

Design and implementation of a pilot hydroponic system for cultivating saltmarsh plants using microbubble technology

Ye-Joon Seo¹, Ji-Sook Park², Youngcheol Park³, Jang K. Kim^{4*}

¹Department of Marine science, Incheon National University, Incheon 22012, Korea (seo268yj@naver.com)

²Research Institution of Basic Sciences, Incheon National University, Incheon 22012, Korea (jspark83@inu.ac.kr)

³New Water Tec Co Ltd., Incheon, Korea (ypark115@naver.com)

⁴Department of Marine Science, Incheon National University, Incheon, Korea (jang.kim@inu.ac.kr)

INTRODUCTION & OBJECTIVES

- Saltmarsh, known for their effective CO₂ absorption and storage as a significant source of blue carbon, is undergoing restoration projects in Korea
- However, the cultivation methods for sowing is not well-established
- Microbubbled water (MB), which consists of bubbles < 50µm and contains sufficient gas (e.g., O₂, CO₂, etc.) for plants has proven effective in nutrient delivery to plant roots
- Little is known about the effect of MB on the early growth of saltmarsh plants
- The aim of this study is to develop a pilot system for hydroponic cultivation of saltmarsh plants using microbubbled water and to investigate the growth effects and photosynthetic efficiency of saltmarsh plants

MATERIALS & METHODS

Hydroponic cultivation optimal conditions experiment

- 1) The seeds were germinated in petri dish using deionized water at 20°C, after which the experiment commenced
- 2) The germinated plants were inserted into sponges and floated on water
- 3) The hydroponic cultivation conditions were as follows :

Experimental species	<i>Salicornia europaea</i>
Temperature	15, 20, 25°C
Photosynthetically active radiation	100±10 µmol m ⁻² s ⁻¹
Photoperiod	12:12 L:D
Nutrients	Provasoli's Enriched Solution
Substrate	Sponge
Replication	16
Media	Deionized water (control), Microbubbled deionized water (MB)

Hydroponic cultivation pilot system development

- 1) A hydroponic planter was designed using 2~3 mm sized sand derived from weathered granite rock
- 2) A pilot system for hydroponic cultivation using microbubble generation device was developed, and a saltmarsh plant hydroponic experiment will be conducted
- 3) The hydroponic cultivation conditions were as follows :

Experimental species	<i>Salicornia europaea</i> , <i>Suaeda glauca</i> , <i>Suaeda japonica</i> , <i>Suaeda malacosperma</i>
Temperature	20°C
Photosynthetically active radiation	100±10 µmol m ⁻² s ⁻¹
Photoperiod	12:12 L:D
Nutrients	Hoagland Solution
Substrate	The weathered sand of granite rock
Replication	3 pots
Media	Deionized water (control), Microbubbled deionized water (MB)

RESULTS

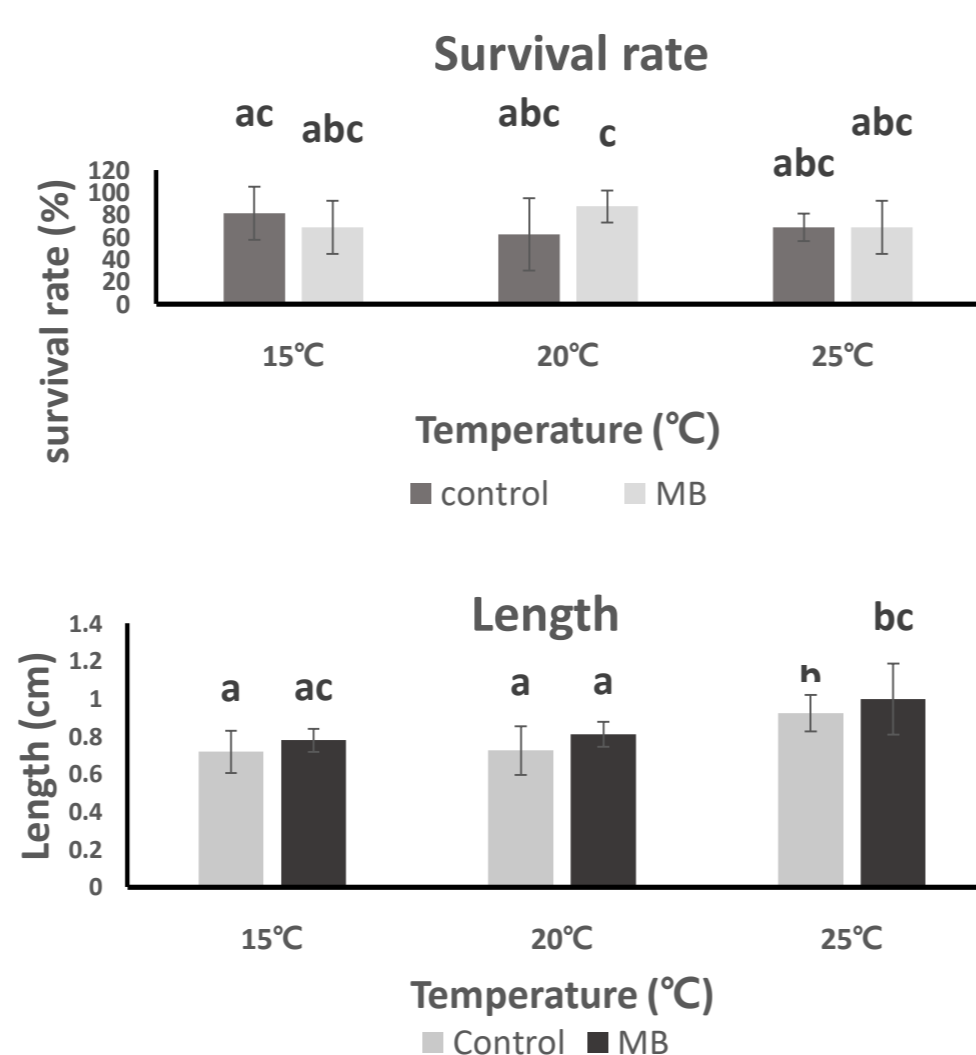
Hydroponic cultivation optimal conditions experiment



Fig.1 Hydroponic cultivation under different conditions (Control, MB) in 20°C



Fig.2 *S. europaea* in a sponge floating on water



Hydroponic cultivation pilot system development



Fig.3 Hydroponic cultivation pilot system



CONCLUSIONS

- *S. europaea* grew better at 25°C than at 15 and 20°C, indicating that 25°C is the optimal temperature
- No effect of MB was observed in hydroponics of *S. europaea* at the optimal temperature
- The experiment using sponges for hydroponics causes some physical stress to the plant
- Further studies are required to test different substrates, such as the weathered sand of granite rock

REFERENCE

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