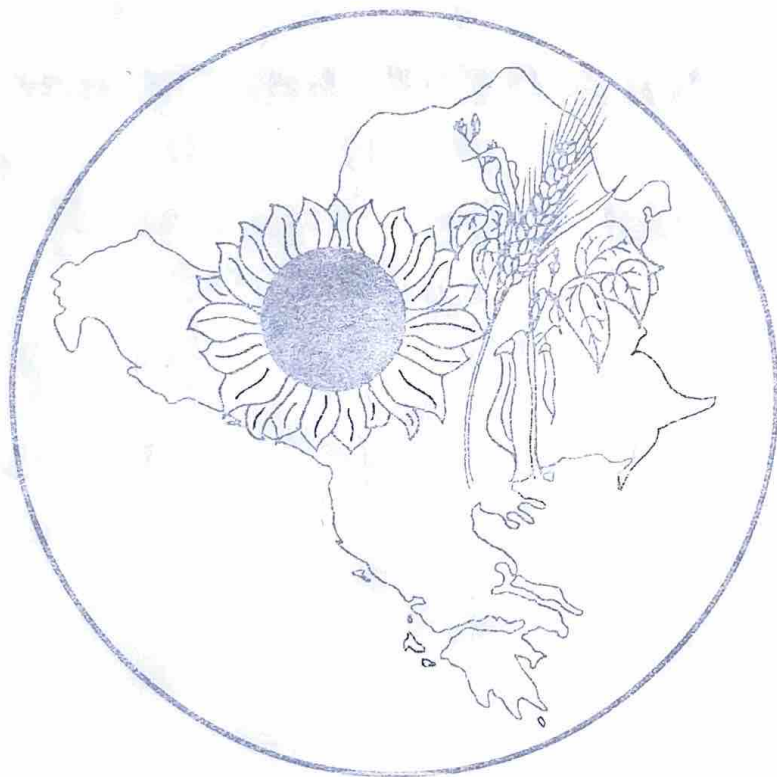


**BREEDING AND
CULTIVATION OF WHEAT,
SUNFLOWER AND LEGUME CROPS
IN THE BALKAN COUNTRIES**



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RESPONSE OF DIFFERENT WHEAT VARIETIES TO *FUSARIUM GRAMINEARUM* SCHWABE (SCAB-HEAD BLIGHT) IN CONDITION OF ARTIFICIAL INOCULATION

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SUMMARY

The study of resistance of 905 different winter and spring wheat genotypes to the agent of spike fusarioses (*Fusarium graminearum*) was conducted under field conditions according to artificial inoculation in different phenophases of grain development in 1993 and 1994. According to the degree of grain infection, the studied genotypes were classified into VI resistance categories. The highest infection degree was with the grain inoculation in the phenophases 3 and 4. In these phases, there were 375 (61%) highly resistance genotypes (HR), and only 39 (6%) susceptible (S) and highly susceptible (HS) genotypes.

Key words: wheat, Fusarium Head Blight (FHB), *Fusarium graminearum*.

INTRODUCTION

In the conditions of intensive wheat production, the scab has become very important disease in the last two decades in Yugoslavia. In years with intensive rainfall at the time of wheat flowering, the fusarium head blight may occur on a large scale and considerably reduce wheat yield and quality. This disease does not cause only significant yield reductions, but it may also encourage the development of mycotoxins (zearalenon).

The best method for solving this problem is the development of resistant wheat varieties. Numerous reports have confirmed the existence of significant differences in the reaction of different wheat genotypes to the fusarium head blight. It is therefore quite feasible to breed wheat varieties resistant to the disease (Atanasoff, 1920; Christensen et al., 1929; Nakogawa, 1955; Schroder, et al., 1963; Purss, 1966; Feekes, 1967; Tkegami, 1970; Mesterhazy, 1977; 1983; 1986, 1995; Wang et al., 1982; Milatovic et al., 1982; Yu and Zhang, 1984; Balazs, 1990; Balazs, et al., 1992; Wilcoxson et al., 1992; Ittu, et al., 1995; Buerstmayr et al., 1995; Veiszo et al., 1995).

The objective of the investigation was to find a new source of the resistance to the agent of the cereal scab (*F. graminearum*) for the needs of the selection of resistant wheat varieties. Besides, our intention was to test a possibility of this method of artificial inoculation, that enables the testing of a large number of plants, to be used in obtaining reliable data on the susceptibility of different wheat genotypes.

MATERIAL AND METHODS

The experiments were conducted at the experiment fields of the Institute of Field and Vegetable Crops in Novi Sad in 1994. Micro plots were sown in optimum period

applying conventional cultural practices. Under the conditions of artificial inoculation with the fungus *Fusarium graminearum*, 905 wheat genotypes were tested. Spike artificial inoculation described by Wilcoxson et al. (1992) was applied as a method. Plant inoculation was performed four times depending on the development stage of grain 2, 3, 4 and 5 (Figure 1) of individual wheat genotypes. When the plants achieved technologic maturity, the spikes from one row, out of four inoculated rows that were one meter long, were collected. After threshing, 4 x 100 grains were tested on wet filter paper for the presence of the pathogen. *Fusarium* infection of the grain was calculated according to the formula of Naumova (1972).

The infection degree was evaluated according to the scale from 1 to 4 (Naumova, 1972):

- 1 = normal germination of the grain, fungus mycelium present;
- 2 = dark spots on coleoptiles and rootlets;
- 3 = inner rotting of stem basis. Curling of abnormal germ with brown tissue;
- 4 = no germination, light-pink mycelium film on the surface.

The studied wheat genotypes were classified into six categories, according to their resistance:

- I = (0-5%) highly resistant (HR);
- II = (6-10%) resistant (R)
- III = (11-25%) medium resistant (MR)
- IV = (26-40%) medium susceptible (MS)
- V = (41-65%) susceptible (S)
- VI = (66-100%) highly susceptible (HS)

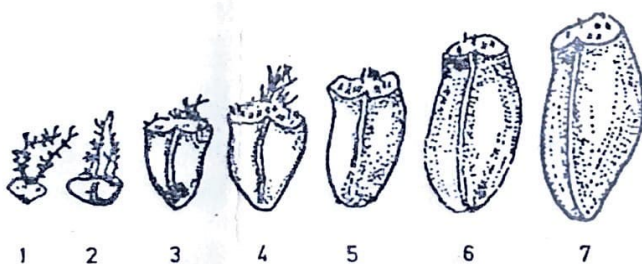


Fig. 1 Phenophases of wheat grain development

RESULTS AND DISCUSSION

According to two-year results, the phenophases 3 and 4 are most favourable for spike artificial inoculation with aim to test genotypes for the resistance to FHB (*Fusarium Head Blight*). It can be concluded according to the results in Table 1, that artificial inoculation of spike in these phenophases was most successful, which was also proved in our previous study (Balaz, et al., 1992).

Most of the studied genotypes were classified in the category of highly resistant (HR) in the grain development phenophase 4 (526-58%) and the lowest number in the phenophase 2 (72-7.9%). The highest number of the genotypes, 408, i.e., 66%, was classified into the category of highly resistant (HR) genotypes with infection inten-

sity of 0-5% in all grain development phenophases. There were 277 or 68% highly resistant (HR) genotypes in the phenophase 4 (Table 1). The category of highly susceptible genotypes (HS) included 16 genotypes while the highest number was in the grain development phenophase 4 (10).

Considering two categories of the results, I, II and III as resistant and IV, V and VI as susceptible, the relation between the resistant and susceptible genotypes was 760:133. The genotypes from the grain development phenophases 1, 6 and 7 were not considered due to low degree of successful infection (Figure 1).

Highly resistant genotypes from the category I (HR) can be applied in further breeding work for the resistance to FHB. Many authors found similar results in their research (Mesterhazy, 1995; Ittu et al., 1995; Buerstmayer et al., 1995; Veisz et al., 1995; Tomasovic and Javor, 1995).

Table 1. Number genotypes per categories resistant to *Fusarium graminearum* in different phenophases of wheat grain development

Resistant Category	Coefficient of Infection	The phenophases of wheat grain development			
		2	3	4	5
I (HR)*	0-5	15	22	277	94
II (R)	6-10	13	12	64	34
III (MR)	11-25	24	41	112	52
IV (MS)	26-40	11	8	39	21
V (S)	41-65	7	3	24	4
VI (HS)	66-100	2	2	10	2

*HR - Highly Resistant
R - Resistant
MR - Medium Resistant

MS - Medium Susceptible
S - Susceptible
HS - Highly Susceptible

CONCLUSION

The results of the study indicate that significant differences exist in the susceptibility of the studied wheat genotypes to the agent of cereal scab.

The infection degree of individual wheat genotypes significantly depended on the stage of grain development in the inoculation period. In earlier phenophases of grain

development (2 and 3), most of wheat genotypes were medium resistant (MR), while when the inoculation was applied in late phases of grain development (4 and 5), most of the wheat genotypes had low degree of the infection (from 0 to 5%) - highly resistant (HR).

This method of testing wheat genotype resistance to the agent of cereal scab is rapid and favourable for testing a large number of varieties, i.e., lines. However, applying this method, the selected resistant genotypes should be more precisely inoculated in the approximately similar phase of grain development.

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