جامعة الانبار
مركز دراسات الصحراء

Plant Tissue Culture for Studying the Environmental Cues

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Keywords: in vitro, Environment, oxidative stress.

Micropropagation is the aim for which the technology of plant tissue culture arose. However, it is an essential tool for important studies in various fields such as biology, biochemistry, molecular biology, and biotechnology. Plants, explants, or tissue are grown under standard conditions and on specific and different artificial media.

Plants are constantly affected by their environment and cannot escape their changing surroundings. Climate change and environmental stability are significant, its instability would negatively affect plant growth and development, so plant growth, development and reproduction are regulated by seasonal signals.

Therefore, their ability to sense and respond to different environmental stimuli, either "chemical or physical" are of adaptive and even evolutionary importance. Recent findings support the importance of physical signals like visible light, UV light, temperature, acoustic waves etc., in the adaptation of plants to environments with mostly suboptimal conditions by changing their growth and development. Regarding the developmental aspect, some studies have suggested that ROS signalling as messengers or transmitters of environmental cues are involved in regulating seed germination.

The benefit of perceiving and responding to physical signals is that they can spread more rapidly and with less energy than chemical triggers, allowing plants to alter their growth and development accordingly. The effects of environmental, physical factors and signals can be well studied using plant tissue cultured cells, tissues, explants, organs, or plantlets. In plant tissue culture, the organ development and morphogenesis can be regulated and modified by changing the in vitro physical conditions, like light, temperature, sound or ultrasound waves, etc. Environmental cues and signals (physical or chemical) are also important in tissue-culture-related methods. For example, cryopreservation involves the exposure of in vitro cells or tissues to physical, chemical, and physiological stresses causing cryoinjury. A perspective of cryobionomics is that molecular changes may be indicative of a positive adaptive response to the stresses incurred which may be advantageous to post-storage survival.

This Special Issue aims to cover various aspects of plant tissue culture as a tool, where the plant plasticity to different environmental cues and signals - primarily but not exclusively physical - are studied, including molecular, biochemical, biophysical, morpho-physiological, growth, and developmental aspects of plant response. Studies will also be presented on the effects of physical cues and signals modifying the plant physiology, development, and growth in various tissue cultures and related methods. Studies focusing on epigenetic and transcriptomic reprogramming are welcome.

References

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