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RESISTANCE OF WINTER WHEAT VARIETIES TO HEAD SMUT AGENTS IN THE NORTHERN STEPPE OF UKRAINE

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The results of studies on the stability of winter wheat varieties of domestic and foreign breeding against pathogens of hard soot on an artificial infectious background are presented.

Among varieties of domestic breeding, the Slavna variety, which was not affected by the disease for three years of testing, was very resistant. High resistance to hard soot was shown by 8 varieties: Smuglyanka, Novosmuglyanka, Oktava, Spasivka, Liga Odes'ka, Katrusya Odes'ka, Zolotokolosa, Pryvablyva. The damage rate of these varieties did not exceed 5 %. Persistent were the following varieties: Zisk, Nota Odes'ka, Fermerka, Konka, Pylypivka, Boria, Lira Odes'ka, Gilea.

Of the varieties of foreign breeding showed a very high resistance to the disease variety Vita, and high – such varieties as Sotnitsa, Grom, Skipetr, Vasa (Russian selection) and Salem (Canadian). Irishka and Krasnodarskaya 99 varieties were stable.

Their use in breeding processes will increase resistance to hard soot in newly created varieties.

***Key words**: winter wheat, varieties, hard soot, resistance, damage.*

Hard soot is one of the oldest cereal diseases that affects winter wheat. More than 200 years have passed since the infectious nature of winter wheat durumweed was established. Since then, scientists have achieved significant results in the study of the biology of its pathogen and have developed various methods of combating the disease. But despite this, they could not eradicate it from the fields.

Durum wheat (*Triticum* L.) in the northern steppe of Ukraine is caused by two pathogens: Tilletiacaries (DS) Tul. and Tilletialevis Kuehn [1, 2].

In terms of pathological properties, mechanism of action on the plant and specialization, both types of hard soot are identical and affect both winter wheat and spring. Symptoms of manifestation and type of sorghum are exactly the same, the species differ only in the morphology of the spores.

The characteristic symptoms of the disease have the most clear manifestation in the phase of milky-wax ripeness of wheat grain. Infected plants differ from the healthy ones by a much smaller height, their ears become dark green in color with a certain purple hue. Later, the difference in color of diseased and healthy plants is leveled. But at this time the soot "sacks", that is, sorghum, become more rounded, they increase in size, move the scales of ears, giving it a crumbly squishy appearance. When pressed on infected cereals that are in the phase of milk ripeness, a grayish liquid with an unpleasant odor of trimethylamine, which is almost similar to the smell of brine from herrings, is released from them. In the phase of waxy ripeness in grains, instead of endosperm, an olive-brown mass of spores develops, which is much lighter than that of healthy grain. This explains the fact that the affected ear remains

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standing straight, while the healthy one tilts under the weight of the grain [3, 4].

In natural conditions, hard soot is common in wheat and found in species of the genera Aegilops, Agropyron, Amblyopyrum, Poa, Bromus and Secale, as well as triticale [1].

Along with widespread distribution, hard soot also causes significant damage, which is estimated at the percentage of ears that have hit it and so-called hidden losses, which do not occur during external inspection of plants, but usually far outweigh the visual losses. According to K. Ya. Kalashnikov [5], in winter wheat, in the presence of 0.17 % of a certain visually diseased ear, the latent losses are 23 times greater.

In general, damage from a hard soot is the sum of several components, it is a sick ear; affected plants that died during the growing season; reducing the yield of inhibitory effects on externally healthy plants; deterioration of food and feed quality of grain. The chemical method is widely used to protect winter wheat from pathogens, but at the present stage, a more environmentally friendly and less costly method is the creation and cultivation of sustainable varieties. Modern selection of winter wheat is impossible without the constant admission of effective donors of disease resistance, which in every case adapt to new conditions and lead to the emergence of epiphytoties on previously resistant varieties. Therefore, the role of donors of disease resistance is increasing. They become factors limiting selection. The number of sources of winter wheat resistance to hard soot is limited, and in many of them resistance to this disease is closely linked to a number of negative features, which complicates their use in breeding [6–8].

The purpose of the research. Is the isolation of pathogens of persistent winter wheat varieties on the artificial infectious background.

Materials and methods of research. The studies were carried out at the Synel'nykove Selection and Research Station of the State Institute of Grain Corps during 2016–2019. The weather conditions of the pre-sowing period, autumn and spring-summer vegetation of winter wheat during this time were quite varied. This made it possible to thoroughly study the stability of the varieties sown in the experiments.

The subject of the study were winter wheat varieties of domestic and foreign breeding. The stability of 61 varieties was studied on an artificial infectious background of solid soot in field conditions. The infectious material for inoculation was collected in the crops of perspective and district varieties of winter wheat. Contamination of wheat with a solid soot was carried out before sowing according to the standard method [9]. The sowing was carried out at a late time at a soil temperature of 10 ^{0}C and below, the seeds were wrapped to a depth of 6–7 cm in rows 1.5 m long with a row spacing of 15 cm. The disease of plants of wheat varieties was taken into account in the phase of milky-wax ripeness by the method of calculation of healthy and diseased ears. Hersons'ka bezosta and Podolyanka varieties were used as a standard susceptible to hard soot.

After the evaluation, the starting material was classified by stability and susceptibility groups on the basis of a 9-point scale. Scores corresponded to the number of affected plants as a percentage: 0 % – very high resistance; 1–5 % is highly resistant; 6–15 % – stable; 16–25 % – weakly susceptible; 26–65 % are receptive; 66–90 % – highly susceptible; 91–100 % are very susceptible [10].

Research results. The study of winter wheat resistance to pathogens shows that regional and promising varieties of domestic and foreign breeding are differently resistant to the disease.

Among varieties of domestic breeding, the Slavna variety, which was not affected by the disease for three years of testing, was very resistant. High resistance to hard soot was shown by 8 varieties: Smuglyanka, Novosmuglyanka, Oktava, Spasivka, Liga Odes'ka, Katrusya Odes'-ka, Zolotokolosa, Pryvablyva. The damage rate of these varieties did not exceed 5 %. The following varieties were found to be resistant: Zysk, Nota Odes'ka, Fermerka, Konka, Pyly-pivka, Boria, Lira Odes'ka, Gilea, the damage rate of which did not exceed 15 %. Eight varieties were poorly susceptible and 13 were susceptible to hard soot. Hersons'ka bezota, Podolyanka and Blago varieties showed high susceptibility to the disease – 18.9–72.2 %.

Of the varieties of foreign breeding showed a high resistance to the disease variety Vita, and high – such varieties as Sotnitsa, Grom, Skiptr, Vasa (Russian selection) and Salem (Ca-

nadian). Irishka and Krasnodarskaya 99 varieties were stable. The lesions of these varieties did not exceed 15 %. Three varieties were characterized by low susceptibility – the Canadian Jersey and the Russian Lebid, Ogradskaya. 6 Russian varieties, as well as the Canadian Novel and the French Colonia, were susceptible to hard soot. Austrian varieties of Midas and Balaton were characterized by high susceptibility to the disease. The lesions of these varieties reached 42.8–82.3 % (Table).

Conclusions. On the artificial infecti-

Affection of winter wheat varieties of causative agents of hard soot

Variety	Affection, %				Stability Ball
	2016 y.	2017 y.	2018 y.	2019 y.	
1	2	3	4	5	6
Varieties of scientific institutions of Ukraine					
Slavna	0	0	0	-	9
Novosmuglyanka	-	-	0	0,2	8
Smuglyanka	0	0,3	0	-	8
Oktava	-	-	0	0,3	8
Spasivka	0	0,3	0	-	8
Liga Odes'ka	-	-	0	0,8	8
Katrusya Odes'ka	-	-	0,5	1,0	8
Zolotokolosa	0	-	0,5	1,9	8
Pryvablyva	-	-	4,3	2,5	8
Zysk	-	3,3	6,0	1,9	7 – 6
Nota Odes'ka	-	-	7,3	0	7 – 6
Fermerka	7,9	5,8	4,6	-	7 – 6
Konka	9,0	-	1,0	1,0	7 – 6
Pylupivka	6,8	-	2,2	10,5	7 – 6
Lira Odes'ka	-	6,7	13,0	11,8	7 – 6
Gileya	14,1	0,6	-	-	7 – 6
Boria	-	-	14,5	4,5	7 – 6
Garmoniya Ode'ka	-	-	18,3	0,8	5
Hersons'ka 99	9,0	2,4	21,1	-	5
Statna	21,4	-	11,6	-	5
Pryvitna	-	-	21,7	13,5	5
Rozkishna	18,7	22,7	5,2	-	5
Zapashna	23,0	5,7	22,7	-	5
Oleksiivka	-	-	25,0	4,9	5
Malynivka	16,7	-	28,3	25,7	4 – 3
Favoryka	-	-	29,4	22,6	4 – 3
Kohana	10,7	3.7	29.3	-	4 – 3
Mudrist Odes'ka	9,9	7,7	33,7	3,5	4 – 3
List 25	15,9	-	34,8	-	4 – 3
Zluka	36,4	10,9	20,7	-	4 - 3
Kohganka	23,3	20,0	38,4	20,0	4 – 3
Gurt	-	20,7	39,1	5,2	4 – 3
Rosynka	14,2	10,7	39,7	-	4 – 3
Zira	45,9	28,4	24,7	27,7	4 – 3
Bogdana	-	32,6	32,2	48,6	4 – 3
Zdoba	-	-	47,8	24,8	4 – 3
Blago	24,9	24,2	52,4	-	4 – 3
Podolyanka	-	18,9	52,4	72,1	2
Hersons'ka bezosta	56,6	44,4	72,2	-	2
Varieties of foreign breeding					
Vita	0	0	0	-	9
Salem	-	-	1,6	0,4	8
Sotnytsya	1,7	0,2	-	-	8
Grom	3,3	0,3	3,3	-	8
Skipetr	2,5	-	4,3	2,8	8
Pryvablyva	-	-	4,3	2,5	8

продовження таблиці

1	2	3	4	5	6
Vasa	4,4	0,2	-	-	8
Irishka	6,3	3,4	2,0	-	7 – 6
Krasnodarskaya 99	11,3	-	13,7	9,8	7 – 6
Jersy	-	-	16,9	13,9	5
Lebid	-	-	17,7	10,5	5
Ogradskaya (Tanya)	21,3	10,4	5,9	-	5
Colonia	-	-	26,3	23,6	4 – 3
Yuvileyna100	3,5	-	27,6	4,5	4 – 3
Yumpa	13,2	29,1	20,1	-	4 – 3
Kalym	34,6	28,2	-	-	4 – 3
Novel	-	-	13,6	39,4	4 – 3
Doskonala	48,9	22.1	-	-	4 – 3
Zymnytsya	-	-	55,7	25,7	4 – 3
Yunona	57,6	29,7	-	-	4 – 3
Midas	-	80,8	42.8	-	2
Balaton	-	82,3	43,2	-	2

ous background, the resistance of localized and promising domestic and foreign winter wheat varieties to the causative agents of hard soot has been studied. Varieties such as Slavna, Vita, Novosmuglyanka, Smuglyanka, Oktava, Spasivka, Salem, Sotnitsa, Liga Odes'ka, Katrusya Odes'ka, Zolotokolosa and others were found promising on the basis of resistance to hard soot. Their use in breeding will increase resistance to pathogens in newly created varieties.

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Явдощенко Н.П., Солодушко Н. Н., Педаш Т. Н. Устойчивость сортов пшеницы озимой к возбудителям твердой головни в северной Степи Украины.

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Изложены результаты исследований изучения устойчивости сортов пшеницы озимой отечественной и зарубежной селекции к возбудителям твердой головни на искусственном инфекционном фоне.

Из сортов отечественной селекции очень высокой устойчивостью отличался сорт Славна, который не поражался болезнью на протяжении трёх лет испытаний. Высокую устойчивость к твердой головне показали 8 сортов: Смуглянка, Новосмуглянка, Октава, Спасовка, Лига одесская, Катруся одесская, Золотоколоса, Прываблыва. Уровень поражения этих сортов не превышал 5 %. Устойчивость проявили следующие сорта: Зыск, Нота одесская, Фермерка, Конка, Пылыпивка, Бория, Лира одесская, Гилея.

Из сортов зарубежной селекции очень высокую устойчивость к болезни показал сорт Вита, а высокую – сорта Сотныця, Гром, Скипетр, Васса (Россия) Салем (Канада). Сорта Иришка и Краснодарская 99 были устойчивыми. Использование их в селекционном процессе позволит повысить устойчивость новых сортов к твердой головне.

***Ключевые слова**: озимая пшеница, сорта, твердая головня, устойчивость, поражение.*

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Явдощенко М. П., Солодушко М. М., Педаш Т. М. Стійкість сортів пшениці озимої до збудників твердої сажки у північному Степу України. *Зернові культури. 2020. Т. 4. № 1. С. 174–178.*

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Наведено результати досліджень з вивчення стійкості сортів пшениці озимої вітчизняної та зарубіжної селекції проти збудників твердої сажки на штучному інфекційному фоні.

Серед сортів вітчизняної селекції дуже високою стійкістю відзначався сорт Славна, який не уражувався хворобою протягом трьох років випробування. Високу стійкість до твердої сажки показали 8 сортів: Смуглянка, Новосмуглянка, Октава, Спасівка, Ліга одеська, Катруся одеська, Золотоколоса, Приваблива. Рівень ураження цих сортів не перевищував 5 %. Стійкими виявилися наступні сорти: Зиск, Нота одеська, Фермерка, Конка, Пилипівка, Борія, Ліра одеська, Гілея.

Із сортів зарубіжної селекції дуже високу стійкість до хвороби показав сорт Віта, а високу – такі сорти, як Сотниця, Гром, Скіпетр, Васа (російської селекції) і Салем (канадської). Сорти Іришка і Краснодарська 99 були стійкими. Використання їх у селекційному процесі дасть можливість підвищити стійкість до твердої сажки у новостворених сортів.

***Ключові слова**: пшениця озима, сорти, тверда сажка, стійкість, ураження.*