

Report of JICA's KCCP course for The Project for Development of the Duckweed Holobiont Resource Values towards Thailand BCG Economy (Be-HoBiD)

Course Title: Establishment of the duckweed holobiont collection and high yield production of duckweed biomass.

Dr.Weerasin Sonjaroon Report,

Tentative course schedule:

Course B:

- 5 Nov Midnight: leave BKK
- 6 Nov: Arrive at Osaka
- 7-12 Nov: at Kyoto Univ
- 12 Nov: Leave Osaka for Sapporo
- 14-25 Nov.: at Hokkaido Univ
- 26 Nov.: Leave Japan for BKK

Dr. Weerasin Sonjaroon, he is lecturer in School of Integrated Science, have expertise in techniques and knowledge about yield production in plants and research experience vertical farming system. According to the Project for Development of the Duckweed Holobiont Resource Values towards Thailand BCG Economy (Be-HoBiD), he is number of this project in G6 Social Implementation for research into high yield and stable production of the duckweed biomass. He can participate in Establishment of the duckweed holobiont collection and high yield production of duckweed biomass, which is program requirement of this project. The purpose of the course are 1. to learn a series of basic techniques and knowledge necessary for the handling and preservation of duckweed and 2.to learn a series of technologies necessary for high yield and stable production of the duckweed biomass. Future plan to be done by the Applicant after the KCCP, he will apply the techniques obtained in Japan to establish a duckweed(-holobiont) collection in Thailand and run DHbRC, duckweed

holobiont resource and research center. Publication of a research paper in international collaboration is also expected.

1. The trainee will be able to handle and preserve a variety of duckweeds in the laboratory, and analyze gene function in duckweed.
2. The trainee obtain knowledge relevant to the duckweed vertical farming system. Trainee can grow the duckweed in high yields using vertical farming system. Trainee can settle problems that may happen during duckweed farming.

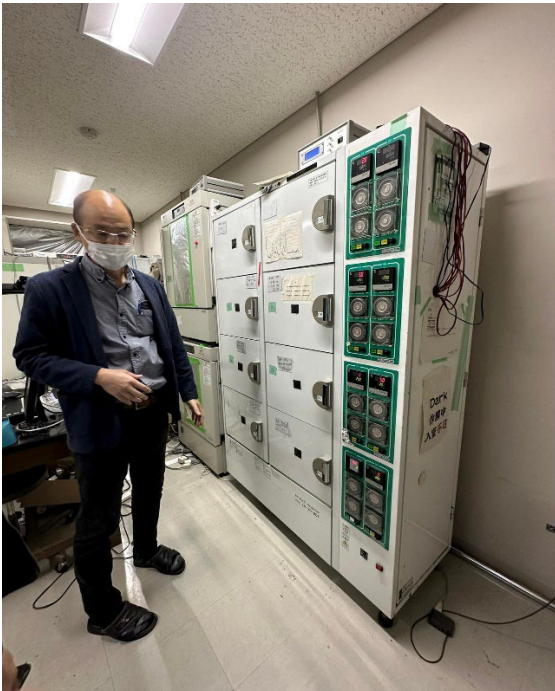
Expected outcomes:

Trainees will apply the techniques obtained in Japan to establish a duckweed(-holobiont) collection in Thailand and run DHbRC, duckweed holobiont resource and research center. Publication of a research paper in international collaboration is also expected.

Course Title: Establishment of the duckweed holobiont collection and high yield production of duckweed biomass at **Kyoto University**

Duckweed culture/growth equipment

Prof. Oyama, he introduced equipment for study growth duckweed and study physiology of duckweed such as controlled environmental chamber for study circadian rhythm and physiology of duckweed. We discussed processes duckweed culture in laboratory.



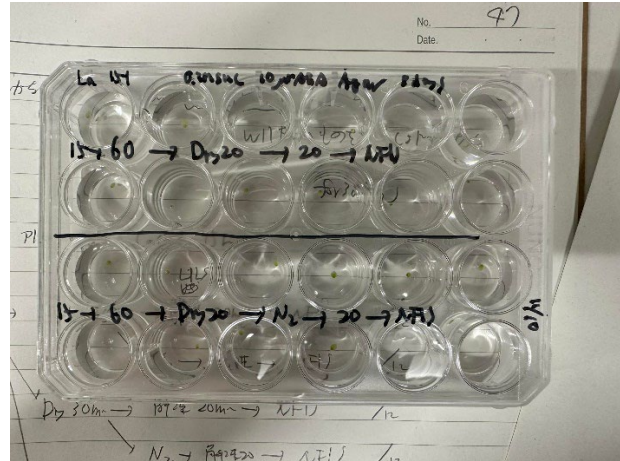
Tour to Botanical Garden of our Department/Introduction of your work

We surveyed duckweed around Kyoto University and tour to Botanical Garden at Kyoto University. Then we presented distribution of duckweed in Thailand and chemical profile in duckweed of Thailand by Dr. Ekaphan.



Cryopreservation

We studied cryopreservation of duckweed and design experiment for study method and vary chemical for these processes due to appropriate condition for cryopreservation of duckweed. Then we discussed the experiment and guidelines in study cryopreservation of duckweed in Thailand. In this cryopreservation, we have knowledge and guidelines for way in Be-HoBiD project in Thailand.



Discussion for future collaborative studies/physiological approaches on

First Step

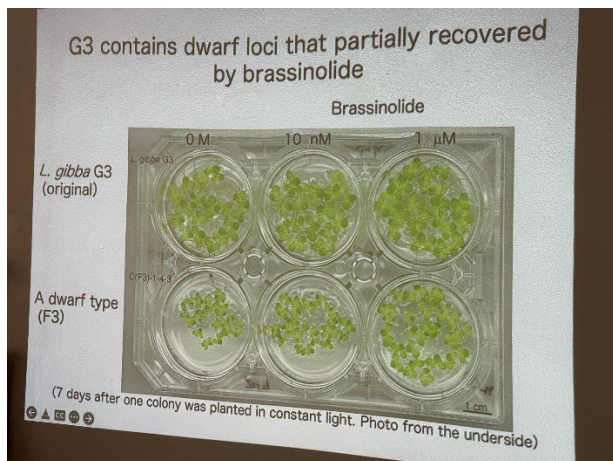
- Collection of Duckweed in Thailand by Dr.Ekaphan
- Study duckweed in rainy season in Thailand.
- 2 Methods next step
 - Collection in Plant tissue culture and next to Cryopreservation
 - Collection in Plant factory with artificial lighting

2 Step for Study Plant Physiology

- Experiment for SDP and LDP of duckweed in Thailand----- next for flowering condition. Lamma SA BA benzenic acid is good, Wolff SDP BA/SA flowering gene

Model for study is SDP 9 hr light /15hr dark LDP 15light/9hr dark control 12/12 hr Lamma in concentration during 10-50 μ M SA and BA maybe induce flowering in 2 weeks, 1-10 μ M SA and BA for Wolff 2-3 hr dark /22 hr light and Temperature 25 C.

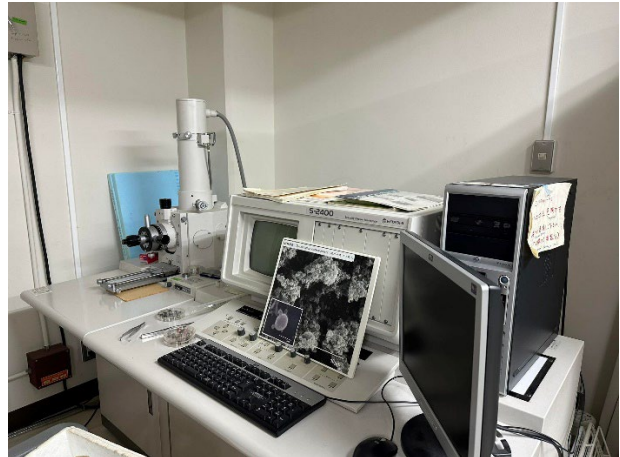
- Experiment for effect of Brs types, 1 μ M BER use DMSO is best solution and concentration of 1-10 μ M DHECD types in Thailand and Kyoto University in Japan.
- Experiment for other physiological processes such as Photosynthesis Environmental stress vary Temperature on photosynthesis, growth and yield and chemical starch.



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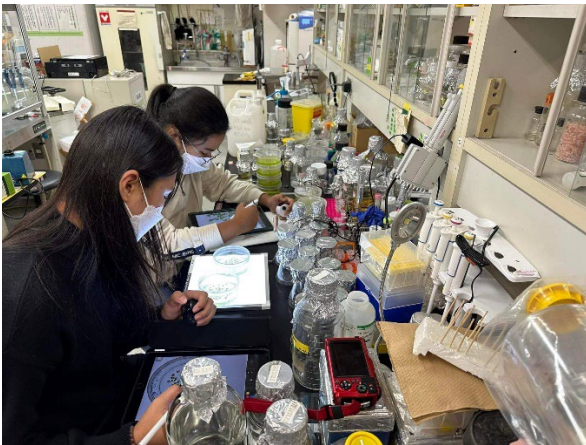
Introduction of Morikawa Lab. and discussion about the technologies

Prof. Morikawa introduced equipment for study duckweed holobiont. Then, we discussion about the technologies for duckweed production in plant factory.



Training about technologies utilizing plant growth-promoting bacteria for enhancing the duckweed biomass production.

We studied about technologies utilizing plant growth-promoting bacteria for enhancing the duckweed biomass production. We studied and designed experiment for plant growth-promoting bacteria by using waste water treatment. We have knowledge about experimental design in study growth-promoting bacteria for enhancing the duckweed biomass production which we can adapt and combination in duckweed production in plant factory and design model duckweed production in DHbRC.



Training of floatfarm at a green house, a vertical farming system of Wolffia.

After that study technologies utilizing plant growth-promoting bacteria for enhancing the duckweed biomass production. We studied vertical farming system of Wolffia in green house.

We studied incubator room for Wolffia production. We understand design and optimization for Wolffia production in incubator room, which similar plant factory model. In this incubator room, can control environmental condition for appropriate Wolffia production such as 25 C temperature, 50% humidity and control 100 PPFD light intensity. In incubator room for Wolffia production, was controlled by timer equipment. Moreover, ozone generator protected contamination in incubator room.

In Greenhouse, we studied overall design Wolffia production. We obtained idea in rack design for duckweed biomass production in plant factory. And obtained knowledge in used suitable nutrient, especially using N types in nutrient. We understated model in design the rack Wolffia production for water circulation, drainage, light condition, Experimental setup, data collection, Inoculation and harvesting methods.

We obtained knowledge in using Data analysis by using ImageJ Fiji, Data analysis by machine learning softwares: Elastik, which is suitable data analysis.

In this Training, we obtained knowledge duckweed production in Japan to establish a duckweed(-holobiont) collection in Thailand and run DHbRC, duckweed holobiont resource and research center.

