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## VULNERABILITY OF FOREIGN VARIETIES OF SPRING WHEAT TO BROWN RUST (*Puccinia recondita* f. sp. *tritici* Rob. ex Desm.) IN THE CONDITIONS OF SOUTHERN KAZAKHSTAN

**Abstract.** The brown rust agent (*Puccinia recondita* f. sp. *tritici* P. *tritici*Erikss.) is a specialized biotrophic parasite, one of the most widespread and harmful diseases of cereals that affect soft wheat *Triticum aestivum* L. under favorable conditions, and the development of the disease can reduce the harvest up to 45% and more. During the epiphytotic development, it covers an area of up to 1.5-2.0 million hectares and reduces the yield up to 20-80%. The most cost-effective and environmentally safe method of combating diseases is the use of resistant varieties, which requires a constant search for new resistance donors and highly resistant samples. This article presents the results of studies on resistance to brown rust.

**Keywords:** varieties of spring wheat, brown (leaf) rust, epiphytoty, resistance, susceptibility.

**Introduction.** Cereals are the most important food and fodder crops in Kazakhstan. Infectious diseases of wheat plants are the main reason for reduction in yields of grain crops and deterioration of its quality [1, 2]. One of the most common and harmful diseases of spring wheat is the brown (leaf) rust caused by the basidiomycota *Puccinia recondita* f. sp. *tritici* Rob. ex Desm. The main area of its distribution and harmfulness is concentrated in the northern regions of Kazakhstan, where the mild or strong development of the fungus is observed every 2-3 years [3-5]. At present, yields of wheat varieties that are unstable to dangerous pathogens reach 60-80% in epiphytotic years [6, 7].

The most cost-effective and environmentally safe method of pest control is the use of resistant varieties, with the constant search for new resistance donors. For reliable protection of the crop, it is necessary to identify sources of resistance to brown rust, to create and use wheat varieties with different resistance genes on immune selection.

**Materials and methods.** The foreign varieties of spring soft wheat, which was obtained from international catteries CIMMYT and ICARDA has been used as a seed grain. The uredospores of brown leaf rust, which was collected on the experimental sites of collection varieties, as well as from affected wild-growing cereals, served as infectious materials. The experiments were carried out in the field experimental conditions of the Kazakh Scientific Research Institute of Agriculture and Plant Growing. To create an infectious background in the phase of plant tillering, an artificial infectious background was created by using a brown rust uredospore (*P. tritici*). The infectious load of uredospores composed 20 mg/m<sup>2</sup>. The processes of infection of plants, the creation of a moist chamber were carried out by the method of N.E. Konovalova and others [8]. The type of lesion of plants with leaf rust was determined on a five-point scale by E.E. Mains, H.S. Jackson [9]. At the same time, 0 point refers to the immune type, 1-2 points to the stable type, and 3-4 points to the susceptible type. The intensity of plant damage was determined by a modified Cobb scale (scale by R.F. Peterson, A.B. Campbell, A. E. Hannah) [10].

**Results.** As a result of research in the conditions of Southern Kazakhstan on an artificial infectious background, the resistance of foreign varieties of spring soft wheat to brown rust was revealed. The

studied varieties showed different responses to disease resistance. Florance Au. variety and control varieties of Morocco, Saratov 29 were strongly affected by leaf rust and the type of reaction has reached 4 points, while the degree of damage was ranged from 70-90%. Varieties of Babaga, Mexipikal, Cham 3, Cham/CA8055 had a moderate resistance rate. Belikh-2, Bohouth 11, Oued Zenati had small pustules with necrotic spots, on the leaf blade of plants the pustules had a scattered development, and the intensity of their development was insignificant (20-30%). Among the varieties studied, Atlas-1, Cham, Karim has been distinguished by resistance. The immunological response was observed in the varieties of Chili, Zenatori Cappeli and Tunsyr-2 (table).

Immune resistance characteristic of foreign summer wheat to brown rust of wheat (*Puccinia recondita* f. sp. tritici)

Sort name	Type and Level of Infection		Eternal resistance (UN1)
	point	%	
Aghram	2+3	30	MR/MS
Atlas-1	0	0	R
Babaga	3	70	MS
Belikh-2	2	20	MR
Bohouth 11	2	40	MR
Florance Au.	4	70	S
Mexipikal	3	60	MS
Cham/CA8055	3	80	MS
Cham	1	5	R
Cham 3	3	60	MS
Chili	0	0	R
Karim	0	0	R
Tunsyr-2	0	0	R
ZenatoriCappeli	0	0	R
OuedZenati	2	40	MR
Morocco (St.)	4	90	S
Saratobskaya 29, (Kazakhstan)	4	95	S

Note: 1 «UN» – a unified scale; 2 «MS» – average sensitivity; 3 «MR» – average resistant; 4 «R» – resistant.

Thus, the studies in the conditions of Southern Kazakhstan showed that foreign varieties of spring wheat are divided into five groups by the immunological types of reaction to brown rust: immune, resistant, moderately resistant, moderately susceptible and susceptible. Immune varieties are as following: Chili, Zenatori Cappeli, Tunsyr-2 and resistant varieties: Atlas-1, Cham, Karim, which are recommended for wheat selection as resistant to leaf rust.

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### **ОҢТҮСТІК ҚАЗАҚСТАН ЖАҒДАЙЫНДА ШЕТЕЛДІК БИДАЙ СОРТТАРЫНЫҢ ҚОҢЫР ТАТПЕН (*Puccinia recondita* f. sp. *tritici* Rob. ex Desm.) ЗАЛАЛДАНУЫ**

**Аннотация.** Қоңыр тат қоздырғышы (*Puccinia recondita* f. sp. *tritici* P. *tritriciana* Erikss.) – астық дақылдарын және *Triticum aestivum* L. жұмсақ бидайды зақымдайтын өте кең таралған, зиянды биотропты паразиттердің бірі болып табылады. Қолайлы жағдайда індеттің дамуы егін өнімін 45%-ға және одан да көп мөлшерде азайтуы мүмкін. Эпифитотияның даму жылдарында ол 1,5-2,0 млн. гектарға дейінгі аумақты қамтып, егіс өнімін 20-80%-ға дейін төмендетеді. Індетпен күресудің экономикалық және экологиялық тұрғыдан ең тиімді әрі қауыпсіз жолы төзімді сорттарды пайдалану болып табылады, ал ол үшін жаңа төзімді донорлар мен жоғары төзімді үлгілерді іздестіру жұмыстарын үнемі жүргізіп тұру қажет. Мақалада қоңыр татқа төзімділік бойынша алынған зерттеу нәтижелері келтірілген.

**Түйін сөздер:** жаздық бидай сорттары, қоңыр тат, эпифитотия, төзімді, қабылдағыш.

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### **ПОРАЖАЕМОСТЬ ЗАРУБЕЖНЫХ СОРТОВ ЯРОВОЙ ПШЕНИЦЫ БУРОЙ РЖАВЧИНОЙ (*Puccinia recondita* f. sp. *tritici* Rob. ex Desm.) В УСЛОВИЯХ ЮЖНОГО КАЗАХСТАНА**

**Аннотация.** Возбудитель бурой ржавчины (*Puccinia recondita* f. sp. *tritici* P. *tritriciana* Erikss.) – специализированный биотрофный паразит, одно из наиболее распространенных и вредоносных заболеваний зерновых злаков и поражающий мягкую пшеницу *Triticum aestivum* L. При благоприятных условиях развитие болезни может снизить урожай до 45% и более. В годы развития эпифитотий она охватывает площадь до 1,5-2,0 млн га и снижает урожай до 20-80%. Наиболее экономически выгодным и экологически безопасным методом борьбы с болезнями является использование устойчивых сортов, при этом требуется постоянный поиск новых доноров устойчивости, высокоустойчивых образцов. В статье представлены результаты исследований на устойчивость к бурой ржавчине.

**Ключевые слова:** сорта яровой пшеницы, бурая (листовая) ржавчина, эпифитотия, устойчивость, восприимчивость.

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