



Abstract

Nanobubbles in Hydroponics [†]

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Abstract: Maintaining oxygen levels in the nutrient solution of hydroponic systems, particularly those using the deep flow technique (DFT), is essential for root uptake of nutrients and for cellular respiration. However, more frequent, extreme and longer heatwaves, as a result of climate change, are posing a threat to outdoor hydroponic growers because oxygen levels in the nutrient solution decrease as temperature increases. Low dissolved oxygen (DO) levels can adversely affect growth rates and yield, making it difficult for growers to meet customers' demand. Current strategies for increasing DO include cooling the solution, introducing oxygen into the nutrient tank using air pumps with air stones and surface contact with atmospheric oxygen. However, nanobubbles could be a more effective solution for raising the DO level when the nutrient solution temperature is over 30 DegC. Nanobubbles (<200 nm in diameter) are generated using a nanobubble aerator and can exist in liquid for several weeks to several months due to a negative surface charge and high gas solubility in water. This study investigated the stability of air nanobubbles in distilled water at 14–48 °C and in nutrient solutions with pH levels of 5.0, 6.0 and 7.0 at 20, 30 and 40 °C. Air nanobubble water could be effective for managing DO levels in conventional and organic hydroponic systems in regions where temperatures are predicted to rise.



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