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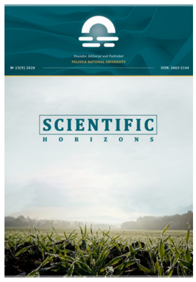

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Evaluation of Winter Barley Cultivars for Resistance to Leaf Fungal Diseases and Yield in the Conditions of the Western Forest-Steppe of Ukraine

Halyna Bilovus*, Maria Terletska, Volodymyr Pushchak, Oksana Vashchyshyn, Oksana Prystatska

Institute of Agriculture in the Carpathian Region NAAS
81115, 5 Hrushevskyi Str., v. Obroshyne, Ukraine

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Abstract. Currently, the issue of creating varieties with complex resistance to the most common diseases of winter barley, considering soil and climatic conditions, is extremely important. This is primarily conditioned upon the tasks of protecting the environment from pesticide pollution and contributes to a significant improvement in the sanitary situation. Important in this context is the search for and evaluation of samples with effective disease resistance genes to use them as parental components in crosses. The aim of this study was to identify varieties of winter barley with a high level of yield and resistance to leaf fungal diseases in the western region of Ukraine. The study was conducted using field (assessment of disease development in winter barley varieties), laboratory, analytical and mathematical and statistical methods. The results of research of winter barley variety samples in the competitive variety test for resistance to leaf fungal diseases are highlighted. Varieties with resistance to pathogens of dark brown spot *Bipolaris sorokiniana* Shoem – Zbruch, Shyrokolystyi, Liubomyr, Kormovyi, Dnister; and to the causative agents of rhinosporiosis *Rhynchosporium graminicola* Heinsen – Shyrokolystyi, Liubomyr, Kormovyi, Dnister, Babylon, Babylon x HE 0.05%. The highest grain yields on average in 2017-2019 among the studied varieties of winter barley were Zbruch, Obroshynskyi x NE 0.05%, Dnister, Kormovyi, Shyrokolystyi, 3.63; 3.42; 3.33; 3.33, 3.25 t/ha. It was found that the most valuable are the varieties: Shyrokolystyi, Kormovyi, Dnister, which are characterised by a combination of high index of complex stability with productivity. The highest indicators of stress resistance were found in cultivars: Dnister (-0.07), Obroshynskyi x NE 0.05% (-0.12), Liubomyr (-0.13). High genotypic plasticity was observed in the varieties: Zbruch (3.84), Obroshynskyi x NE 0.05% (3.62) and Dnister (3.51 t/ha). Further research will focus on the development of rhinosporiosis and dark brown spots of winter barley depending on environmental factors in the western region of Ukraine

Keywords: yield, rhinhosporiosis, dark brown spot, index of complex resistance, stress resistance, genotypic plasticity

*Corresponding author

INTRODUCTION

In the grain balance of Ukraine, one of the main insurance crops is winter barley, which has a fairly high profitability, its cultivation requires minimal costs. The area under winter grain in Ukraine in 2019 was 7.2 million hectares, and in the Lviv region – 22.9 thousand hectares (Petrychenko & Likhochvor, 2020). The increase in the production of barley grain as a food and feed crop is explained by the modern concept of nutrition, which involves the use of a wide range of foods with high taste, the need to provide the human body with sufficient proteins, carbohydrates, minerals, essential amino acids, vitamins, etc. (Bilovus & Zayats, 2014; Lykhochvor & Matkovska, 2017; Mikhailenko, 2008).

Modern technologies of the selection process of such an important crop as winter barley, help to create new varieties with high yields at relatively low economic costs.

The experience of Ukrainian and world selection shows that in the process of creating varieties of winter barley in some cases the availability of source material is crucial, which combines productivity with adaptive traits (Gudzenko & Vasylkivsky, 2017; Demidov *et al.,* 2017; Anbessa et al., 2010; Van Oosterom & Acevado, 1992).

Extensive adaptation of the variety to radically different growing conditions is a relatively rare case. In the history of selection and production, such unique generally recognised varieties were: wheat – Myronivska 808, barley – Wiener (Vasylkivskyi & Gudzenko, 2017; Hudzenko *et al*., 2019). However, varieties with wide adaptability may be inferior to more locally adapted in specific conditions (Abessa et al., 1992; Ceccarelli, 1996). This is especially true of conditions with strong pressure of environmental factors (drought, waterlogging, etc.) (Van Oosterom & Acevado, 1992; Von Korff *et al*., 2008).

Data from a recent survey of 410 farmers and 114 consultants in Germany on the impact of recent climate change on plant productivity are almost identical. The increase in the frequency of droughts and dry winds, the increase in the incidence of heavy rains, and the mitigation of winters have been noted as the main effects of climate change. Based on empirical data, respondents are inclined to believe that special varieties are needed to adapt to these changes. Productivity, ecological stability, resistance to lodging and drought tolerance are noted as the main features of such varieties. There is a unanimous opinion on the need for continuous research on the ecological stability of the varieties created (Macholdt & Honermeier, 2016).

In connection with global climate change and warming, the selection of varieties of winter cereals for specific soil and climatic conditions with high winter hardiness and disease resistance is of particular importance (Levitin, 2012; Solonechnyi *et al*., 2017).

One of the factors that negatively affects the yield is the impact of harmful pathogens. According to leading scientists (Solonechnyi *et al*., 2017; Vasylkivsky & Sabadyn, 2015; Lytvynenko & Volkodav, 2005), plant diseases are one of the main factors destabilising agricultural production. In most areas of Ukraine, fungal pathogens of winter barley reduce yields and worsen grain quality. Leaf fungal diseases, such as powdery mildew, rhinhosporiosis, reticulate, striped and dark brown spots, dwarf rust, root rot, etc., are the most harmful. Losses from widespread pathogens of these diseases range from 6.0 to 50.0% (Solodushko, 2013).

In the agrocenosis of winter barley there is a constant change in the virulence of pathogens. Damage to plants by pathogens depends not only on factors of plant resistance, but also on the state of the pathogen population and environmental conditions. The emergence and reproduction of new races of pathogens leads to the loss of resistance varieties. With the help of growing resistant varieties can significantly improve the ecological characteristics of agrocenoses, increase the profitability of plant production (Solonechnyi *et al.,* 2014).

Among the main causes of mass destruction of cereals, researchers call the narrowing of genetic diversity, insufficient use in the selection of introgression of resistance genes from wild plant species and the disappearance of local adapted varieties – sources of resistance to biotic and abiotic environmental factors (Solonechnyi *et al*., 2014; Solonechnyi *et al*., 2017; BLyzniuk *et al*., 2019).

A genotype with complex resistance to dark brown spot pathogens and other diseases is rare, which is especially valuable for the selection of geneticists. Creation and introduction into production of resistant varieties of this culture to the action of various diseases (with a sign of complex resistance) is a priority for breeders and geneticists (Solonechnyi *et al*., 2017; Blyzniuk *et al*., 2019; Shishkin & Derova, 2014). It has already become clear that the use of sustainable varieties is an important environmental factor that provides a significant reduction in energy costs for crop production. In this regard, breeders and phytopathologists are faced with the need to create varieties that combine the same genotype traits of productivity and disease resistance. The negative impact of diseases is manifested in many ways and in different ways depending on the methods of spread, sources of infection, phase of culture development and weather conditions. To effectively control diseases, it is necessary to consider not only weather conditions, phases of crop development, but also have clear information about the etiology of the disease and the biology of pathogens.

Dark brown spot is the the causative agent *of Bipolaris sorokiniana* Shoem. Prolonged wet and warm windy weather during the growing season causes damage to crops; precipitation; late sowing dates; application of nitrogen fertilizers only. The disease leads to a decrease in the assimilation surface area, premature drying of leaves and plants, reduced grain yield and deterioration of its sowing and technological qualities. With the intensive development of the disease, crop losses can be 30-40% (Sabadin, 2008; Bilovus & Marukhnyak, 2019).

Rhinosporiosis is the causative agent of *Rhynchosporium graminicola* Heinsen. Symptoms of the disease are manifested on both sides of the leaf and leaf sheaths in the form of gray-green watery, and later when drying – light spots with a dark brown border. Initially, the leaves of the lower tiers are infected, but with significant moisture, the disease spreads throughout the plant – to the flag leaf and ear. With the intensive development of the disease in the epiphytic years before the shortage of 25% or more (Bilovus & Marukhnyak, 2019). Thus, the creation of high-yielding varieties of winter barley with high fodder value is an urgent issue today, in particular in the Western Forest-Steppe of Ukraine.

The purpose of the work is to identify varieties of winter barley with a high level of yield and resistance to leaf fungal diseases in the Western region of Ukraine.

MATERIALS AND METHODS

The research was conducted in 2017-2019 in the conditions of selection and seed crop rotation of the laboratory of grain and fodder crops selection and in the laboratory conditions (plant protection laboratory) of the Institute of Agriculture of the Carpathian region of NAAS. The object of the study were 12 varieties of winter barley, various institutions-originators, which are included in the Register of plant varieties suitable for distribution in Ukraine. The soil of the experimental plot is gray forest surface gleyed, which is characterised by the following agrochemical indicators: humus content in the layer 0-20 cm (according to Tyurin) – 2.1%, saline pH – 5.8, lightly hydrolyzed nitrogen (according to Cornfield) – 112.7 mg/kg, mobile forms of phosphorus (according to Kirsanov) – 111.0 mg/kg, potassium (according to Kirsanov) – 109.0 mg/kg of soil. Agrotechnics of cultivation of winter barley cultivars is generally accepted for winter barley in the conditions of the western region of Ukraine. Predecessor – oil radish, background of mineral nutrition – $N_{60}P_{60}K_{60}$, agricultural machinery – generally accepted for growing winter barley in the research area. The estimated area of the site is 25 m^2, repetition – four times. Sowing was carried out with a selection seeder SKS-6-10 with the device of the central seeding, harvesting – the combine "Sampo-130".

The intensity of disease of winter barley plants was determined on a 9-point scale (Babyants *et al.,* 1998):

9-8 – very high and high stability;
7-6 – stable;
5 – weak susceptibility;
4-3 – susceptibility;
2 – high susceptibility;
1 – very high susceptibility.

Phenological observations of the development of winter barley plants were carried out and the indicators of crop structure and technological qualities of grain varieties were determined according to the method of V.O. Yeshchenko (2014).

Records of diseases on winter barley were carried out in the phase of tube emergence, earing and milk ripeness according to generally accepted methods (Babyants *et al.*, 1998; Tribel *et al.*, 2001).

Individual resistance indices were calculated as the ratio of the average long-term value of resistance for an individual pest to the average for all samples studied. Indices of complex resilience expressed the average value of indices of individual resilience (Litun *et al.*, 2009).

According to the description of weather conditions for 2017-2019, the data of the Lviv Hydrogeological and Reclamation Station were used, the observation point was v. Obroshine. To determine the influence of climatic factors, in particular the amount of precipitation and temperature on the development of diseases used hydrothermal coefficient (SCC) in the period April-July (Lyashenko, 2014). When assessing the agro-climatic resources of this area, it was conisidered that SCC in the range of 1.0-1.5 characterises optimal humidity, greater than 1.5 – excessive, less than 1.0 – unstable, less than 0.5 – weak.

Statistical reliability of experimental data was performed using Microsoft Excel by determining the mean, minimum (m), maximum values (max) and range of variation. Mathematical processing of yield data was performed by the dispersion method (Ushkarenko *et al.*, 2013). In the comparative evaluation of the studied varieties, the indexing method was used, according to which the disease damage of plants in points was translated into an indicator of distance from the average value for all studied samples (resistance indices). The level of resistance to stress was determined by the difference between the minimum and maximum yield ($Y_2 – Y_1$). It is negative, and the greater its value, the greater the resistance to stress. The characteristic of varieties in terms of resistance to stress is complemented by the value ($Y_2 – Y_1$)/2, which expresses the degree of correspondence between the genotype of the variety and various environmental factors (Sych, 2005).

RESULTS AND DISCUSSION

With the beginning of the growing season in April 2017, precipitation was 16.1 mm less than normal, or 68% of normal (Table 1).

***Table 1**. SCC according to average monthly data for the period 2017-2019 (April-July)*

Indicator	Period				
	April	May	June	July	For the whole period
2017					
Average air temperature (t_{avg}), °C	8.5	13.8	18.2	18.5	14.7
The amount of precipitation, mm	34.9	85.3	22.2	57.2	199.6
The sum of active temperatures ($t_{act.}$>10), °C	–	428	546	573	1547
SCC of Selyaninov	–	2.0	0.4	1.0	1.3
2018					
Average air temperature (t_{avg}), °C	13.7	16.9	18.3	19.2	17.0
The amount of precipitation, mm	21.6	69.0	153.5	116.0	360
The sum of active temperatures ($t_{act.}$>10), °C	411	524	549	595.2	2079.2
SCC of Selyaninov	0.52	1.3	2.8	1.9	1.73
2019					
Average air temperature (t_{avg}), °C	10.0	13.2	21.2	18.3	15.7
The amount of precipitation, mm	32.8	149.6	53.1	81.2	316.9
The sum of active temperatures ($t_{act.}$>10), °C	300	409	636	567	1912
SCC of Selyaninov	1.1	3.65	0.83	1.43	1.6

Thus, in April the temperature exceeded the norm by 1.1°C and amounted to 8.5°C, and in May an increase of 0.9°C was observed. The amount of precipitation in the third decade of May was 22 mm more than normal. In June-July there was a significant lack of precipitation. In June, only 22.2 mm fell – 24% to the norm, in July 57.2 – 56%. Even higher deviation from the norm was in June +1.9°C. The average monthly temperature in July was 18.5°C, which is 1°C higher than normal.

It should be noted that according to the calculations of the SCC on the average monthly data in 2017, the period from April to July was quite wet.

Because in April in the II and III decades there are no active air temperatures above 10°C, so the SCC for this month was not expected. It should be noted that May was excessively wet (SCC – 2.0), June – very dry (SCC – 0.4), and July – quite wet (SCC – 1.0). The third decade of May was favorable for the development of diseases such as dark brown spot, rhinhosporiosis.

In April 2018, there was a sharp increase in air temperature to 13.7°C (+6.3°C above normal), in May to 16.9°C (+4.0°C above normal). The regime of soil moisture in these months did not meet the needs of plants. In June, there was a sharp change in the humidification regime (+60.5 mm to normal) with increasing air temperature (+2.0°C to normal), which led to the accelerated formation of reproductive organs of plants. The air temperature in July was 1.7°C higher than the perennial, and the amount of precipitation was 14.0 mm higher than normal.

Thus, the SCC calculations show that in addition to April, the growing season in May-July was quite wet. The month of April was very dry (SCC=−0.5), May was quite wet (SCC=−1.3), and June and July were excessively wet. It should be noted that the weather conditions that were during the growing season of winter barley in 2018 contributed to the development of dark brown spot, rhinosporiosis. In 2019, April was characterised by warm and dry weather (air temperature was 2.6°C above normal and precipitation was 18.2 mm less than normal). The air temperature in May was 0.3°C above the norm, and the amount of precipitation was 64.6 mm higher than the norm (Table 1).

In summer, weather conditions differed. June was characterised by warm and relatively dry weather (air temperature was 4.9°C above normal, and precipitation was 39.9 mm less than normal). The air temperature in July was 0.8°C higher than the perennial, and the amount of precipitation was 20.8 mm less than normal. According to the results of SCC calculations in 2019 (Table 1), we can conclude that the period April-July was quite wet. April and July were quite wet (SCC=−1.1), May – excessively humid (SCC=−3.6), June – mild drought (SCC=−0.83).

It should be noted that weather conditions in the third decade of May and the first decade of June contributed to the development of diseases such as dark brown spot, rhinosporiosis. Thus, the weather conditions of 2017-2019 contributed to the maximum development of pathogens conditioned upon optimal and excessive humidity and the optimal air temperature.

Such conditions allowed to reliably assess the samples of winter barley for resistance to dark brown spot, rhinosporus. The development of dark brown spots, depending on the variety samples in 2017 was: 3.5-15.0%, in 2018 – 5.5-25.0%, in 2019 – 4.5-35.0%; rhinhosporiosis – 2.5-25.5%; 5.5-35.0%; 3.5-28.5%.

Researchers S.V. Mikhailenko (2008), N.M. Shakhova & A.I. Shapovalov (2014), O.I. Borzykh (2015), O.V. Chaika & M.M. Klyuchevych (2009) and others argue that the timing of dark brown spots depends on the average air temperature and the amount of precipitation in May, which is confirmed by our research results. The problem of barley immunity in Ukraine has recently attracted the attention of many scientists in the field of crop production, including V.Ya. Sabadin (2008), V.M. Gudzenko (2013) and other. As a result of the work carried out in this direction, the sources of resistance to the main diseases of winter barley have been identified, including varieties and lines with high resistance to abiotic factors have been created. Immunological evaluations were performed to determine the stability of winter barley cultivars with rhinosporiosis and dark brown leaf spot. As a result of the immunological evaluation (Table 2) marked varieties with high resistance to rhinhosporiosis pathogen *Rhynchosporium graminicola* Heinsen (score 7), namely: Shyrokolystyi (St), Liubomyr, Kormovyi, Dnister, Babylon, Babylon x NE 0.05%. It should be noted that on average in 2017-2019 high resistance (score 8-7) to the causative agent of dark brown spot *Bipolaris sorokiniana* Shoem showed varieties: Zbruch, Shyrokolystyi (St), Liubomyr, Kormovyi, Dnister.

***Table 2**. Resistance of winter barley varieties against leaf diseases, average for 2017-2019*

Variety sample	*Rhynchosporium graminicola Heinsen*		*Bipolaris sorokiniana Shoem*		Index of complex stability, ICS
	Score	Stability index, I	Score	Stability index, I	
Shyrokolystyi (St)	7	1.06	7	1.1	1.08
Zbruch	6	0.91	8	1.24	1.07
Liubomyr	7	1.06	7	1.1	1.08
Kormovyi	7	1.06	7	1.1	1.08
Dnister	7	1.06	7	1.1	1.08
N5 Ca (M6xM7)	6	0.91	6	0.93	0.92
ID No. 1453	6	0.91	5	0.78	0.84
Babylon	7	1.06	6	0.93	0.99
Babylon x NE 0.05%	7	1.06	6	0.93	0.99
Babylon x NE 0.05%	7	1.06	6	0.93	0.99
Obroshynskyi x NE 0.05%	6	0.91	6	0.93	0.92
Obroshynskyi x NE 0.05%	6	0.91	6	0.93	0.92
X*	6.6	0.99	6.41	1.0	0.99
min**	6.0	0.91	5.0	0.93	0.84
max***	7.0	1.06	8.0	1.24	1.08
R.	1.0	0.15	3.0	0.31	0.24

Note**: x* – average, min ** – minimum value, max *** – maximum value, R * – range (max-min)*

According to the indices of resistance less affected by rhinosporiosis showed varieties: Shyrokolystyi, Liubomyr, Kormovyi, Dnister, Babylon, Babylon x NE 0.05%; dark brown spots: Shyrokolystyi, Zbruch, Liubomyr, Kormovyi, Dnister (Table 2).

The level of resistance of winter barley cultivars to pathogens was assessed by the index of complex resistance (ICS). The highest indicators of complex resistance to pathogens of two diseases were observed in cultivars: Shyrokolystyi, Liubomyr, Kormovyi, Dnister (ICS=1.08).

Variety as a genetic system responds specifically to external environmental factors. A distinctive feature of any variety is a set of properties that determine its suitability for a particular area, and therefore the correct choice of variety is of paramount importance in the cultivation of cereals.

According to the results of research (Table 3) on average over the years of research varieties Zbruch (3.63 t/ha), Obroshinskyi x NE 0.05% (3.42), Kormovyi (3.33 t/ha), Dnister (3.33 t/ha), Shyrokolystyi (3.25 t/ha) had the highest grain yield. In the current climate change, an important indicator of varieties is their resistance to stress. The stress-resistance indicator has a negative sign and the smaller its value, the higher the stress-resistance of the variety. Dnister (-0.07), Obroshyskyi x NE 0.05% (-0.12), Liubomyr (-0.13) had the highest indicators of stress resistance.

Table 3. *Adaptability and yield of winter barley cultivars, average for 2017-2019*

Variety sample	Yield, t/ha			Yield, t/ha	Genotypic plasticity, t/ha
	Y_2 (min)	Y_1(max)	X*		
Shyrokolystyi (St)	3.00	3.57	3.25	-0.57	3.29
Zbruch	3.71	3.97	3.63	-0.26	3.84
Liubomyr	3.13	3.26	3.04	-0.13	3.19
Kormovyi	3.03	3.81	3.33	-0.78	3.42
Dnister	3.48	3.55	3.33	-0.07	3.51
N5 Ca (M6 x M7)	3.28	3.48	3.20	-0.2	3.38
ID No. 1453	3.40	3.60	3.30	-0.2	3.50
Babylon	2.99	3.38	2.93	-0.39	3.18
Babylon x NE 0.05%	3.07	3.26	3.0	-0.19	3.16
Babylon x NE 0.05%	2.96	3.35	2.94	-0.39	3.15
Obroshynskyi x NE 0.05%	3.34	3.46	3.23	-0.12	3.40
Obroshynskyi x NE 0.05%	3.55	3.69	3.42	-0.14	3.62
X*	3.24	3.53	3.22	-0.29	3.39
min**	2.99	3.26	2.93	-0.07	3.15
max***	3.71	3.97	3.63	-0.78	3.84
R.	0.72	0.71	0.7	-0.71	0.69

Note: *Y_2(min) – minimum grain yield, Y_1(max) – maximum grain yield, X * – average, min ** – minimum value, max *** – maximum value, R **** – range of variation (max-min)*

The average yield of varieties in contrasting conditions (stress and non-stress) characterise their genotypic plasticity. The high value of this indicator indicates a high degree of correspondence between the genotype of the variety and environmental factors. The maximum relationship between genotype and environmental factors was observed in cultivars: Zbruch (3.84), Obroshynskyi x NE 0.05% (3.62) and Dnister (3.51).

According to generalised data, barley crops are damaged by more than 200 pests. At the same time, they have certain specific features regarding ecological and geographical origin. According to the results of our research, which coincide with the results of well-known researchers: V.M. Gudzenko & S.P. Vasylkivskyi (2017) O.A. Demidov et al. (2017), P.M. Solonechnyi et al. (2017), V.Ya. Sabadin (2008) among the studied varieties of immune and highly resistant to several diseases at the same time is not identified. Given the above, to create varieties with group resistance, it is necessary to use in crossbreeding sources with high resistance to certain diseases, followed by selection of varieties with group resistance and productivity, considering soil and climatic conditions of the growing area.

CONCLUSIONS

According to the results of three-year research, winter barley varieties with resistance to dark brown spotting were identified: Zbruch, Shyrokolystyi, Liubomyr, Kormovyi, Dnister; and to rhinosporiosis – Shyrokolystyi, Liubomyr, Kormovyi, Dnister, Babylon, Babylon x NE 0.05%.

On average, in 2017-2019, the highest grain yield among the studied varieties of winter barley was observed in the varieties: Zbruch, Obroshynskyi x NE 0.05%, Dnister, Kormovyi, Shyrokolystyi, respectively 3.63; 3.42; 3.33; 3.33, 3.25 t/ha. It was found that the most valuable are the varieties: Shyrokolystyi, Kormovyi, Dnister, which are characterised by a combination of high index of complex stability with productivity.

High resistance to stress was shown by Dnister (-0.07), Obroshynskyi x NE 0.05% (-0.12), Liubomyr (-0.13). High genotypic plasticity was observed in the varieties: Zbruch (3.84), Obroshynskyi x NE 0.05% (3.62) and Dnister (3.51 t/ha). According to the results of research, it is established that the most valuable varieties are Kormovyi, Dnister, Shyrokolystyi, which are characterised by a combination of high index of complex resistance to major diseases and productivity.

Isolation of genotypes with high productivity potential and high complex resistance to fungal diseases for the conditions of the Western Forest-Steppe of Ukraine with further use in practical breeding is an extremely relevant area of research for both breeding and industrial cultivation.

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Оцінка сортозразків ячменю озимого за стійкістю до листкових грибних хвороб та урожайністю в умовах Західного Лісостепу України

Галина Ярославівна Біловус, Марія Іванівна Терлецька, Володимир Ігорович Пущак, Оксана Антонівна Ващишин, Оксана Несторівна Пристацька

Інститут сільського господарства Карпатського регіону НААН
81115, вул. Грушевського, 5, с. Оброшине, Україна

Анотація. Нині надзвичайно актуальним постає питання створення сортів з комплексною стійкістю проти найбільш поширених хвороб ячменю озимого з врахуванням ґрунтово-кліматичних умов. Насамперед це пов’язано з завданнями охорони навколишнього середовища від забруднення пестицидами і сприяє суттєвому оздоровленню санітарної ситуації. Важливими в цьому контексті є пошук та оцінка зразків з ефективними генами стійкості до хвороб з метою використання їх як батьківських компонентів при схрещуваннях. Метою цього дослідження було виділити сортозразки ячменю озимого з високим рівнем урожайності та стійкості до листкових грибних хвороб в умовах західного регіону України. Дослідження проведено з використанням польових (оцінка розвитку хвороб на сортах ячменю озимого), лабораторних, аналітичних і математично-статистичних методів. Висвітлено результати досліджень сортозразків ячменю озимого в конкурсному сортовипробуванні за стійкістю до листкових грибних хвороб. Виділено сортозразки зі стійкістю до збудників темно-бурої плямистості *Bipolarissorokiniana* Shoem – Збруч, Широколистий, Любомир, Кормовий, Дністер; та до збудників ринхоспоріозу *Rhynchosporium graminicola* Heinsen – Широколистий, Любомир, Кормовий, Дністер, Вавілон, Вавілон х НЕ 0,05 %. Найвищою врожайністю зерна в середньому за 2017–2019 рр. серед досліджуваних сортозразків ячменю озимого відзначились сорти Збруч, Оброшинський х НЕ 0,05 %, Дністер, Кормовий, Широколистий відповідно 3,63; 3,42; 3,33; 3,33, 3,25 т/га. Виявлено, що найбільш цінними є сортозразки: Широколистий, Кормовий, Дністер, для яких характерно поєднання високого індексу комплексної стійкості з продуктивністю. Найвищі показники стресостійкості було виявлено у сортозразків: Дністер (-0,07), Оброшиський х НЕ 0,05 % (-0,12), Любомир (-0,13). Високу генотипову пластичність відзначено у сортів: Збруч (3,84), Оброшинський х НЕ 0,05 % (3,62) і Дністер (3,51 т/га). Подальші дослідження будуть зосереджені на вивченні розвитку ринхоспоріозу та темно-бурої плямистості ячменю озимого залежно від екологічних чинників в умовах західного регіону України

Ключові слова: врожайність, ринхоспоріоз, темно-бура плямистість, індекс комплексної стійкості, стресостійкість, генотипова пластичність