UDC: 633.11:581.1:632.112 DOI: https://doi.org/10.53040/ppap2026.100

INFLUENCE OF CLIMATIC CONDITIONS ON DROUGHT TOLERANCE AND BAKING QUALITY IN COMMON WHEAT

JELEV Natalia*, https://orcid.org/0000-0002-1664-6055
GORE Andrei, https://orcid.org/0009-0002-7356-7289
DELEAN Tatiana, https://orcid.org/0009-0004-4084-6956

Moldova State University, Institute of Genetics Physiology and Plant Protection, Chisinau, Republic of Moldova,
**Corresponding e-mail:* natalia.jelev@sti.usm.md

Climate change is expected to increase the frequency and severity of drought events and accelerate agricultural land degradation, thereby affecting the suitability of areas for winter wheat cultivation. Consequently, both grain yield and technological quality may be significantly influenced by environmental conditions during the growing season. Climate-resilient wheat cultivars are therefore becoming an important priority for modern breeding programs.

The purpose. To evaluate the adaptability of winter wheat cultivars to the climatic conditions of 2025 by examining physiological, biochemical, and grain quality traits.

Materials and Methods. The study was conducted on the winter wheat cultivars *Meleag, Moldova 614, Moldova 5,* and *Bijuteria Zâmbrenilor*, grown under field conditions at the Institute of Genetics, Physiology and Plant Protection, MSU. Photosynthetic pigments (chlorophyll *a*, chlorophyll *b*, and carotenoids) were determined in flag leaves at the heading, flowering, and milk development stages according to Lichtenthaler (1987). The contents of L-proline and soluble sugars were quantified at flowering and milk development stages, while grain quality was assessed using wet and dry gluten content, gluten deformation index, and thousand-kernel weight. Statistical analysis of the experimental data was performed using ANOVA and Tukey's test.

Results. Photosynthetic pigment dynamics varied with developmental stage and genotype. Chlorophyll *a* and carotenoid contents decreased after flowering, whereas *Meleag* and *Moldova 614* maintained higher pigment levels throughout the study period, indicating greater stability of the photosynthetic apparatus under drought conditions. L-proline and soluble sugars accumulated during grain development,

reflecting the activation of osmoregulatory and cellular protective mechanisms. These metabolic adjustments represent important adaptive responses that contribute to maintaining cellular homeostasis under drought and elevated temperature stress. Considerable variability among the studied cultivars was observed for gluten content and thousand-kernel weight, with several genotypes exceeding the standard cultivar *Kuialnic*. Furthermore, the gluten deformation index remained within the optimal parameters for breadmaking in drought-tolerant cultivars. A strong correlation was found between high flag leaf chlorophyll retention and final thousand-kernel weight. The obtained results highlight the importance of combining physiological and technological traits for the evaluation of wheat adaptation to adverse environmental conditions.

Conclusions. Photosynthetic stability, osmolyte accumulation, and grain quality traits are complementary indicators for identifying drought-adaptive winter wheat genotypes. The cultivars characterized by higher pigment retention and enhanced osmolyte accumulation exhibited a greater adaptive potential under the climatic conditions of 2025. The genotype *Bijuteria Zâmbrenilor* also demonstrated balanced biochemical indicators suitable for regional cultivation. These traits can be effectively incorporated into breeding programs aimed at improving stress tolerance, productivity, and grain quality. The identified physiological markers will help screen early-generation hybrid lines during severe heat stress.

Keywords: winter wheat, drought stress, photosynthetic pigments, L-proline, soluble sugars, grain quality.

Acknowledgments. The research was carried out within the subprogram 011101 "Genetic and biotechnological approaches to agroecosystem management under climate change conditions", financed by the Ministry of Education and Research of the Republic of Moldova.