

Chemical priming: a way to increase plant protection against stress conditions in the field?

Abiotic stresses such as salinity, drought, flooding, heat, cold, freezing, excess light, UV radiation and heavy metal toxicity have a significant impact on plant growth and crop yield worldwide. Climate change continues to exacerbate the detrimental effects of these stresses on crop yield, thereby threatening global food security. Plants grown under field conditions may well be exposed during their life span to a range of different abiotic stresses that occur sequentially or simultaneously. A combination of different abiotic stresses (such as salinity and heat, drought and heat, and heavy metals and heat) may be more harmful for plant growth than each of these stresses individually. Consequently, considerable attention is now directed towards enhancing plant protection mechanisms against multiple abiotic stresses (i.e. cross-tolerance).

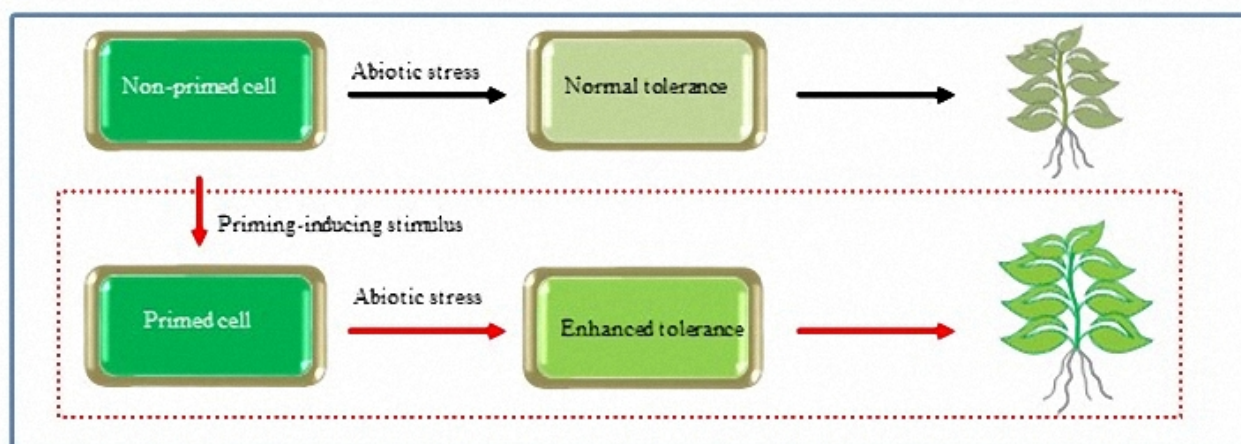


Fig. 1. Pre-treatment using a priming-inducing stimulus (e.g. chemical compound) results in enhanced cell tolerance and amelioration of stress-induced plant growth inhibition.

Different methodologies have been employed aiming at enhancing cross-tolerance; some are particularly time-consuming, such as conventional breeding, and others are currently unacceptable in many countries around the world, such as plant genetic modification. A recent review article published in *Trends in Plant Sciences* focuses on an alternative, rising methodology potentially able to tackle this crop stress management challenge, named “chemical priming”. Plants treated with certain natural or synthetic compounds (i.e. chemical agents) prior stress events show enhanced tolerance when exposed to individual abiotic stresses. As a result, stress impacts on plant growth and yield in primed plants are remarkably reduced in comparison with non-primed plants. However, not much attention has been paid yet to the use of chemical priming against different, sole and combined, abiotic stresses and its effective application in crop stress

management.

In the present review, key findings are discussed from the latest research on chemical priming agents (such as nitric oxide, hydrogen peroxide, hydrogen sulfide, melatonin and polyamines) that suggest they could be used to reduce the effects of abiotic stresses in commercial crops. The ability of these agents to enhance tolerance to different abiotic stresses and specific aspects of their way of action summarized in this review suggest their great potential for use against multiple abiotic stresses. Conclusively, further research towards fully exposing their way of action would be of great significance for plant stress physiology research. In addition, focusing on specific challenges and opportunities related to this technology, such as the mode of application, new methodologies and the potential impacts of chemical priming on the environment, would result in the optimum and rapid establishment of this technology as a tool in crop stress management.

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Publication

[Chemical Priming of Plants Against Multiple Abiotic Stresses: Mission Possible?](#)

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