

Impact of Drought Stress on Antioxidant Enzyme Activity in *Arabidopsis thaliana*

Authors:

Darshan Patel¹, Bhaumik Patel¹

¹Sequence Research & Development Private Limited, Ahmedabad, India

Corresponding Author: Darshan Patel (info@ojscloud.com)

Abstract

Drought stress significantly limits plant growth and crop productivity. In *Arabidopsis thaliana*, reactive oxygen species (ROS) accumulation under water deficit leads to oxidative stress. Plants mitigate ROS damage through antioxidant enzymes like superoxide dismutase (SOD), catalase (CAT), and peroxidase (POD). This study investigated how drought affects antioxidant enzyme activity in *A. thaliana* under controlled conditions. Our results show significant increases in SOD, CAT, and POD activities in drought-treated plants compared to well-watered controls, indicating an upregulation of defense mechanisms against oxidative stress. These findings advance understanding of drought tolerance pathways and could inform breeding strategies for improved stress resilience in crops.

Keywords: *Arabidopsis thaliana*, drought stress, antioxidant enzymes, oxidative stress, plant physiology

Introduction

Drought is a major environmental stress affecting plant productivity worldwide. Water deficiency leads to an imbalance in cellular homeostasis and overproduction of ROS, causing oxidative damage. Plants deploy enzymatic antioxidants like SOD, CAT, and POD to detoxify ROS. This study quantifies changes in antioxidant enzyme activity to better understand drought responses.

Materials and Methods

Seeds of *Arabidopsis thaliana* (Col-0) were grown under controlled conditions. At 21 days, plants were divided into control and drought-treated groups. Water was withheld for 10 days for drought treatment. Enzyme activities were measured spectrophotometrically.

Results

SOD, CAT, and POD activities significantly increased under drought stress.

Discussion

Increased enzyme activity indicates activation of antioxidant defense mechanisms.

Conclusion

Drought stress enhances antioxidant enzyme activity in *Arabidopsis thaliana*.

References

1. Mittler R. Trends Plant Sci. 2002.
2. Apel K, Hirt H. Annu Rev Plant Biol. 2004.