The Effect of Surface Tension on Plant Growth in Fogponics

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The world population is rapidly rising – estimated to reach 9.8 billion by 2050 – requiring a dramatic increase in crop production and associated water consumption. Fogponics, a hardly used growing method that relies on suspension of roots in fog, may help to reduce this burden. In this project, an enhanced fogponics technique was developed by lowering the surface tension of water using the nontoxic surfactant Polysorbate 20. Two experiments were conducted using May Queen (MQ) and romaine lettuce (RL) grown using fogponics. The first compared lettuce grown with water treated with surfactant and fertilizer against a control unit treated with only fertilizer. After 36 days, the MQ and RL in the surfactant unit produced 52% and 30% more dry biomass than those in the control. Additionally, the surfactant unit consumed 55% less water per plant than the control unit. In the second experiment, RL was grown in three fogponics units: one with surfactant and 50.0mL of fertilizer, one with surfactant and 37.5mL of fertilizer, and one with 50.0mL of fertilizer and no surfactant. Plants grown using 50.0mL of fertilizer and surfactant grew 82% more dry biomass than those grown without surfactant, and plants grown with 37.5mL of fertilizer produced 73% more dry biomass than those grown without surfactant, suggesting that surfactant increases plant growth, even with less fertilizer. Without deploying alternative agricultural methods, the world stands to face further resource depletion and undernourishment – surfactant-enhanced fogponics promises to be a solution to this issue and holds great potential for larger crop yields and decreased water consumption.

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