

ANTIOXIDANT BIOMARKERS IN ASSESSING MAIZE GERMINATION AND SEEDLING GROWTH FOLLOWING EXPOSURE TO NEGATIVE TEMPERATURE STRESS

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Background: In the current climate change environment, most breeding programs in Northern Europe are conducting research into developing cold-resistant maize genotypes. In this context, it is important to study and understand the morpho-physiological and biochemical properties of maize that would facilitate adaptation to these conditions, and the valuable information obtained could be used for further improvement of breeding material. Therefore, we studied five hybrids to evaluate their response to negative temperature stress (NTS) at -4°C for 16 h before germination and subsequent growth at 26°C for 7 days.

Aim of the study: Determining the role of antioxidant system components in ensuring defensive potential in maize seedlings, with different levels of resistance to the action of specific dose of negative temperature in the early stages of ontogenesis.

Materials and methods: The seeds of different maize hybrids used in this study were provided by the Public Institution “National Center for Seed Research and Production”, Pașcani, RM. Before germination, maize seeds were exposed to a specific dose of subzero temperatures (-4 g) for 16 hours. Germination, growth and development of maize seedlings were carried out under controlled conditions with air temperature regulation. Morphological and physiological parameters, components of the antioxidant system, including peroxidase and catalase activity, total polyphenol and flavonoid content, ascorbic acid and malondialdehyde (MDA) were determined in seedlings.

Results: Data were obtained on the role of antioxidant system components in providing the protective potential of maize seedlings with varying levels of resis-

tance to NTS. The results revealed a significant ($P<0.05$) decrease in growth parameters such as seminal root length, plant height (cm), and fresh seedling biomass (g), caused by NTS. However, a significant ($P<0.05$) increase in lipid peroxidation was observed. Changes in the activities of antioxidant enzymes such as catalase, benzidine peroxidase, ascorbate peroxidase, as well as non-enzymatic antioxidant compounds such as total phenolic compounds and flavonoids, and ascorbic acid were also noted.

Conclusions: Research has shown that pre-treatment of maize seeds with negative temperature (-4°C) for 16 hours significantly affected germination, growth and antioxidant metabolism of seedlings and that antioxidant enzymes and compounds played a crucial role in protecting plants from oxidative damage. However, different hybrids responded differently, depending on their genetic specificity.

Keywords: maize seeds, negative temperature stress, antioxidants biomarkers.

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