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## Investigation on leaf temperature and water use of Tatsoi cultivation under light and water stress

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### Abstract

The research investigates the leaf canopy temperature ( $T_c$ ) and water use efficiency (WUE) of *Brassica rapa* subsp. *narinosa* (Tatsoi plant) grown using the Nutrient Film Technique (NFT) hydroponic system under light and water stress conditions under controlled environmental conditions. Tatsoi plants, ten days post-sowing, were subjected to three shading treatments, i.e., full sunlight (A, 0% shading), moderate shade (B, 90% shading), and heavy shade (C, 99% shading), and three watering frequencies (24, 12, and 6 hours) within a greenhouse setting. The nutrient solution used was a balanced AB Mix, ensuring adequate mineral availability for plant growth. The experiment, conducted during the dry season over 28 days after plantation (DAP), revealed that Tatsoi's leaf temperature could be significantly moderated through evaporative cooling, particularly under total sunlight exposure. The highest difference between leaf and air temperature ( $T_c - T_a$ ) in shading treatments (B & C) was found to be reduced by 45.94% and 27.9%, respectively. However, the imposition of shade and reduced watering frequency led to a marked decline in WUE, with the most severe reduction observed under the heaviest shading and least frequent watering conditions. The reduction percentage of WUE was more than 90% for moderate and heavy shading (B & C) treatment at each watering duration, compared with the full sunlight and 24-hour watering duration (A24). These findings underscore the resilience of Tatsoi to water stress under full sunlight, with only a minimum impact on WUE, contrasting with the substantial decrease in WUE associated with increased shading. The study's outcomes contribute to the broader understanding of plant physiological adaptations to environmental stressors, with implications for optimising cultivation practices in hydroponic systems, especially in tropical regions.

**Keywords:** Hydroponics, leaf temperature, light and water stress, Tatsoi plant, water use efficiency