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INHERITANCE OF VALUABLE AGRONOMIC TRAITS IN F_1 HYBRIDS OF BREAD WHEAT

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Abstract
The inheritance of agronomically valuable traits in F_1 hybrids is an important component of bread wheat (Triticum aestivum L.) breeding. This study analyses supplied data for 11 hybrid combinations with respect to plant height, spike length and number of grains per spike. Plant height ranged from 78.1 to 101.4 cm, spike length from 9.4 to 11.6 cm, and grain number per spike from 17.2 to 23.1. The reported dominance coefficients (hp) indicate different inheritance patterns among combinations. Zvezda × Yaksart was characterized by the shortest plant height, Kroshka × Zvezda by the longest spike and a high grain number, while Zamin × Yaksart had the highest grain number per spike.

Keywords: Bread wheat, F_1 hybrids, inheritance, plant height, spike length, grains per spike, dominance, heterosis, breeding.

Introduction

Plant height, spike architecture and grain number are important components of wheat productivity and plant adaptation. Plant height is particularly important in breeding because excessive stature can increase lodging risk, whereas reduced and intermediate plant height can improve standability under intensive production. The

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introduction and deployment of dwarfing genes were central to the development of modern high-yielding wheat cultivars. However, the phenotypic expression of plant height and its relationship with other traits depend on genetic background and environmental conditions.

Spike length is another useful morphological trait because it reflects part of the structural capacity of the spike. Nevertheless, longer spikes do not automatically result in higher grain yield. Grain number per spike is influenced by spikelet fertility, floret survival, genotype and environmental conditions during reproductive development. Consequently, the combined evaluation of plant height, spike length and grain number can provide more useful information for selecting promising F_1 combinations.

The objective of this analysis was to evaluate the inheritance patterns reported for three valuable agronomic traits in F_1 hybrids of bread wheat and to identify combinations that may be useful for subsequent breeding generations.

Materials and Methods

The analysis was based on the supplied F_1 dataset comprising 11 hybrid combinations: Zvezda × Yaksart, Mannop × Umanka, Iftikhor-2 × Hisorak, Barhayot × Bunyodkor, Chillaki × Elamon, Hisorak × Yaksart, Kroshka × Zvezda, Zamin × Yaksart, Grom × Elamon, Sanzar-8 × Chillaki and Bunyodkor × Chillaki. Three traits were considered: plant height (cm), spike length (cm) and number of grains per spike.

Since parental means, sample sizes, experimental errors and the exact calculation formula were not available, the present work uses descriptive comparison rather than recalculating statistical parameters.

Results and discussion

Plant height varied considerably among the F_1 combinations, from 78.1 cm in Zvezda × Yaksart to 101.4 cm in Chillaki × Elamon. Zamin × Yaksart (82.4 cm) and Iftikhor-2 × Hisorak (81.6 cm) also showed relatively short stature. In contrast, Chillaki × Elamon (101.4 cm), Bunyodkor × Chillaki (101.2 cm), Mannop ×

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Umanka (97.7 cm), Barhayot × Bunyodkor (97.7 cm) and Kroshka × Zvezda (97.0 cm) were comparatively tall.

The supplied interpretation indicates partial dominance for plant height in Zvezda × Yaksart, Chillaki × Elamon, Mannop × Umanka, Zamin × Yaksart and Bunyodkor × Chillaki, while heterosis was reported for Hisorak × Yaksart, Kroshka × Zvezda and Sanzar-8 × Chillaki. The relatively short stature of Zvezda × Yaksart is particularly interesting for breeding programmes targeting lodging-resistant plant architecture. Modern wheat research confirms that dwarfing genes can strongly influence plant height and may also affect spike and yield-related traits, so selection should be based on the complete trait complex rather than height alone.

Spike length ranged from 9.4 cm in Sanzar-8 × Chillaki to 11.6 cm in Kroshka × Zvezda. Mannop × Umanka and Bunyodkor × Chillaki each had 11.2 cm, while Hisorak × Yaksart had 11.0 cm. The supplied hp values suggest positive inheritance effects in several combinations. The interpretation identifies negative dominance in Zvezda × Yaksart and heterosis in Bunyodkor × Chillaki.

Kroshka × Zvezda is especially notable because its 11.6-cm spike was accompanied by 22.0 grains per spike. Bunyodkor × Chillaki also combined a relatively long spike with a high grain number. The number of grains per spike ranged from 17.2 in Iftikhor-2 × Hisorak to 23.1 in Zamin × Yaksart. The combinations Mannop × Umanka, Kroshka × Zvezda and Bunyodkor × Chillaki each produced 22.0 grains per spike, while Chillaki × Elamon produced 21.3.

Zamin × Yaksart is particularly promising because it combined the highest grain number per spike (23.1) with relatively short plant height (82.4 cm) and a 10.2-cm spike. The supplied interpretation classifies grain number as partially dominant in Zamin × Yaksart, Mannop × Umanka, Barhayot × Bunyodkor, Zvezda × Yaksart and Bunyodkor × Chillaki, while complete heterosis was reported for Kroshka × Zvezda. Since grain number is a quantitative trait affected by multiple genetic and environmental factors, these findings should be confirmed in F_2 and later generations.

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Table 1. F_1 performance and reported dominance coefficients (hp) for three agronomic traits. Values are reproduced from the supplied dataset.

Hybrid combination	Plant height, cm	hp	Spike length, cm	hp	Grains/spike	hp
Zvezda × Yaksart	78.1	0.2	9.9	−0.3	17.8	0.1
Mannop × Umanka	97.7	0.6	11.2	0.8	22.0	0.2
Iftikhor-2 × Hisorak	81.6	0.0	9.6	0.0	17.2	−1.0
Barhayot × Bunyodkor	97.7	−0.0	10.2	0.2	19.2	0.5
Chillaki × Elamon	101.4	0.2	10.1	0.5	21.3	0.0
Hisorak × Yaksart	99.1	1.1	11.0	0.0	17.6	−0.4
Kroshka × Zvezda	97.0	1.7	11.6	1.2	22.0	1.0
Zamin × Yaksart	82.4	0.6	10.2	0.8	23.1	0.3
Grom × Elamon	92.2	−0.4	10.1	−0.1	19.1	−0.9
Sanzar-8 × Chillaki	90.4	1.7	9.4	0.4	18.2	−2.5
Bunyodkor × Chillaki	101.2	0.6	11.2	0.8	22.0	0.2

Conclusion

The supplied F_1 data demonstrate substantial variation among bread-wheat hybrid combinations for plant height, spike length and grain number per spike. Zvezda × Yaksart was the shortest combination (78.1 cm), Kroshka × Zvezda had the longest spike (11.6 cm) with 22.0 grains per spike, and Zamin × Yaksart had the highest grain number (23.1) together with relatively short stature (82.4 cm). These combinations are therefore of particular interest for further breeding work.

The results also demonstrate that inheritance patterns differ among crosses, indicating the importance of parental combination in the expression of quantitative traits. For practical breeding, promising F_1 combinations should be advanced and evaluated in F_2 and subsequent generations using replicated multi-environment trials.

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