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SCREENING OF WHEAT VARIETIES ON THE *CBF-A3* GENE CONFERRING RESISTANCE TO COLD STRESS

DUNICH Alina[1,*], https://orcid.org/0000-0001-9614-3441
MISHCHENKO Lidiya[1], https://orcid.org/0000-0003-0697-6971
MISHCHENKO Ivan[2], https://orcid.org/0000-0002-2919-8546
MOLODCHENKOVA Olga[3], https://orcid.org/0000-0003-2511-0866
DASHCHENKO Anna[2], https://orcid.org/0009-0000-9943-0710
FANIN Yaroslav[3], https://orcid.org/0000-0003-3129-7583
MOTSNYI Ivan[3], https://orcid.org/0000-0002-1812-9481

[1]Taras Shevchenko National University of Kyiv, Kyiv, Ukraine
[2]National University of Life and Environmental Sciences of Ukraine, Kyiv,
[3]Plant Breeding&Genetics Institute-National Center of Seed and Cultivar Investigation, Odessa
**Corresponding e-mail: lmishchenko@ukr.net*

Plants are often exposed to a wide range of environmental abiotic and biotic stressors that significantly impact plant growth, development, and productivity. One of the major abiotic stresses that reduces crop productivity is cold (freezing or chilling). Plants have developed various mechanisms, involving altered physiological, biochemical, and molecular processes, to cope with stresses. Some of these mechanisms or signaling pathways in plants are not yet sufficiently understood. The cold resistance (CR) is regulated by several pathways, including the ICE-CBF-COR transcriptional cascade. However, the specific responses of these pathways to cold stress and their interactions are not fully understood. The activation of the so-called inducer of CBF expression (ICE) genes marks the beginning of the cold response gene induction. This process leads to the activation of COR (COld Regulated) genes by CBF (C-repeat Binding Factors) transcription factors, thereby enhancing CR (Song et al. 2021). CBF transcription factors play a crucial role in regulating COR genes, which are triggered by cold and provide resistance to future freezing temperatures (acclimation) in various plant species.

The goal of this study was to screen wheat varieties for the presence of the cold resistance gene *CBF-A3* using a PCR-based marker.

For this study, 172 wheat varieties were selected from different regions of

Ukraine (Chernihiv, Kyiv, Kirovohrad, Odesa, Poltava, Kharkiv and Ternopil). Genomic DNA was extracted from wheat leaves using the GeneJet Plant Genomic DNA Purification Mini Kit K0791 (Thermo Fisher Scientific, USA). For polymerase chain reaction, a specific primer pair, developed by Babben et al. (2018) for detection of the *CBF-A3* gene for cold resistance was used: CBF-A3_F primer (5′-ATCCCACACTCTCGCTCAAG-3′) and CBF-A3_R primer (5′- GCTGGGAATTATCGGCACTA-3′). PCR amplification was performed following standard procedure with annealing for 30 s at 56°C using DreamTaq™ Green PCR Master Mix (Thermo Fisher Scientific, USA).

PCR results showed the presence of a 790 bp DNA fragment of the *CBF-A3* gene in 19 wheat varieties. Thus, our investigation revealed 19 *CBF-A3* -positive wheat varieties. These results will be useful to provide these wheat varieties containing *CBF-A3* as potentially resistant to cold stress in wheat breeding programs in Ukraine.

Keywords: cold stress, resistance, *CBF-A3* gene, wheat.

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