

6. Cultivation of Leaf Lettuce with Reduced Ca/Mg Ratio using Izu-Akazawa Deep Sea Water

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1. Introduction

Deep sea water is a natural resource for energy, aquaculture and agriculture because it has the characteristics of low temperature, high cleanliness and high nutrient content. We focused on these characteristics, especially the rich magnesium content and high cleanliness of deep sea water, for use in hydroponic liquid solution. In previous research, we have studied leaf vegetables grown in plant factory with artificial lighting (PFAL). In PFAL, production cost has become an important issue, and high value added vegetables are one way to solve this problem. The objective of this study was to develop cultivation conditions to produce leaf lettuce with an excellent Ca/Mg ratio, which is beneficial for human health, using deep seawater for nutrient solution.

2. Materials and Methods

The experiments were conducted in ESPEC MIC's PFAL in Tokyo, Japan. Green leaf lettuce (1001G, Fujii Seed) was used in this study. In experiment 1, leaf lettuce was cultivated under normal condition until 2 days before harvest, and cultivated using 5 different nutrient solutions on the last 2 days. The solutions were controlled 10%DSW, 20% DSW, 10%ED (deep sea water treated by electric dialysis) and 20%ED.

In experiment 2, we studied 2 and 10 days of nutrient solution with 20%ED before harvest. In this experiment, several mineral contents in leaves of leaf lettuce were analyzed using a simplified analysis (LAQUA twin, HORIBA) and an accurate analysis (ICPE-9000, SHIMADZU).

In each experiments, the air temperature was set

at 23 °C (Light period) / 19 °C (Dark period), and the CO₂ concentration was 1,000ppm (Light period) / non control (Dark period), respectively.

3. Results and Discussion

In the 2 days of treatment with DSW and ED (Exp.1), the fresh weight and Ca/Mg ratio showed no significant difference among the control, 10%DSW, 10%ED, and 20%ED treatments. Comparing leaf lettuce after 2 and 10 days of the 20%ED treatment (Exp.2,) showed that the Ca/Mg ratio was significantly lower in leaf lettuce cultivated with 20%ED for 10 days than in those in the control and those with 20%ED for 2 days.

These results indicated that an appropriate cultivation method to decrease the Ca/Mg ratio of leaf lettuce is to cultivate the plants with 20% ED for 10 days before harvest.

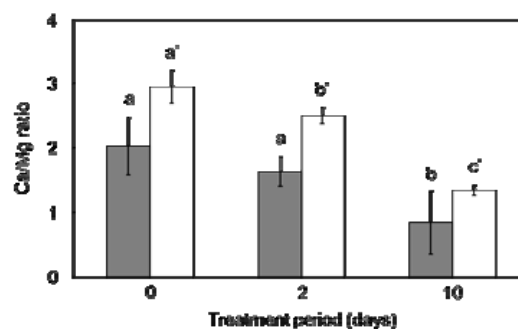


Fig.1 Ca/Mg ratio in leaves of leaf lettuce at 42 days after seeding. Plants were irrigated with deep seawater for 2 and 10 days before harvest. Different letters indicate significant difference between each treatments ($P < 0.05$, mean \pm SD, Steel-Dwass test, ANOVA, $n=15$). ■, Compact Ion Meter; □, ICP.