



# “CULTIVATION TECHNOLOGIES OF THE LAND AND SEA BASED SYSTEMS”



## Report on Training School on “Cultivation technologies of the land and sea-based system” in Malaga, Spain

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The COST Action SeaWheat (<https://seawheatcost.haifa.ac.il/>) and the University of Malaga organized a 4-days Training School on the technical and legal aspects of *Ulva* cultivation (WG2 and WG6), from June 26-29, 2023, at the Experimental Research Station Grice Hutchinson (IBYDA-UMA; <https://www.ibyda.es>), in Malaga, Spain.

### Rational and objectives

The main objective of the SEAWHEAT COST Action is to make a step-change towards a green economy based on *Ulva* mass production and utilization within the European community and beyond. The purpose is the development of *Ulva*-based blue-biotech industries and the utilization of *Ulva* as a model organism in European algaculture. The COST Action aims at facilitating the acceptance of *Ulva* as a new, sustainable, and safe food item in the traditional European diet. The Action will profit from the world-renowned quality standard of European food production. The ultimate goal is to integrate the nutritional value of *Ulva* into the European human diet and animal nutrition.

During this four-day training school, trainers with expertise in reproduction, aquaculture, and regulatory aspects of *Ulva* cultivation introduced the participants to theoretical and practical approaches to *Ulva* farming and consultation of industry stakeholders. The Training School included a site visit and case studies in Almeria (i.e. a factory for biostimulant production from algae, and aquaculture facilities at the University of Almeria and IFAPA).

### Trainers

The training school involved the participation of seven trainers and four assistants, listed alphabetically:

1. Dr. Ricardo Bermejo from the University of Malaga, Spain
2. Dr. Paula Celis-Plá from the University of Playa Ancha, Chile
3. Prof. Félix Figueroa from the University of Malaga, Spain
4. Dr. Erik-jan Malta from Ctaqua, Spain
5. Dr. Fabio Neves from the University of Santa Catarina, Brazil
6. Dr. Rui Pereira from A4F, Portugal (leader of WG2)
7. Dr. Céline Rebours from Møreforskning AS, Norway (leader of WG6)

Additionally, the event was attended by the Action Chair and Scientific representative of the COST Action "SeaWheat," Prof. Muki Shpigel from the University of Haifa, Israel (refer to Figure 1).



## Trainees

The call resulted in twenty-eight (28) excellent applications being received. A selection committee consisting of 6 people assessed all applications, selecting 17 applicants. During the assessment process, various factors were taken into consideration, including active involvement in an on-going project with *Ulva*, experience in *Ulva* cultivation (minimum of one year), membership in a Small-Medium Enterprise, gender equality, and applicants from ITC countries.

The selected trainees, eight males and nine females were either masters, PhD students or postdoctoral researchers from eleven different countries: Finland, France, Germany, Ireland, Netherlands, Portugal, Serbia, Spain, Tunisia, Turkey and United Kingdom: 6 trainees from ITC countries; 9 from SMEs (Algabrava, Algues de Roses, Alles Alge, Bluegreen technologies, Green Aqua Vagos, Hydrosphere, Mediterranean Algae, Nemo Seafarms, the Seaweed company).

All trainees have been funded with a maximum of 1340 € (up to 500 € air-ticket; 80 € D.A.) grant per participant. Unfortunately, two trainees did not accept the course invitation.

## Host

The meeting has been organized locally by Dr. Ricardo Bermejo ([ricardo.bermejo@uma.es](mailto:ricardo.bermejo@uma.es)), Prof. Félix López Figueroa ([felix\\_lopez@uma.es](mailto:felix_lopez@uma.es)) and Dr. Erik Jan Malta ([e.malta@ctaqua.es](mailto:e.malta@ctaqua.es)).



**Figure 1.** Group photo of the participants and trainers of Training School at the .

## Course design and training material

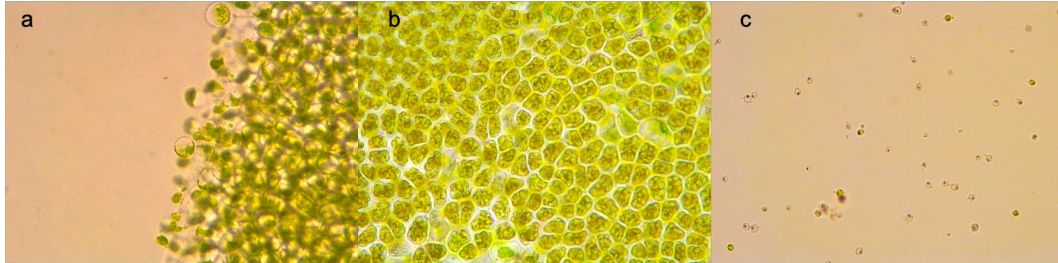
To plan the training school, trainers met on several occasions to design the program and develop the didactic materials. They created a concise practical manual that included various protocols for Pulse Amplitude Modulated fluorometry, micropropagation from spores and protoplasts, as well as determining the content of phenolic compounds, antioxidants, and pigments. At the beginning of the training school, the trainees were provided with this manual, a notebook, a folder containing scientific articles focused on "how to conduct an interview and analyze the data," and a ballpoint pen.

Throughout the training sessions, the trainees had the opportunity to perform tasks such as obtaining protoplasts (Fig. 2a), inducing *Ulva* sporulation (Fig. 2b and 2c), estimating photosynthetic performance using PAM fluorometry, and determining phenolic, pigment, and antioxidant contents in *Ulva* (fig. 3). Furthermore, the participants developed an interview questionnaire to gather relevant information for the development of a start-up or a small to medium-sized enterprise. They conducted interviews with members of four different companies that were involved in the



development of algae-based products or focused on seaweed cultivation (namely A4F, Biorizon, Ctaqua, and a start-up from Brazil) and analyzed the data obtained (Fig. 4).

Prior to the conclusion of the training school, all the results obtained during the sessions were analyzed by the trainees and discussed with the trainers.



**Figure 2.** Protoplast release (x10; a), reproductive *Ulva* thallus (x10; b), and detail of spores (x40; c) under the microscope.



**Figure 3:** Trainees estimating the phenolic, pigment, and antioxidant contents in dried *Ulva* samples.



**Figure 4:** Trainees analyzing the data collected during the interviews.

During the Training School, the trainees had opportunities to visit different aquaculture facilities. They visited the University of Almeria, IFAPA (Andalusian Institute of Agricultural and Fisheries Research and Training), and the Grice Hutchison Experimental Research Station. These visits allowed them to observe the functioning of different land-based culture systems, including raceways, aeration tanks, and thin-layer cascade systems (Fig. 5).



**Figure 5.** Several participants in the 2<sup>nd</sup> Seawheat Training School visiting one of the largest raceways in Europe at the University of Almería.

### **Conclusions**

The Training School in Malaga, Spain, was an enriching experience for all involved trainers, trainees, and hosts. In addition, this Training School helped “SeaWheat” COST Actions to create a network between SMEs and researchers that we are sure will contribute to knowledge transference from academia to the industry. A survey will be developed after the TS2 and be sent to the trainees of TS1 and TS2 in order to use the information to improve the format of the future Training Schools organized in the CA SEAWHEAT project.