

## Common Bunt (*Tilletia tritici*) in Different Wheat Genotypes

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**Abstract:** In order to prevent wheat infection by *Tilletia* spp. the following should be provided: strictly respecting of the regulations concerning sanitary inspection of seed wheat; sowing of declared seed; continuous control of the chemicals for seed treatment; qualitative treatment (purchase of modern technique for seed treatment) and permanent control of the quality of wheat seed treatment in the centres for seed processing. The investigations on the susceptibility of 12 wheat varieties: Sava, Partizanka, Lasta, Evropa, Pobeda, Bezostaja 1, Stephens, Siete Cerros, Flamink, NS 9/93, Libellula and San Pastore to common bunt (causer *Tilletia tritici* (D.C.) Tul.) were carried out. The investigations were carried out in 2002, 2003, and 2004 in the Experimental field of the Selectional Station at Indija. On the basis of the obtained results, it was proved that all domestic varieties, artificially inoculated by *T. tritici*, Lasta and Pobeda manifested lower susceptibility, while Sava, Partizanka, and especially Evropa were highly susceptible. Siete Cerros and NS 9/93 did not react to artificial inoculation by the pathogen and manifested low percent of disease, while the other foreign varieties were susceptible. Flamink and San Pastore manifested high susceptibility to this fungus.

**Keywords:** wheat; variety; Common bunt (*Tilletia tritici*); efficacy; fungicide

Common bunt is caused by the parasites of the genus *Tilletia*. These are *Tilletia caries* (DC.) Tul. & C. Tul. (syn. *Tilletia tritici* (Bjerk.) G. Wint. and Rabenh.), *Tilletia foetida* (Wallr.) Liro (syn. *T. laevis* Kühn in Rabenh.), *Tilletia controversa* Kühn. Rabenh and *Tilletia indica* (Mitra, 1931, loc cit. Watham, 1986).

*Tilletia caries* and *T. foetida* are widely distributed in the regions of wheat cultivation in the world. ROEMER *et al.* (1938) cited that the species of *T. caries* represented typical species of the Western Europe, and *T. foetida* of the Eastern Europe. In Bulgaria the papers of MALKOV (1907) and AFANASOV (1938) proved that the findings of these two authors were correct, because *T. caries* occurred sporadically. The same is true for Turkey (GASSNER 1938) and Romania (SAVULESCU 1944). For example, in Turkey *T. foetida* occurs in 89.7%, and *T. caries* in 10.3% (OZKAN & DAMGACI 1985). On the basis of the investigation carried out by

MAMLUK and ZAHOUR (1993) *T. laevis* occurred in bread grain, and *T. caries* in durum species.

In our country according to MINEV (1951) *T. laevis* is predominant with 66% and *T. tritici* with 14%.

Common bunt is among the most important wheat diseases. When there was not an efficient chemical for seed disinfection, lost in yield ranged from 20–90%. Thanks to efficient protection of wheat seed by fungicides, the losses became insignificant. Obligatory wheat seed treatment is regulated by the law. Our regulations do not permit the occurrence of *Tilletia* spp. in lower seed categories.

In order to prevent wheat infection by *Tilletia* spp. the following should be provided: strictly respecting of the regulations concerning sanitary inspection of seed wheat; sowing of declared seed; continuous control of the chemicals for seed treatment; qualitative treatment (purchase of modern

technique for seed treatment) and permanent control of the quality of wheat seed treatment in the centres for seed processing.

In our country the fungicides for wheat seed treatment on the basis of phenyl-mercury acetate, carboxine + thiram, mancozeb, tebukonazol, triadimenol, prothloraz + carbendazime, difenconazole, flutriafol + tiabendazole, benomil and diniconazole have been registered (MITIĆ 1997).

Creation and cultivation of resistant varieties are very important factors of integrated wheat protection measures (WIESE 1987). The Yugoslav breeding program has been developing more intensively since 1956 (BOROJEVIĆ 1990). In our country wheat breeding is carried out by five institutions: in Novi Sad, Kragujevac, Zaječar, Zemun, and Belgrade. So far few papers dealing with the resistance of varieties cultivated in our country have been published. Due to this, the aim of our investigations was to prove the resistance of genetically variable wheat varieties, domestic, as well as foreign, to *Tilletia tritici*, and to point to their importance.

## MATERIAL AND METHOD

In this paper the wheat genotypes from the collection of the Institute for Field and Vegetable Crop Production, Novi Sad, were investigated: Sava, Partizanka, Lasta, Evropa, Pobeda, Bezostaya 1, Stephens, Siete Cerros, Flamink, NS-9/93, Libellula and San Pastore. The first five are our domestic varieties, spread in many countries and very often used in such and similar investigations. Stephens is from the U.S.A. (Oregon), Siete Cerros is of the Mexican origin (created in CIMMYT), but adapted in all continents, Flamink originates from Africa, NS 9/93 is a line of winter durum wheat created at the Institute for Field and Vegetable Crop Production in Novi Sad, Libellula and San Pastore are of Italian origin.

The seed of the mentioned variety was artificially inoculated by teleutospores of the fungus *T. tritici* in the dosages of 2 g/kg of wheat, and treated by fungicides. Besides the treated variants of every variety, the variants infected by teleutospores (control) were also present. The investigations were carried out in 2002, 2003, and 2004 in the Experimental field of the Selectional Station of Indija.

In the field seed is investigated according to the method of OEPP No 19. The experiment was

set up for every wheat variety, in a way that it contained 2 varieties in 4 repetition as follows variant seed inoculated by the teleutospores of *T. tritici* (control). The experimental plot was 2.5 m<sup>2</sup>. Sowing was carried out on October 21, 2002, Oct. 24, 2003, and Oct. 18, 2004. The estimation was carried out from 3–7 July, 2002, 2003 and 2004, by harvesting the plot (phenophase full maturity) and 200 ears per plot were examined (infected – non infected).

For the determination of resistance degree of the varieties to *T. tritici* the scale from 0 to IV was used (KRIVČENKO & MRGKOVA 1977): 0 – very resistant all ears completely healthy; I – resistant: No. of diseased ears up to 10%; II – medium resistant; No. of diseased ears 11–25%; III – medium susceptible: No. of diseased ears 26–50%; IV – very susceptible: No. of diseased ears over 50%.

Data processing in the experiment for the investigation of susceptibility of different wheat genotypes to *T. tritici*, in percents, was carried out by analysis of variance (SNEDECOR & COCHRAN 1967), and the efficiency is calculated by the method of Abbott (ABBOTT 1925) by Duncan's test (DUNCAN 1955).

## RESULTS AND DISCUSSION

Data on the resistance of the varieties cultivated in our country do not exist (STOJANOVIĆ *et al.* 1996). Due to this, one of the goals of this paper was to investigate the resistance of the selected wheat varieties to *T. tritici*.

If the results of the investigation on susceptibility of these varieties artificially inoculated by *T. tritici* are observed, among domestic varieties Lasta and Pobeda are less susceptible, while Sava, Partizanka, and especially Evropa, manifested high susceptibility to *T. tritici*. The varieties Siete Cerros and NS 9/93 react to artificial inoculation by the pathogen manifesting low percent of disease, while all other foreign varieties are susceptible. Flamink and San Pastore manifested very high susceptibility (Table 1).

Similar data were also obtained by other authors and proved that the varieties from the group of durum are immune or highly resistant (GOLIK 1982, loc. cit. GAUDET & PUCHALSKI 1989).

The results of STOJANOVIĆ *et al.* (1996) also proved that the varieties Lasta and Pobeda are also classified into the group of medium resistant, while Evropa is in the category of medium susceptible varieties.

Table 1. Results of the investigation on susceptibility of wheat varieties to *T. tritici*

Variants		% of Infection		
		2002	2003	2004
Sava	control + <i>T. caries</i>	15.70 <sup>f</sup>	5.50 <sup>d</sup>	11.00 <sup>d</sup>
Partizanka	control + <i>T. caries</i>	33.40 <sup>h</sup>	23.13 <sup>i</sup>	11.25 <sup>e</sup>
Lasta	control + <i>T. caries</i>	2.80 <sup>b</sup>	2.13 <sup>b</sup>	5.25 <sup>c</sup>
Evropa	control + <i>T. caries</i>	43.56 <sup>j</sup>	29.38 <sup>k</sup>	41.88 <sup>k</sup>
Pobeda	control + <i>T. caries</i>	1.07 <sup>a</sup>	7.25 <sup>e</sup>	16.00 <sup>h</sup>
Bezostaja 1	control + <i>T. caries</i>	22.57 <sup>g</sup>	15.00 <sup>h</sup>	11.38 <sup>f</sup>
Stephens	control + <i>T. caries</i>	12.88 <sup>d</sup>	7.88 <sup>f</sup>	14.88 <sup>g</sup>
Siete Ceros	control + <i>T. caries</i>	1.00 <sup>a</sup>	1.13 <sup>a</sup>	3.63 <sup>b</sup>
Flamnik	control + <i>T. caries</i>	35.50 <sup>i</sup>	26.50 <sup>j</sup>	19.13 <sup>i</sup>
NS 9/93	control + <i>T. caries</i>	3.24 <sup>c</sup>	4.88 <sup>c</sup>	0.13 <sup>a</sup>
Libellula	control + <i>T. caries</i>	14.21 <sup>e</sup>	12.75 <sup>g</sup>	23.13 <sup>j</sup>
San Pastore	control + <i>T. caries</i>	71.00 <sup>k</sup>	66.20 <sup>l</sup>	84.63 <sup>l</sup>
LSD <sub>005</sub>		0.09	0.01	0.03

Different small letters indicate statistically significant differences

In the research work of NICOLESCU *et al.* (1985) in the period of 1982–1984 the variety Partizanka was for 13% more resistant than the control (line F 262).

The infection of Bezostaja 1 by this pathogen is from 61–78%, which proved that it is more susceptible in relation to new Russian varieties Krasnovodopadskaya 28 and 23, which are infected 20–39% (EREZHEPOV 1984).

On the basis of the investigation of ALLAN and PETERSON (1989), in the period of 1981–1988, in the wheat varieties Madsen, Stephens, Daws, and Nugaines the infection of 9.24, 31, and 43% was registered.

The results of the investigation on wheat variety resistance under the conditions of artificial inoculation by the teleutospores of *T. tritici* in the period from 1972–1984 show that in the Rumanian wheat varieties Dacia, Ceres, Libellula, Lovrin 32, and Diana, the infections lower than 20% were registered (BANITA & ILICEVICI 1986), which means that according to the scale of KRIVCHENKO and MRGKOVA (1977) they belong to the category of medium resistant varieties, which correspond to our investigations.

### CONCLUSION

In conclusion, the investigated domestic wheat varieties, artificially inoculated by *T. tritici*, Lasta

and Pobeda are less susceptible, while Sava, Partizanka, and especially Evropa manifested very high susceptibility to *T. tritici*. The varieties Siete Cerros and NS 9/93 manifest low percent of the infection, while the other varieties are susceptible to the attack of this pathogen. Flamink manifested very high susceptibility.

In our country most of cultivated wheat varieties are medium or high susceptible, and it points to the necessity of creating new varieties, which will have, among many positive characteristics, high resistance to *T. tritici*.

One of the reasons why *T. tritici* is wide spread in our country is because of the lack of the efficient genes of resistance in cultivated varieties.

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