

квітні-травні ефективний захист посівів інсектицидами короткої дії може не забезпечити достатнього зниження чисельності личинок до господарсько невідчутного рівня. У таких умовах акцент на захист гороху від попелиць може бути перенесений на стадію вегетації культури для збереження якості зерна і ентомофагів.

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CORRELATION OF GRAIN PROTEIN, YIELD AND DURATION OF THE "FLOWERING - MATURITY" PERIOD IN BREEDING SAMPLE OF SOFT WINTER WHEAT

Wheat grain is mainly used as bread products for humans. In terms of food importance, this culture takes the leading place in the world. The biochemical composition of wheat grain in quantitative and qualitative terms determines its consumer value. Among the main indicators of the nutritional value of wheat grains, the protein content prevails, which can compensate for limiting the consumption of animal products. Breeding is the most effective way to increase the proportion of protein in grain mass. Therefore, when creating high-yielding varieties, it is necessary to strengthen control over indicators of the nutritional value of grain [1–3].

The aim was to establish the nature of the manifestation of the "grain protein" trait in soft winter wheat lines, which were created with the involvement of late-ripening samples of the Western European ecotype. To establish correlation-regression models of dependences of grain protein with the duration of the interphase period "flowering - grain maturity" and grain yield in elite numbers in breeding nurseries.

It was established that the minimum protein content of the number grain was in the range of 11...12%. The maximum protein content of the grain was recorded at the level of 15.5-16.6% in lines from hybrid populations Kf4-16 /Ovid and Kf2-16 /Khersonian Bezosta. According to the average indicators of protein, the combinations Kf2-16 / Khersonsk Bezosta (14.74%) and Koshov / Kf2-16 (13.12%) were noted.

The coefficient of variability of grain protein of selection numbers was at a fairly high level in hybrid combinations Kf4-16 / Ovid (8.46%), Kf5-16 / Ledy (7.69%), Kf2-16 / Khersonsk Bezosta (5.56%) , which indicates the possible high

efficiency of selections based on grain protein indicators. A special perspective of selections is possible from hybrid populations with high intra-population protein variability and high protein selection numbers (Kf2-16 / Kherson Bezosta).

Calculations of the correlation coefficient between grain protein content and the duration of the "flowering-maturity" period in selection numbers showed a low dependence between these traits. Thus, the correlation coefficients ranged from -0.281 to 0.413, which indicates the possibility of selection for grain protein in all groups with different durations of the "flowering-maturity" period. The highest positive correlation of these traits was observed in numbers of the hybrid combination Kf4-16/Ovid ($r=0.413$). However, it should be noted that numbers of this combination had the largest range of grain protein variability (11.6...15.5%) and the highest rate of trait variation (8.46%).

The correlation of protein content and grain yield of selection numbers was also at a low level (from -0.358 to 0.333). The exception was the hybrid combination Kf5-16/Ledya, which had a correlation of these traits of 0.609. However, it is characteristic that this hybrid combination had the lowest levels of protein both in terms of the average value (12.10%) and the scale of the manifestation of the trait (11.3...14.1%). Such correlations of these traits indicate the possibility of simultaneous selection for grain productivity and grain quality.

A more detailed analysis of the correlation-regression relationships of the interphase period "flowering-maturity" and grain protein in the general sample of selection numbers showed that there is a curvilinear dependence of these characteristics. It has been established that the maximum protein content is mainly manifested in selection numbers with the duration of the "blooming-ripening" period within 46-50 days. Exceeding these parameters leads to a decrease in grain protein content in selection numbers.

Calculations of the correlation-regression model of the dependence of grain yield and protein content in the general sample of breeding numbers showed that the curvilinear dependence of these traits also prevails here.

An analysis of correlation-regression models of the dependence of the interphase period "flowering-maturity" and grain protein content in selection numbers selected from separate hybrid populations was carried out. Thus, in the lines from the Kf2-16/Ovid hybrid population, a linear relationship between these traits was established, albeit at a low level of significance (Fig. 3). The linear correlation coefficient was 0.263, however, a certain level of gradation of the "flowering-maturity" period with the maximum manifestation of grain protein in families from this hybrid population was not noted. Therefore, it is possible to select genotypes with high protein content in this hybrid population with different durations of the reproductive vegetation period.

The calculation of the correlation-regression model of the dependence of grain yield and protein content in selection numbers selected from the Kf2-16/Ovidii hybrid population showed that an increase in grain yield leads to a decrease in protein content, which worsens the forecasts of simultaneous selection based on these two indicators. High productivity (yield over 9.5 t/ha) is limited by grain protein in the

range of 12-12.5%, and this is a significant obstacle for breeding in this population based on productivity and grain quality.

In general, it can be concluded that a parallel increase in grain yield and protein content with individual selections from certain hybrid populations may exist, however, such a positive high dependence in most combinations is associated with lower grain yield of basic hybrid populations or with their lower protein content. Therefore, the breeding potential of such combinations is low, if limited only to yield and protein indicators.

Based on the results of a comprehensive assessment of promising numbers, lines combining economic valuable traits were identified

Based on the above, selections for protein and grain yield must take into account possible correlation-regression models between them and the duration of the "flowering-maturity" interphase period. For irrigation conditions, it is possible to use hybrid heterogeneous populations in which a correlation has been recorded between the protein content of the ear of corn and the duration of the reproductive interphase period "flowering-ripeness" (Kf4-16/Ovid) and the protein content of the grain with yield (Kf5-16/Ledyá).

Conclusions. The nature of the manifestation of the trait "grain protein" in selection numbers selected from hybrid populations with the participation of Western European ecotypes of soft winter wheat was established. Correlation-regression models of the dependence of protein content, grain yield and duration of the "flowering-ripe" period in selection numbers created with the participation of late-ripening Western European ecotypes were established.

A simultaneous increase in grain yield and protein content by traditional selections is possible, however, such a simultaneous increase of these traits is more suitable for hybrid heterogeneous populations with low protein and yield parameters, or one of the traits (low protein).

For each hybrid population created with the participation of parental components contrasting in duration of vegetation, it is necessary to develop a specific selection plan taking into account intra-population correlation-regression models of productivity, grain protein content and duration of the "flowering-maturity" period.

The duration of the "flowering-maturity" period in the best numbers ranged from 45 to 52 days, and each original hybrid combination had its own optimum, which determined high yield and protein content of the grain. Extending the duration of the "flowering-maturity" period slightly increases grain yield in selection numbers selected from individual hybrid populations, however, such an effect on grain protein content is insignificant.

References:

1. Колучий В.Т. Селекція пшениці озимої на якість зерна в Лісостепу України. *Селекція і насінництво*. 2011. Вип. 100. С. 160-171.
2. Hellemans T., Landschoot S., Dewitte K., Van Bockstaele F., Vermeir P., Eeckhout M., Haesaert G. Impact of crop husbandry practices and environmental

conditions on wheat composition and quality: a review. *Journal of agricultural and food chemistry*. 2018. № 66(11). P. 2491–2509. <https://doi.org/10.1021/acs.jafc.7b05450>.

3. Жупина А.Ю., Базалій Г.Г., Усик Л.О., Марченко Т.Ю., Лавриненко Ю.О. Успадкування висоти рослин гібридами пшениці озимої різного еколого генетичного походження в умовах зрошення. *Аграрні інновації*. 2021. № 10. С. 122–129. <https://doi.org/10.32848/agrар.innov.2021.10.19>.

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EFFICIENCY OF USING GROWTH PROMOTERS AND MICROFERTILIZERS IN GRAIN MAIZE SOWING IN SOUTHERN UKRAINE

Today, studies of the effectiveness of the use of microfertilizers, plant growth regulators, and bacterial preparations in the technologies of growing agricultural crops are gaining more and more popularity. Studying the impact of microfertilizers is especially promising and relevant in the conditions of reducing the amount of organic and high-cost mineral fertilizers. The analysis of literature data indicates that the use of complex microfertilizers makes it possible to significantly reduce the application rates of macrofertilizers, contributes to the realization of potential opportunities embedded in the body of plants, in particular certain immune reactions and vital energy, and also reduces the content of nitrates, heavy metal ions and of radionuclides in products, significantly weakens the mutagenic and teratogenic effect of herbicides [1].

The manifestation of the characteristics of corn hybrids of different FAO groups was determined and their relationship with grain yield when grown under drip irrigation in the conditions of the Southern Steppe of Ukraine was investigated. The influence of microfertilizers on the dynamics of biometric indicators and plant productivity indicators of corn hybrids was established, and agrotechnical recommendations for growing high yields of corn grain were substantiated.

An important aspect of the experiment is the possibility of determining the level of influence of individual biometric indicators on the formation of corn grain yield. It was established that there is a close direct correlation between plant height and grain yield of hybrids. Thus, in the phase of milk ripeness, the correlation