

Analysis of the size and color characteristics of wheat grains and their relationship to storage time and germination

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Key words: cereal grains, phenotyping, color characteristics, germination

Motivation and Aim: Grain coat is the main barrier between the grain and the external environment. A number of important biological functions are associated with its characteristics: moisture absorption, grain viability, resistance to preharvest germination. Thus, grain coat properties are important for maintaining its physiological state and longevity. In this regard, there is an ongoing interest in plant breeding in studying the grain morphological and color traits. One of the promising and relevant approaches in this regard is the use of digital cameras, which are inexpensive, but at the same time of sufficient quality for accurate color and size/shape reproduction of the research object [1].

Results: A computer method was developed for phenotyping the color and size/shape characteristics of cereal grains, based on the analysis of two-dimensional digital images. The developed method was used to obtain and analyze grain characteristics in 44 recombinant inbred lines of bread wheat, in which genbank storage time and germination ability were evaluated. No significant relationship with the storage time was detected for the grain shape/size traits, while 90 % of the color traits demonstrated such a correlation. The most significant negative correlations were found between the harvesting year and the traits of grain redness: the greater the storage time, the more intensive is red color component for the grains. At the same time, it was shown that grains of longer storage time have lighter coat. Analysis of linear correlations between germination of wheat seeds of different genotypes and harvesting years and their seed traits revealed a negative linear relationship between the red component of coat color and germination: the redder the grains, the lower their germination rate.

Conclusion: The results obtained demonstrate manifestations of metabolic changes in the coat of grains associated with storage time and their relationship with a decrease of seed viability. Our data showed that the intensity of the red component of the color of the grain coat has a negative relationship with the germination of seeds: the redder the grains, the lower their germination.

Acknowledgements: The study was funded by the Kurchatov Genomic Center of the ICG SB RAS, agreement with the Ministry of Education and Science of the Russian Federation No. 075-15-2019-1662.

References

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