Optimization of Irrigation by Novel Method of Sap Flow-Based Drip Irrigation

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Water is a valuable natural resource that is used in virtually every part of our daily life. However, the problem of water shortage is getting worse by year, and it is projected that almost two-thirds of world's population will face water shortage problems by 2025. The primary use of water worldwide is irrigation, accounting for 36% of total water usage in USA. However, a big portion of water irrigated are not even used by the plants. When plants are irrigated, they cannot use up all the water given, and the excess water is lost by either evaporation or seepage. To increase the irrigation water use efficiency and ultimately tackle the water shortage problem worldwide, a more efficient, optimized way of irrigation is necessary. This project suggests a novel irrigation method that optimizes the irrigation amount and duration, designed for mass-produced crops. Sap flow-based irrigation was induced to assess the water usage of crops, with a novel measurement method for crops with thin stems instead of the original method. The measurement method was calibrated by applications on tomato plant(Solanum Lycopersium L.). Then drip irrigation was combined with sap flow-based irrigation to minimize the water lost from routes other than plant consumption. The final irrigation method was then applied to tomato plants for 60 days along with other, currently used methods while their water usage and plant growth was recorded. The novel method was able to reduce a significant amount of water usage than its comparisons, while not negatively affecting the yield from the crops. By suggesting a new improved method of irrigation, our project can be the key to tackle the water waste problem in irrigation, and ultimately the worldwide water shortage problem.

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