


# Chapter 18

## The Role of Biologicals Azotohelp<sup>®</sup>, Liposam<sup>®</sup>, and Organic–Balance<sup>®</sup> as Mitigators of Abiotic Stress in Maize Plants

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## ABSTRACT

*In this study the expression of drought-resistance marker genes ZmNHL1, ZmVPP1, ZmNAC111: the antiradical activity, relative water content and biochemical chromatographic profiling of the phenolic compound complex in the leaves of maize plants treated by biopreparations under drought stress, was investigated. Drought stress significantly affected the expression of stress-responsive genes in plants under the action of biopreparations (in 4-7 folds). The maize leaves in the variant with «Organic-Balance®» 0.5 l/ha + «Azotohelp®» 0.3 l/ha + «Liposam®» 0.25 l/ha were characterized by the high content of total content of phenolic compounds, highest antiradical activity (88.2%), the most active glycosylation processes of flavonoids (up to 13%), the highest relative water content (97.3%) compared to the control. PCA and PLS-DA showed that the alterations of secondary metabolites, induced by biopreparations, serve as an initial mechanism for activation of the plant's antioxidant system, leading to a more robust defence system post-stress signals.*

## BACKGROUND

Drought stress is one of the most devastating abiotic stresses, whose intensity has increased over the past decades, affecting yield and global food security. It is projected that by 2050, drought will cause significant problems in plant growth and development in more than 50% of the world's arable lands (Kasim et al., 2013; Kuzmych et al, 2022; Yakymchuk et al, 2022). Due to the global climate change, mainly driven by the rising of the average global temperature, the weather is becoming more unpredictable, with abnormal precipitation and extreme temperatures becoming widespread phenomena. According to recent studies, by 2050 the global average temperature will rise and probably exceed by 2°C under the current high emission scenario. This escalation will significantly amplify the consequences of climate change, affecting billions of people worldwide.

Abiotic stresses represent pivotal challenges for agriculture, since crop production is the most vulnerable sector to global climate change. Among different kinds of abiotic stress, drought stress is the most detrimental one to plants, as it causes transpiration rates to surpass the water uptake, resulting into the disruption of water potential gradients, changes of cell volume, denaturation of protein, reactive oxygen species (ROS) production and disruption of membrane integrity. These processes collectively lead to severe plant organisms damage and yield reductions or even losses.

Corn is a cornerstone of Ukraine's agricultural economy. According to the Food and Agriculture Organization (FAO), Ukraine is one of the world's largest producers and exporters of corn, contributing significantly to the global supply. This crop

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