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**PLASTICITATEA FENOTIPICĂ A GENITORILOR ȘI HIBRIZILOR F₁ DE GRÂU
COMUN LA INTERACȚIUNEA CU CIUPERCA
*FUSARIUM AVENACEUM***

**PHENOTYPIC PLASTICITY OF PARENTAL FORMS AND F₁ HYBRIDS OF COMMON
WHEAT AT THE INTERACTION WITH THE
FUSARIUM AVENACEUM FUNGUS**

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Rezumat. Putregaiul de rădăcină este una din cele mai frecvente și severe boli la culturile agricole în Republica Moldova, inclusiv la grâul comun de toamnă. În condițiile noastre, în anul 2021 a crescut semnificativ rata ciupercii *Fusarium avenaceum* (Fr.) Sacc. care a atins rata de 11,4% din spectrul fungic implicat în dezvoltarea maladiei. S-a constatat că organele de creștere și dezvoltare au reacționat diferit la acțiunea ciupercii, ceea ce a depins de genotip și combinația hibridă. Cele mai relevante au fost germinația boabelor și lungimea radiclei, sensibilitatea cărora a fost mai pronunțată la hibridii F₁. S-a stabilit gradul de dominație și efectul reciprocității la hibridii F₁.

Cuvinte cheie: grâu comun, *Fusarium avenaceum*, organe de creștere, grad de dominație, efectul reciprocității.

Abstract. Root rot is one of the most frequent and severe diseases of agricultural crops in the Republic of Moldova, including common winter wheat. Under our conditions, in 2021 the rate of the fungus *Fusarium avenaceum* (Fr.) Sacc increased significantly, which reached the rate of 11.4% of the fungal spectrum involved in the development of the disease. It was found that the organs of growth and development reacted differently to the action of the fungus, which depended on the genotype and the hybrid combination. The most relevant were grain germination and radicle length, the sensitivity of which was more pronounced in F₁ hybrids. The degree of dominance and the effect of reciprocity in F₁ hybrids were determined.

Key-words: common wheat, *Fusarium avenaceum*, growth organs, degree of dominance, effect of reciprocity.

The *F. avenaceum* fungus was described for the first time in 1886 and is one of the most widespread plant pathogenic species [2], causing enormous economic losses to agricultural crops. The fungus also presents a food safety concern because it is also an active producer of mycotoxins in

grains, such as moniliformin, eniatins, bovericin [1]. For the strategies to improve resistance to root rot, knowledge of the genetic basis of plant response to pathogens is necessary [3]. Starting from the mentioned, the purpose of our research was to elucidate the phenotypic plasticity of common winter wheat genotypes to the action of the *F. avenaceum* fungus.

In the research were used: i) 7 parental forms of common winter wheat – Moldova 11, Moldova 16, Moldova 66, Centurion, Amor, Miranda, Cuialnic, 4 pairs of reciprocal hybrids F₁ and ii) culture filtrate (CF) of the *F. avenaceum* strain, isolated from the wheat plant with stem base rot symptoms. The grains were kept for 18 h in CF, and after rinsing with distilled water they were grown in Petri dishes on moistened filter paper for 6 days. As a control they served grains soaked in distilled water.

From 7 parental forms and 8 hybrids, in 10 cases the vigor index (*germination, % x seedling length, cm*) decreased under the influence of the fungus. In the F₁ hybrids, there were decreases in the mentioned parameter - of 48.4-61.3%, but also stimulations of 7.4-54.2% compared to the control. The degree of dominance in the F₁ hybrids for the vigor index was negative, both in the control variant and in the variant with *F. avenaceum* CF – from low values to overdominance (Table 1).

Table 1. The degree of dominance (h_p) of the vigor index of common wheat plants in interaction with *Fusarium avenaceum*

Genitor/ F ₁ hybrid	Variant	Vigor index	% to control	h _p
F ₁ M 11 x Centurion	Control	466,1	-	-1,39
	CF	718,8	154,2	-1,44
F ₁ Centurion x M 11	Control	1560,0	-	-0,85
	CF	757,9	48,6	-0,79
F ₁ Amor x M 16	Control	343,7	-	-3,99
	CF	187,0	54,4	-2,72
F ₁ M 16 x Amor	Control	1090,7	-	-1,28
	CF	1171,0	107,4	-0,13
F ₁ M 66 x Amor	Control	1219,4	-	-10,76
	CF	747,7	61,3	-21,85
F ₁ Amor x M 66	Control	1211,2	-	-10,95
	CF	586,0	48,4	-8,06
F ₁ Miranda x Cuialnic	Control	697,8	-	-12,59
	CF	852,5	122,2	-7,70
F ₁ Cuialnic x Miranda	Control	1152,2	-	-6,28
	CF	1447,9	125,7	-1,14

The effect of reciprocity (*Reinhold formula*) for the vigor index in both variants – control and CF was only positive: +0,02...+3,29 and +0,75...+3,28, respectively (Table 2).

Table 2. Reciprocal effect (r_e) on the vigor index of common wheat plants in interaction with *Fusarium avenaceum*

Reciprocal hybrid	Control	<i>F. avenaceum</i> CF
F ₁ M 11 x Centurion/ F ₁ Centurion x M 11	+1,12	+0,75
F ₁ Amor x M 16/ F ₁ M 16 x Amor	+1,36	+1,50
F ₁ M 66 x Amor/ F ₁ Amor x M 66	+0,02	+0,77
F ₁ Miranda x Cuialnic/ F ₁ Cuialnic x Miranda	+3,29	+3,28

This denotes the major influence of the paternal parent on the phenotypic plasticity of common winter wheat, both under optimal conditions and when interacting with *F. avenaceum*.

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Bibliography

1. PONTS, N., GAUTIER, CH., GOUZY, J. et al. Evolution of *Fusarium tricinctum* and *Fusarium avenaceum* mitochondrial genomes is driven by mobility of introns and of a new type of palindromic microsatellite repeats. *BMC Genomics*, BioMed Centr. 2020, 21 (1), 16 p. (10.1186/s12864-020-6770-2). ISSN 1471-21-64.
2. SAKODA, T., YAMASAKI, N., ABE, Y. et al. Bulb Rot of *Sandersonia aurantiaca* caused by *Fusarium anguioides* and *Fusarium* sp. Intercepted at Plant Quarantine in Japan. *Res. Bull. Plant Prot. Japan*. 2011, 47, p. 41–47. ISSN 0919-2956.
3. WILLIAMSON-BENAVIDES, B.A., DHINGRA, A. Understanding Root Rot Disease in Agricultural Crops. *Horticulturae*, 2021,7, 33. <https://doi.org/10.3390/horticulturae7020033>. ISSN 2311-7524.