traits.

The tasks of the research are as follows:

- Selection of samples exhibiting valuable agronomic traits based on morphological, biological, and valuable economic characteristics from the world collections of soft wheat of various geographical origins.
- Determining the inheritance traits of quantitative characteristics and resistance to yellow rust disease in the F1-F2 generations of soft wheat crosses.
- Investigating the inheritance, variability, and correlational relationships of quantitative characteristics regarding the short stature trait in the F1-F3 generations of soft wheat.

Currently, in the practice of soft wheat breeding, the short stature genes Rht 1 and Rht 2 obtained from the Norin 10 variety, and the Rht 3 gene from the Tom Roise variety are actively used. Genes Rht 1 and Rht 2 are recessive, while the Rht 3 gene is considered dominant. In subsequent studies, mutant lines of soft wheat have also identified the Rht 4, Rht 5, and Rht 6 genes. It has been determined by A.R. Worland that Rht 7 and Rht 8 genes are located on the 2D chromosome of the Sharbati Sonora variety, while F. Merezhko identified the presence of the Rht 9 gene on the 2B chromosome of the Diamond 2 variety in experiments.

The main indicators describing the initial sources in breeding work are yield and product quality. These indicators are complex processes characterized by numerous valuable agronomic traits and features.

The 1000-kernel weight is one of the structural components of yield and significantly impacts spike productivity. The 1000-kernel weight is a critical factor influencing the growth and development of the plant.

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In our experiments, rapid growth during the vegetative period was observed to be transmitted from generation to generation. Studying the duration of the growth period in the F1 generation of hybrids is extremely important.

In our research conducted in Samarkand region, the duration of the "germination-formation" period of the studied soft wheat varieties varied according to the biological characteristics of the samples. As a result of studying the hybrids, when one parental form was early-maturing and the other was mid-maturing, it was observed that the hybrids generated from the first generation leaned towards early-maturing varieties, indicating that the early-maturity trait was dominant. The hybrids did not undergo drastic changes. The most frequently crossed combinations of F1 (33.3%) and F2 (47.6%) exhibited early-maturity compared to their parental forms.

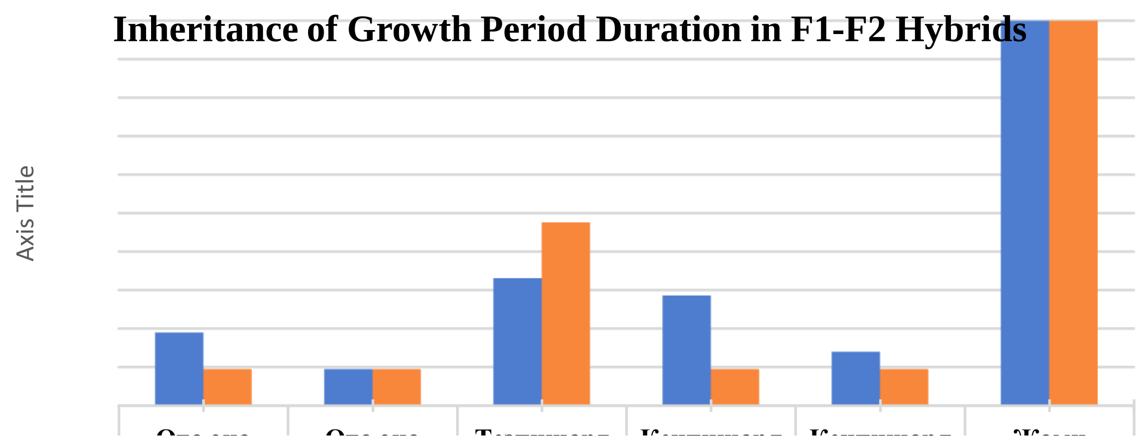
In the hybrids obtained with the participation of the varieties Uzbekistan-1, Selyanka, Sangzar-4, and Sangzar-8, the period from germination to heading was shorter compared to the control variety, or the early-maturity of the hybrids was recorded. The hybrids were classified into early-maturing, mid-maturing, and late-maturing transgressive forms based on their growth periods.

In the conditions of Jizzakh region, the F1 hybrids obtained from the combinations of the early-maturing Semurogh, Istiqlol-20, and K-52363 (Ecuador) showed 5.8% heterosis in the Kroshka x Intensive hybrid combination. Three hybrids (17.6%) were observed to be earlier than the late-maturing parental forms, while in the K-4834 Chile x Istiqlol-20 hybrid combination (5.8%), the hybrids were later than the parental forms despite being considered early-maturing (Table-1).

Table 1. Inheritance of Growth Period Duration in F1-F2 Hybrids.

Types of Inheritance	Number of Analyzed Combinations, Pieces		%	
	F_1	F_2	F_1	F_2
1. Early-maturing compared to parental forms	4	2	19,0	9,5
2. Late-maturing compared to parental forms	2	2	9,5	9,5
3. Early-maturing compared to late-maturing parental forms	7	10	33,3	47,6
4. Late-maturity is earlier than parental forms, and early-maturity is equal	6	5	28,5	23,8
5. Late-maturity is equal to parental forms and early-maturity is later	2	2	9,5	9,5
6. Total	21	21	100	100

In the hybrid generations obtained from early-maturing varieties Uzbekistan-1, Kroshka, Semurogh, Uzbekistan-20, Istiqlol-20, and K-52363 (Ecuador), the period from germination to heading was relatively short, or the early-maturing characteristic of the hybrids was noted (see Annex 19, Table).
As N.I. Vavilov stated, the creation of high-yielding varieties with large grains and long spikes is crucial in breeding; these elements of yield must be interconnected with the performance indicators of productivity.



Categories	% F1	% F2
Early-maturing compared to parental forms	19.0	9.5
Late-maturing compared to parental forms	9.5	9.5
Early-maturity with late-maturing parental forms	33.1	47.6
Late-maturity equal to parental forms and early-maturity	28.6	14.0
Late-maturity equal to parental forms	14.0	9.5
Total	**100**	**100**

Table1.2: Duration of the Growth Period in F1 Hybrids of Soft Wheat

T/P	HybridCombinations	GrowthPeriod, Days		
		♀	♂	F_1
1.	1. Zamin-1 x K-52321 (Ecuador)	229	225	227
2.	2. Uzbekistan 1 x K-45669 (Mexico)	216	220	218
3.	3. Sherdor x ATAU 85 (Turkey)	216	224	222
4.	4. Kroshka x Intensive	218	220	216
5.	5. K-52103 (Ecuador) x Krasnodar-99	223	220	220
6.	6. K-62154 (Japan) x Uzbekistan 1	220	216	218
7.	7. K-52363 (Ecuador) x Visa	216	220	218
8.	8. K-4834 (Chile) x Istiqlol-20	220	216	220
9.	9. K-60035 (Japan) x Uzbekistan 20	218	216	216
10.	10. K-52193 (Ecuador) x K-2314 (France)	218	220	218

11.	11. Yonbosh x K-45217 (Mexico)	220	216	217
12.	12. K-6314 (Yugoslavia) x Kroshka	219	216	218
13.	13. K-23014 (Syria) x Semurogh	224	216	220
14.	14. K-45669 (Mexico) x Sangzar 8	22 0	219	219
15.	15. K-62154 (Japan) x Selyanka	220	217	219
16.	16. Zamin 1 x K-460123 (Hungary)	226	219	223
17.	17. Istiqlol-20 x Ummanka	218	222	220

Among the studied samples, three main traits that constitute productivity—spike density, number of grains per spike, and grain size—were embodied in the selected high-yielding samples.

In breeding, the creation of high-yielding varieties with larger grains and longer spikes is essential. Among the studied samples, three primary traits that constitute productivity—spike density, number of grains per spike, and grain size—were distinguished by high yield.

In terms of productive stems, in the conditions of the Samarkand region, 7 traits in F1 hybrids and 6 traits in F2 hybrids exhibited superiority, while a state of depression was observed for some traits. The inheritance of F2 hybrids ranged from 28% to 61%. Thus, selection for this trait at later generations is not appropriate.

In the conditions of the Samarkand region, the phenomenon of heterotic was observed in 21 combinations of F1 hybrids (23.8%) and F2 hybrids (19%). Among 12 combinations of F1-F2 hybrids, it was identified that traits tended to deviate positively towards the parent forms. In one of the F1 hybrid combinations, the plant height was observed to be taller compared to the parental forms (see Table).

A state of depression was observed in 3 combinations of F2 hybrids where the plant height was higher than that of the parental forms. The inheritance of F2 hybrids ranged from 32% to 83%, and the results indicated that selection for plant height should be conducted at later generations.

In experiments conducted in the Samarkand region, among 21 hybrid combinations for the 1000-kernel weight, heterotic was observed in F1 generations (28.5%), with 52.4% showing a positive deviation towards parental forms. In 3 hybrids (14.3%), negative deviation towards parental forms was noted, and 4.8% exhibited a state of depression. According to the results of the inheritance coefficient of F2 hybrids, it is necessary to select for larger-grained genotypes in later generations.

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