Acta Scientific AGRICULTURE (ISSN: 2581-365X)

Volume 7 Issue 12 December 2023

Editorial

Brackish Waters to Mitigate the Freshwater Scarcity in Regions Arid and Semi-Arid using Hydroponics as a Clean Production Cultivation Technique

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Received: July 07, 2023

Published: November 01, 2023

Historically, and with the impacts of the climate change, droughts are increasingly severe in arid and semi-arid regions, limiting the use of irrigation by freshwater scarcity. Thus, conventional soil cultivation methods need to undergo changes aiming reduce water loss. As an alternative for these regions, brackish groundwater can be used as non-conventional water resources in potential to supplement irrigation water; however, there are severe risks of soil salinization, as well as losses in crop production and quality. Therefore, sustainable technologies should be used to mitigate or control the impacts caused by salt stress; in addition to requiring less volume of water in the production process.

Alternatively to traditional cultivation in soil, hydroponics (cultivation without soil) has been a technique used worldwide on a commercial scale, especially for growing vegetables. Because it requires a lower volume of water compared to conventional soil cultivation, hydroponics has been the solution for regions with low freshwater availability. For example, to produce 1 kg of fresh biomass of lettuce in hydroponic cultivation are necessary the water volume of 20 L; while in the conventional soil cultivation, 250 L are required. In the same line of reasoning to produce 1 kg of fresh biomass of coriander, approximately 34 L in hydroponics versus 223 L in conventional cultivation are required.

In the hydroponics it has been possible to cultivate several species of plants using water with high levels of electrical conductivity (ECw, in dS m^{-1}) e.g., 3.3 dS m^{-1} in melon; 4.0 dS m^{-1} in mini watermelon; 4.5 dS m^{-1} in cucumber, tomato, and zucchini; 4.6 dS m^{-1} in watercress; 5.5 dS m^{-1} in cauliflower, chicory, and endive; 5.6 dS m^{-1} in gherkin; 6.5 dS m^{-1} in coriander, lettuce, pepper, and rocket; 7.1 dS m^{-1} in bell pepper; 7.5 dS m^{-1} in green onion and okra. Such values mentioned refer only to ECw levels, that is, after the addition of nutrient salts, these values were even higher.

Three main strategies can be adopted using brackish waters in hydroponic conditions, namely

- Exclusive use of brackish waters: preparation of the nutrient solutions and replacement of water consumed by plants.
- Use of brackish waters only in the preparation of the nutrient solutions: freshwater to replenish the water consumed by plants.
- Use of brackish waters only to replenish the water consumed by plants: preparation of the nutrient solutions using freshwater.

The exclusive use of brackish waters throughout the production process is the strategy most consistent with a field condition, that is, farmers only have this type of water. However, in the hottest season of the year as a result of increase in the nutrient solution temperatures, there is a more harmful effect of salinity on the yield and visual quality of plants. In this sense, it may be strategic to allocate saline waters only for the preparation of nutrient solutions or to replace the water consumed by plants. For these two strategies, freshwater is used at some stage in the production process. Therefore, rainwater harvesting in the greenhouse structure may be a source of low salinity water.

Conclusion

Soilless cultivation (hydroponics) has become an important strategy for growing a variety of crops. In hydroponics, provides the opportunity to grow short-lived crops, such as leafy vegetables (chicory, coriander, endive, green onion, lettuce, parsley, rocket, watercress, among others). In addition, it has been possible to cultivate species with longer cycles, such as bell pepper, cauliflower, cucumber, gherkin, melon, mini watermelon, okra, pepper, tomato, zucchini, among others. It is possible to cultivate different species

throughout the whole year with comparatively few land, water, and labor requirements. Thus, especially in regions with limited water resources, the hydroponic cultivation technique can open up new approaches to food production using brackish waters in the preparation of the nutrient solutions.