

Immunological assessment of spring wheat varieties to septoriosi in the Saratov region

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Septoria is one of the harmful diseases of wheat cultivars cultivated in the Saratov region. This infectious disease of fungal etiology limits yield indicators and rapidly progresses in many regions of the Russian Federation. The aim of the research was to assess the resistance of winter and spring wheat cultivars that are referred to as promising and recommended for cultivation in the Low Volga region of the Russian Federation to pathogens of Septoria

Key words: effector genes; PCR-diagnosis; wheat selection; Septoria blotch; phytopathogenic fungi; PtrToxA; PtrTox1; PtrTox3.

Our annual monitoring shows that in recent years in many regions of Russia, including the Saratov region, the pathogenic complex of septoriosi of wheat has been dominated by *Zymoseptoria tritici* species. Less common species are *Parastagonospora nodorum* and *P. pseudonodorum*. The fungi of *P. nodorum* and *P. pseudonodorum* are known for their ability to synthesize necrotrophic effectors (NEs), which function as pathogenicity factors. The priority direction of wheat breeding for immunity in the Lower Volga region has been and remains the continuous search and use of new effective genetic sources and donors.

During three years of testing against a natural infectious background, varieties were isolated that showed resistance or weak susceptibility to Septoriosi. A laboratory test of varieties for three pathogens of septoriosi was carried out: *Z. tritici*, *P. nodorum* (*ToxA*, *Tox1*, *Tox3*, *Tox267*), *P. pseudonodorum* (*ToxA*, *Tox1*, *Tox3*).

When wheat samples were infected with *Z. tritici* species, the following varieties performed well: Guberniya, Anastasiya, Sosedka, Favorit. Their degree of damage on average did not exceed 7%; they were included in the group of highly resistant varieties (RR). The degree of damage by *Z. tritici* species to the varieties Gostianum, Lutestsens 230, Podruga, Prokhorovka, Saratovskaya 70, Saratovskaya 73, Belyanka did not exceed 20 %, which made it possible to classify these varieties as resistant (R). Resistance to *P. nodorum* was confirmed by two varieties: Anastasia and Saratovskaya 73, and resistance to *P. pseudonodorum* by six varieties: Podruga, Anastasia, Sosedka, Favorit, Saratovskaya 73 and Belyanka.

Genotyping of wheat varieties using a molecular marker was aimed at identifying carriers of genes that control sensitivity and resistance to the SnToxA toxin [1]. The *Xfcp623* marker amplified a 380 bp fragment associated with the *Tsn1* gene, sensitive to the SnToxA toxin in 12 varieties of winter bread wheat: Lutestsens 230, Saratovskaya 8, Guberniya, Donskaya bezostaya, Saratovskaya 90, Zhemchuzhina Povolzhya, Saratovskaya 17, Kalach 60, Podrugа, Anastasia, Sosedka and one variety of spring soft wheat, Lebedushka. The genotypes of two varieties of winter soft wheat: Gostianum 237 and Mironovskaya 808, six varieties of spring soft wheat: Favorit, Prokhorovka, Yugo-Vostochnaya 2, Saratovskaya 70, Saratovskaya 73 and Belyanka, are carriers of the recessive allele of the *tsn1* gene and they are protected at the genetic level from SnToxA of four dangerous plant pathogens: *Pyrenophora tritici-repentis*, *P. nodorum*, *P. pseudonodorum* and *Bipolaris sorokiniana*.

Screening of genotypes of wheat varieties for the presence of a dominant or recessive gene (*Snn1/snn1*) was carried out using PCR with primer pairs *Xfcp624F/Xfcp624R* [2]. The marker amplified a 345 bp fragment associated with the *Snn1* gene, sensitive to the SnTox1 toxin in 14 varieties: Gostianum, Saratovskaya 8, Guberniya, Mironovskaya 808, Donskaya bezostaya, Saratovskaya 90, Zhemchuzhina Povolzhya, Saratovskaya 17, Kalach 60, Podrugа, Anastasiya, Sosedka, Saratovskaya 70 and Saratovskaya 73; 6 varieties have the recessive *snn1* allele in their genotype: Lutescens 230, Favorit, Prokhorovka, Yugo-Vostochnaya 2, Belyanka and Lebedushka. The variety Mironovskaya 808 was taken as the standard, the genotype of which carries *Snn1* and *tsn1* according to T. Nuzhnaya et al., 2021 [3].

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