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INFLUENCE OF STRESSFUL ENVIRONMENTAL CONDITIONS ON THE FORMATION OF GRAIN QUALITY INDICATORS OF WINTER WHEAT VARIETIES OF POLTAVA STATE AGRARIAN UNIVERSITY

To evaluate breeding material for grain quality parameters, express methods are needed at the early stages of breeding, which allow for the selection of high-quality genotypes. For the sake of stable yields of winter wheat, breeders have been creating ecologically plastic and drought-resistant varieties for many years that were more tolerant to sharp stresses that negatively affected grain quality. The quality indicators of winter wheat grain largely depend on the climatic features of the region and the weather conditions of the year, which complicates the solution of this problem. However, there is such a factor, the influence of which is inevitable - this is the time of spring renewal. This period may be shorter or longer, but it is characterized by the plant being in a state of stress. The time of spring renewal (early or late) of winter wheat can be qualified, according to the teachings of the prominent Canadian physiologist Hans Selye, as stress, that is, it is the body's reaction to a strong negative impact of the environment.

It is known that the vegetation of winter wheat in the same area can resume at different times with a range between the extreme possible periods of 45–70 days. The essence of the factor of the time of restoration of spring vegetation is that with too early or too late restoration of vegetation in plants, a significant deviation from the optimal growth and development rates, intensity of photosynthesis, resistance to lodging, structure, quality and size of the crop is observed. An increase in grain protein content above its biologically optimal level can occur due to the presence of extreme conditions, even if they occurred immediately after the resumption of time of spring renewal. The increase in grain protein content in this case may be a reaction of wheat plants to a relatively high average daily air temperature. The priority in determining the influence of the time of time of spring renewal on the productivity and quality of winter wheat grain belongs to V. D. Medynets. His many years of research have shown that the protein and gluten content in winter wheat grain in years with late spring vegetation recovery is higher than in years with early recovery. Of course, there are likely exceptions when other factors (drought, waterlogging) affect the formation of grain quality no less than the time of renewal of spring vegetation, but in general this pattern persists.

The aim of the research was to assess the impact of different periods of spring vegetation renewal of winter wheat on the stability of grain quality parameters. The research was conducted during 2020–2024 at the experimental field of Poltava State Agrarian University. The objects of the research were winter wheat varieties: 'Zeleny gai', 'Vilshana', 'Dykan'ka', 'Sagaydak', 'Poltavchanka' and the standard variety 'Orzhytsia nova'. The organization and technique of the winter wheat breeding process were carried out according to generally accepted classical methods, which are widely used in breeding practice in the process of creating winter wheat varieties. The protein and gluten content were determined by the express method on the «Infrascan-105» device.

The content of protein and gluten in grain was higher in years with late resumption of time of spring renewal, and lower when vegetation resumed early. The biological essence of this connection is that the renewal of spring vegetation determines the light and thermal regimes of plant growth and development in the period from the beginning of spring regrowth to earing. The temperature of this period determines the level of nitrogen accumulation in the leaves before flowering, the value of which is directly proportional to the protein content in the mature grain. Even more important for protein metabolism than temperature is the intensity of lighting and the spectral composition of light in the period from the resumption of spring vegetation to earing, which has a stronger effect than increasing doses of nitrogen fertilizers and reaches the maximum level for wheat in years with a late time of spring renewal.

The year 2020 turned out to be unique in terms of the timing of the resumption of spring vegetation. Over the many years of research, this is the first year during which vegetation did not stop during the winter period. In the year without cessation of spring vegetation, the highest protein and gluten content of the studied winter wheat varieties was observed. The variety 'Sagaydak' stood out especially, with a protein content of 16.1% and a gluten content of 31.5%.

The time of spring renewal in 2021 began on March 25, and in 2022 – on March 23, which is considered late. It was found that at the late time of the resumption of spring vegetation, the level of formation of grain quality indicators was quite high and amounted to an average of 14.2% for protein and 30.8 for gluten. The highest protein and gluten content was recorded in the variety 'Sagaydak' – 14.7 and 31.3%, respectively.

In 2023, the beginning of the time of spring renewal was recorded on March 11, and in 2024 - on March 15, which, according to the results of many

years of research, is considered early vegetation. In the studied varieties, the protein content varied from 12.6 ('Poltavchanka') to 14.2% ('Vilshana'). The gluten content ranged from 27.5 to 30.2%, respectively. All varieties exceeded the standard variety 'Orzhytsia' nova' in terms of protein and gluten content. The highest protein and gluten content was found in the 'Vilshana' variety, which exceeded the standard variety in terms of protein content by 0.7% and in terms of gluten content by 2.2%.

The high level of formation of grain quality indicators in years with different beginnings of spring vegetation renewal is explained by the fact that the technology of the breeding process of the PDAU involves targeted selection of genotypes to obtain high grain quality indicators.

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RESISTANCE OF WINTER WHEAT VARIETIES TO BIOTIC ENVIRONMENTAL FACTORS IN THE CONDITIONS OF THE FOREST-STEPPE OF UKRAINE

Production requires stable, environmentally plastic and highly productive wheat varieties. Breeding seeks to create varieties that have high productivity, salt tolerance, immunity, winter hardiness and drought tolerance. With modern cultivation technologies and increasing potential productivity of varieties, the size and quality of the crop are increasingly dependent on unregulated environmental factors.

If a variety does not have plasticity with respect to a wide range of soil and climatic conditions, then it cannot withstand the action of various biotic and abiotic stresses. An adaptive variety is ecologically plastic and adapted to all external environmental factors, which is the most important task of breeding in creating agroecological wheat varieties.

Identification of mechanisms of plant resistance and adaptation to adverse factors opens up broad prospects for the development of breeding and biotechnology. In the fight against wheat diseases, the selection of disease-resistant varieties is the most effective method. The introduction of varieties with group resistance to diseases into production is equivalent to an increase in sown areas by 15–20%.

The most important stages of selection for immunity are the search, creation and use of resistant starting material. In order to identify effective sources of resistance to the pathogens of the most common diseases (*Fusarium* (F. *graminearum, F. culmorum, F. oxysporum, F. Sporotrichoides* etc.)*, Tilletia caries, Blumeria graminis* f. sp. *Tritici, Puccinia triticina, Septoria tritici* etc.), for many years, breeders have been assessing the resistance of wheat varieties from different breeding centers of Ukraine on separate artificial infectious backgrounds of these pathogens.

Creating varieties resistant to pathogens is a difficult task in breeding, especially in wheat. The difficulties are associated with the fact that each pathogen has physiological races, it evolves quite quickly, often outpacing the selection process of creating a new variety. This creates the need to constantly monitor the variability of both the host crop and the parasite, and to search for new resistance genes.

It is known about the complex nature of the interaction between two biological systems: the plant and the pathogen, therefore it is necessary to take into account the genetic systems of both, as well as carefully control external conditions, taking into account their impact on both the plant and the disease. It has been established that the evolution of parasites is associated with the evolution of the plant affected by them, and the appearance of new genetic resistance factors in varieties leads to the enrichment of the pathogen population with new aggressive races. This creates the need for continuous selection of new immune varieties, a constant search for more effective resistance genes.

The resistance of winter wheat varieties to the most common pathogens was studied during 2019–2024 in the conditions of the Educational and Production Center of the Bila Tserkva National Agricultural University.

The following varieties were characterized by comprehensive resistance to powdery mildew, septoria leaf spot and brown rust: 'Myrlena', 'Hratsiia myronivska', 'Berehynia myronivska', 'Estafeta myronivska', 'Dniprianka', 'Pustovarivka', 'Svitylo', 'Akratos', 'Midas', 'Plantyn', 'Zorepad', 'Kvitka poliv', 'Charodiika bilotserkivska', 'Perlyna lisostepu', 'Elehiia', 'Hratsiia', 'Muza bilotserkivska', 'Bilotserkivska napivkarlykova', 'Lehenda bilotserkivska', 'Vidrada', 'Lybid', 'Tsarivna', 'Yasochka', 'Mulan', 'Romantyka', 'Torrild', 'Hlaukus', 'Bohemiia', 'Tobak', 'Kolonia', 'Bumer'.

The highest plasticity in terms of resistance to pathogens was characterized by the varieties of Myronivska, Bila Tserkva and some varieties of foreign selection; they possess resistance genes that are effective against the pathogen population present in the central Forest-Steppe of Ukraine.

Therefore, the creation and introduction into production of new productive wheat varieties with increased resistance to pathogens will make it possible to preserve the harvest in the future and minimize environmental pollution with pesticides.