

International Society for

Applied Phycology

NEWSLETTER



ISSN 2208-3146

ISSUE 1-2023

October 2023

Message from the President	1
Message from the Editor	2
Akali solubilization and isoelectric precipitation to extract protein from selected seaweeds in Sri Lanka.....	3
Impacts and implications of <i>Ulva prolifera</i> -induced Green Tide in China	7
Training in microalgae-related industrial processes.....	12
The 21 st Symposium of the Phycology Branch of Chinese Society for Oceanology and Limnology...	15
Algae 2030 and the ISAP 2024 Congress, Porto, Portugal	16
News and Views.....	20
International Society for Applied Phycology (ISAP) Newsletter Article Submission Guidelines.....	24
ISAP Contacts and Officers	27

Message from the President

Dear ISAP Subscribers,

I am pleased to present to you the first issue of the ISAP Newsletter for year 2023. The publication of the current issue is made possible through the dedication and commitment of the Newsletter Working Group led by Céline Rebours and her members Andrew Ward, Eugenia Olguin and Priya Pollard, and for that I would like to express my gratitude to them.

Please allow me to provide a summary of the society's latest developments since the last issue of the ISAP Newsletter in 2022,

- We have received encouraging responses to the Call for requests for support from ISAP to organize a training course in Algal-Biotechnology with four proposals received for the year 2023. The financial support of 2000 Euro to organize a training course on Seaweed Cultivation and Biotechnology was awarded to Dr Leila Ktari and her team at the National Institute of Marine Sciences and Technologies (INSTM). The training course took place successfully in Tunis from 12th to 16th September 2023 with a total of 25 participants attending the theoretical and practical sessions in person. The trainees were mainly from Tunisia with 5 international participants (2 from Algeria, 1 from Egypt, 1 from Italy and 1 from Oman).
- I am also pleased to inform that ISAP has signed a Memorandum of Understanding with Algae Biomass Organization (ABO) at the end of 2022 to promote interactions between these entities and the dissemination of information on topics of common interest. ISAP welcomes joint cooperation with organizations or societies with mutual interest in applied phycology, and to those who are interested, please contact me at appliedphycologysoc@gmail.com.
- Preparations are being made by the Local Organizing Committee of the 8th Congress of the International Society for Applied Phycology which will be held from 16th - 21st June 2024 in Porto, Portugal. Please block your dates and stay tune to the conference website <https://isap2024.com/> which will be launched soon for updates on this important event.
- ISAP is receiving sponsorships from a number of algal companies through our new industrial sponsorship program, and this will allow us to support more capacity building activities in algal biotechnology. I would like to thank all the sponsors for their support, and welcome more sponsorships and donations to support the participation of young scientists in the triennial congress and more importantly ISAP's cause to promote research, education, and the dissemination of knowledge about algae, applied algal research and the utilization of algae. For further details, please contact our Vice President Stefan Kraan at appliedphycologysoc@gmail.com.

One of the privileges enjoyed by ISAP subscribers is the access to our member's directory. Hence, I urge all subscribers to update your profile by logging in to our webpage and to make good use of this directory to establish new connections. Once again, I would like to remind you that ISAP have several social media accounts which are being managed by our dedicated Communications Coordinator, Priya Pollard. These include a Facebook page, Twitter account and a LinkedIn group. If you have yet to explore them, I would like to urge everyone to follow or like these pages (and of course share the posts) to increase ISAP' visibility and more importantly to get the latest updates from us.

Finally, I would like to emphasize that ISAP operates solely on the volunteer work of its executive committee members and subscribers. This means that all subscribers can participate in various activities of the society. We certainly appreciate receiving your ideas, feedback on ISAP, news, and announcements of interest for ISAP subscribers. We would also be delighted to receive articles for our upcoming issues of the newsletter. For further details, please contact either the Editor-in-chief of the newsletter Céline Rebours, the ISAP Secretary Sze-Wan Poong or myself whose contact details can be found at the end of the newsletter.

Warmest regards,

Qiang Hu,

President, International Society for Applied Phycology

Message from the Editor

Dear Colleagues,

After overcoming several challenges in 2023, we are pleased to present the first issue of the ISAP Newsletter for this year!

I would like to warmly thank the authors for the preparation and submission of very interesting manuscripts and my deepest gratitude for their patience during the review as well as the publication processes. I would also like to acknowledge our communication manager, Priya Pollard, and the editorial review team for their kind assistance in the preparation of this first 2023 ISAP Newsletter.

In this issue, we have two main articles, three short articles, and views and announcements including the announcement for the 8th Congress of the International Society for Applied Phycology in the wonderful city of Porto in Portugal!

The first article, Jayani Samarathunga, Isuru Wijesekara and Madhura Jayasinghe proposed to use alkali solubilization and isoelectric precipitation as a green method to extract protein from seaweeds. The second article Li Huan and Guangce Wang reviewed the implications of *Ulva prolifera*-induced Green Tide in China.

Furthermore, the two short articles are reports on one training school in Almeria (Spain) and one Symposium in Wuhan (China). The training on microalgae and industrial processes was conducted with the patronisation of ISAP. The Symposium was the 21st one organised by the Phycology Branch of Chinese Society for Oceanology and Limnology.

Finally, a short article describes what the conference delegates can be expected when attending the ISAP 2024 Congress titled “Algae 2030” in Porto, Portugal

We hope you will enjoy reading this issue of the newsletter!

As always, please do not hesitate to contact one of us from the editorial team, if you have any ideas on contributing an article in the next issue of the newsletter. **The deadline for submission is March 30th, 2024.** You will find the guidelines at the end of the newsletter.

Kind regards,

Céline Rebours,
ISAP Vice President and Editor of the ISAP Newsletter

Akali solubilization and isoelectric precipitation to extract protein from selected seaweeds in Sri Lanka

JAYANI SAMARATHUNGA¹, ISURU WIJESSEKARA^{2*}, MADHURA JAYASINGHE²

¹Faculty of Graduate Studies, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

²Department of Food Science & Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

***Corresponding author: isuruw@sci.sjp.ac.lk**

Abstract

There are numerous methods for seaweed protein extraction. However, it is essential to use safe extraction methods which do not carry hazardous compounds to the food material since most of them use toxic chemicals. This article reveals the potential of extracting proteins from *Ulva fasciata*, *Sargassum* sp., *Padina* sp., *Gracilaria verrucosa* and *Gracilaria edulis* collected from Sri Lanka using the method of alkali solubilization of proteins and protein separation through isoelectric precipitation. This can be suggested as a potential green extraction method which uses minimum chemicals. These proteins can be extracted with optimized methods in retaining their functional properties like antioxidant activity, antihypertensive, anticancer, antidiabetic and antiviral properties. Hence, the Fourier Transform Infrared spectroscopy (FTIR) analysis of the above protein extracts has been studied to evaluate their functional groups. The crude protein content of the dried seaweed powders and the extracted proteins were evaluated. Comparatively higher contents of protein in the extracts have been exhibited through alkali solubilization.

Introduction

Seaweeds are emerging as a promising source of protein, peptides, or amino acids in the human diet. Protein content of some seaweeds is known to be higher than certain terrestrial plants (Samarathunga et al. 2022). These proteins include glycoprotein, lectins, Mycosporine-like amino acids and phycobiliproteins (de Souza Celente et al., 2023). Extraction of protein from seaweeds has become limited due to the complex structure formed by proteins and other compounds in the cell wall (Samarathunga et al. 2022). Conventional protein extraction methods such as water extraction, buffer extraction and novel methods like enzyme assisted extraction, microwave assisted extraction, ultra-sound extraction and supercritical fluid extraction have been discussed in different studies (Cermeño et al., 2020; Wijesekara et al., 2017). These methods have been tested within the laboratory level and introduction of seaweed proteins to the global food market is yet to be developed. Although several seaweed-based foods can be found in the market, these were found with least consumer acceptability in most of the countries due to certain unfavourable tastes and odours. Also, due to the lack of awareness of the nutritional importance of macroalgae, many people refrain from consumption of seaweed-based foods. This article will provide important facts on feasibility of seaweed protein extraction using a green technology and functional groups of those proteins identified by using FTIR analysis. These functional groups are the building blocks of many bioactive compounds in seaweed proteins.

Methodology and results

Sample collection

The following seaweeds, *Ulva fasciata*, *Sargassum* sp., *Padina* sp., *Gracilaria verrucosa* and *Gracilaria edulis* were collected from Matara, Hikkaduwa (*Sargassum* sp., *Padina* sp.), Trincomalee and Kalpitiya coastal areas in Sri Lanka respectively (Figure 1). Fresh seaweeds were rinsed with water to remove salt, epiphytes, and sand and were allowed a few minutes to drain off water. Samples were oven dried at 55-60 °C for 16 h to a constant weight. The dried sample was then pulverized to obtain uniform size (355 µm pore size sieve) particles. Thereafter, the powdered seaweed samples were stored in airtight plastic bags at 10°C until further analysis.



Figure 1: *Ulva fasciata*, *Sargassum* sp., *Padina* sp., *Gracilaria verrucosa* and *Gracilaria edulis* were represented by a, b, c, d and e respectively. Image scale bar: 2 cm.

Protein extraction

Proteins were extracted using the method described by Veide Vilg and Undeland (2017) with minor modifications. Dried seaweed powder was mixed with distilled water in a ratio of 1:20 (w/v) at 30°C (Room temperature: RT). Mixture was homogenized using a magnetic stirrer at 1000 rpm for 2 h at RT. Then pH of the mixture was adjusted to pH 12 by adding 1M NaOH dropwise. It was stirred for another 1h at 1000 rpm (RT) using a magnetic stirrer (Lab companion HP-3100) to solubilize more proteins. Mixture was centrifuged at 6000 rpm for 30 min at RT and supernatant was collected. Proteins in the supernatant was precipitated at pH below pH 2 by adding 1M HCl dropwise. Then the mixture was centrifuged at 6000 rpm for 30 min at RT and pellet fraction was collected. Pellet was resolubilized in distilled water at 1:20 m/v ratio. Latter solution was neutralized by adjusting pH to 7 by adding 1 M NaOH dropwise. Finally, solution was freeze dried and stored at -12°C in a silica containing bag until further analysis. The content of crude protein contents of the above seaweeds and protein extracts shown in Table 1 were analysed by the Kjeldahl method.

Table 1: Crude protein contents of seaweed dried powders and the protein extracts (% dry basis) using alkaline solubilization (replicates (n) is 3).

Name	Crude protein content of the dried seaweed powder (% dry basis) (Replicates, n=3)	Crude protein content of the freeze-dried protein extracts (% dry basis) (Replicates, n=3)
<i>Ulva fasciata</i>	16.38±0.38	31.82±0.04
<i>Sargassum</i> sp.	10.43±0.14	14.38±0.02
<i>Padina</i> sp.	12.58±1.05	36.03±0.01
<i>Gracilaria verrucosa</i>	16.77±0.20	35.59±0.00
<i>Gracilaria edulis</i>	10.64±0.10	16.83±0.01

FT-IR analysis of the protein extracts

The extracted seaweed proteins were examined using FTIR to characterize their functional groups according to the method followed by Kannan (2014). The KBr pellet method was used, and FT-IR spectra were recorded in the range 4000-400 cm^{-1} . Scientific graph of the % transmittance vs wavenumber (in cm^{-1}) was drafted using Origin Pro 9.1 software. All the seaweeds have elicited relatively similar vibrations (Figure 2). The vibration stretching detected at 1700-1600 cm^{-1} and 1500-1400 cm^{-1} indicate the presence of Amide I (C=O, N-H, C-N, Amide I absorption zone) and Amide II (C=O, N-H, C-N) respectively (Kannan,2014). Also, the N-H stretching observed around 3500-3400 cm^{-1} and 3350-3310 cm^{-1} correspond to primary amines and secondary amines respectively. The study of Righini et al. (2020) has reported vibrations of aromatic amino acids like tyrosine and phenylalanine are observed at around 1620-1595 cm^{-1} . Proteins extracted from all seaweed species have shown vibrations around this range (*Ulva fasciata*: 1650 cm^{-1} , *Sargassum* sp.: 1630 cm^{-1} , *Padina* sp.: 1627 cm^{-1} , *Gracilaria verrucosa*: 1540 cm^{-1} and *Gracilaria edulis*: 1542 cm^{-1}). O-H bending of carboxylic acids were observed at around 1440-1395 cm^{-1} of the above samples (Kannan,2014). These functional groups are pertained to form valuable compounds in seaweed proteins. Seaweeds contain essential amino acids which are necessary to the human body. Hence, this FTIR analysis reveals the presence of peptide bonds and amino acids in the extracted seaweed proteins.

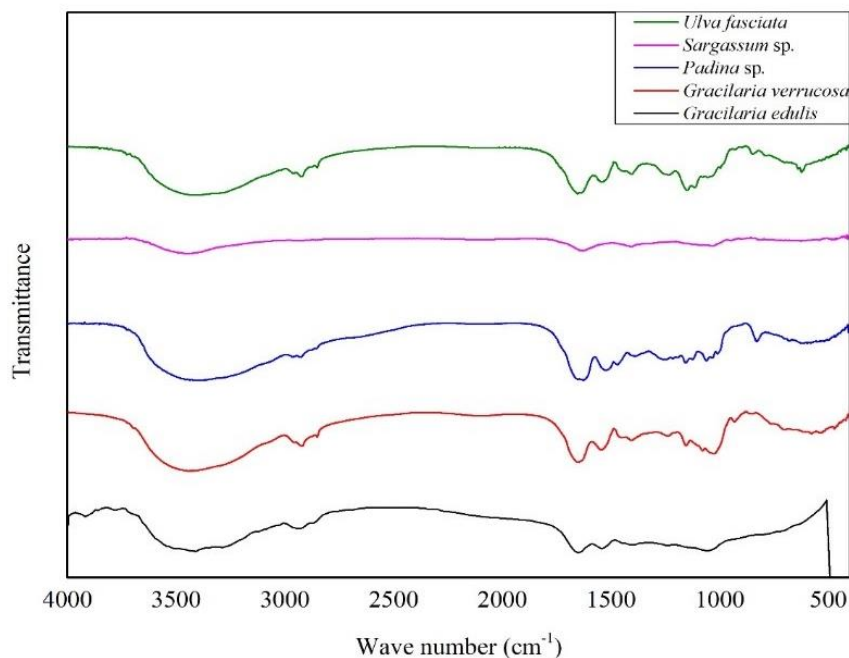


Figure 2: Comparison of different peaks of the FTIR vibrations in protein extracts of different seaweeds using a stacked graph.

Discussion

Generally, crude protein content of seaweeds ranges from 3–15% of dry weight (DW) in brown algae, 9–26% of DW for green algae and maximum 47% of DW for red algae (Pliego-Cortés et al.,2020). The evaluated seaweeds in Sri Lanka have shown moderate protein contents (Premadasa et al., 2022; Jayasinghe et al., 2018). Nutritional aspects of seaweed proteins are highly demanding with reference to their bioactive properties. Previous studies in Sri Lanka have reported importance of peptides from seaweeds (Hamit et al., 2022). Seaweed protein extraction using alkali solubilization is a simple and cost-effective method with minimum environmental impacts. Moreover, the above information on seaweed proteins will be important to expand the global demand for seaweed proteins. Extraction of proteins from seaweeds is challenging in the food industry due to low extraction yield, high cost for purification and aspects related to food safety. Therefore, green extraction techniques like alkali solubilization of proteins and protein separation through isoelectric precipitation must be encouraged and developed.

Conclusion

The crude protein contents of all the seaweeds analysed in this study have shown higher protein contents in the protein extracts obtained through alkali solubilization than their respective dried seaweed powders (Dried seaweed powders: 10.43±0.14-16.77±0.20 % DW and freeze-dried protein extracts: 14.38±0.02-36.03±0.01 % DW). Highest protein content among the protein extracts was observed in the brown seaweed *Padina* sp. (36.03±0.01% DW). Vibration stretching (1700-1600 cm⁻¹ and 1500-1400 cm⁻¹) of FTIR analysis results have revealed the presence of peptide bonds in each seaweed protein extract.

Acknowledgement

This study was financially supported by a research grant from the National Research Council, Sri Lanka (19-095).

References

- Cermeño, M., Kleekayai, T., Amigo-Benavent, M., Harnedy-Rothwell, P. and FitzGerald, R.J., 2020. Current knowledge on the extraction, purification, identification, and validation of bioactive peptides from seaweed. *Electrophoresis*, 41(20), pp.1694-1717.
- de Souza Celente, G., Sui, Y. and Acharya, P., 2023. Seaweed as an alternative protein source: Prospective protein extraction technologies. *Innovative Food Science & Emerging Technologies*, p.103374.
- Hamit, C.S., Nam, K.C. and Abeyrathne, E.D.N.S., 2022. Bioactive peptide production and determination of functional properties using crude water extracts of *Ulva lactuca* (Chlorophyta) and *Sargassum crassifolium* (Phaeophyceae) collected from Sri Lanka. *Applied Phycology*, 3(1), pp.73-82.
- Jayasinghe, P.S., Pahalawattaarachchi, V., Ranaweera, K.K.D.S. and Perera, R., 2018. Chemical composition of six edible seaweed species available in the coastal belt of Sri Lanka. *Journal of the National Aquatic Resources Research and Development Agency*, vol 45-47.
- Kannan, S., 2014. FT-IR and EDS analysis of the seaweeds *Sargassum wightii* (brown algae) and *Gracilaria corticata* (red algae). *International Journal of Current Microbiology and Applied Sciences*, 3(4), pp.341-351.
- Pliego-Cortés, H., Wijesekara, I., Lang, M., Bourgougnon, N. and Bedoux, G., 2020. Current knowledge and challenges in extraction, characterization and bioactivity of seaweed protein and seaweed-derived proteins. *Advances in botanical research*, 95, pp.289-326.
- Premadasa, V.S. and Edirisinghe, D.M.A., 2022. Study on proximate composition of four seaweeds from Kilinochchi and Kalpitiya area of Sri Lanka. *Journal of Fisheries*, 10(2), pp.102401-102401.
- Righini, H., Francioso, O., Di Foggia, M., Quintana, A.M. and Roberti, R., 2020. Preliminary Study on the Activity of Phycobiliproteins against *Botrytis cinerea*. *Marine drugs*, 18(12), p.600.
- Samarathunga, J., Wijesekara, I. and Jayasinghe, M., 2022. Seaweed proteins as a novel protein alternative: Types, extractions, and functional food applications. *Food Reviews International*, pp.1-26.
- Veide Vilg, J. and Undeland, I. 2017. pH-driven solubilization and isoelectric precipitation of proteins from the brown seaweed *Saccharina latissima*—effects of osmotic shock, water volume and temperature, *Journal of Applied Phycology*, 29(1), pp. 585–593. doi: 10.1007/s10811-016-0957-6.
- Wijesekara, I., Lang, M., Marty, C., Gemin, M.P., Boulho, R., Douzenel, P., Wickramasinghe, I., Bedoux, G. and Bourgougnon, N., 2017. Different extraction procedures and analysis of protein from *Ulva* sp. in Brittany, France. *Journal of Applied Phycology*, 29(5), pp.2503-2511.

Impacts and implications of *Ulva prolifera*-induced Green Tide in China

LI HUAN AND GUANGCE WANG*

Key Laboratory of Experimental Marine Biology, Centre for Ocean Mega-Science, Institute of Oceanology, Chinese Academy of Sciences, Qingdao, China.

*Corresponding author: gcwang@qdio.ac.cn

Green tide is an ecological anomaly caused by the massive proliferation of green marine macroalgae or seaweeds in the sea. There are many species of macroalgae that can cause green tides, such as *Enteromorpha*, *Ulva*, *Chaetomorpha* and *Cladophora* (Schramm and Nienhuis 1996; Yabe et al. 2009). After breaking away from their fixed bases, these macroalgae/ seaweeds float on the sea surface and continue to proliferate and grow increasing the amount of algal biomass, and hence result in the green tide events. The floating macroalgae usually occur in densely populated coastal or inner bay areas where biomass becomes trapped. The coastlines of China, the United States, France, and Japan, have all reported outbreaks of green tides (Charlier et al. 2007; Nelson et al. 2008; Sun et al. 2008; Yabe et al. 2009). At present, the outbreak of green tides is mainly attributed to seawater eutrophication, increasing water temperatures in spring and summer, coupled with slow hydrodynamic exchange (Pedersen and Borum 1997; Fan et al. 2013). In recent years, the frequency of green tide occurrence, distribution range and total biomass of macroalgae have shown a significant increasing trend.

Since the first reported green tide caused by the green macroalga *Ulva prolifera* in 2007, it has been documented in the Yellow Sea every year for the past 17 consecutive years (Figures. 1-3). Based on the scale of the outbreak, the scope of impact, and duration of the green tide event, green tides in China are the largest in scale, longest in duration and severest in impact compared to green tides that occur in other coastal countries. Once a green tide occurs, large amounts of macroalgal biomass accumulate in the coastal waters, this accumulation of biomass destroy the coastal landscape, interfere with tourism and water sports. At the same time, the local government invests a lot of resources including human resources, equipment and financial support to remove macroalgal biomass. Green tides also cause a series of secondary hazards. For example, large amounts of macroalgae can reduce photosynthesis and growth of other marine photosynthetic organisms found below the sea surface. Decay of macroalgal biomass consumes oxygen that causes anoxia in seawater. The chemical substances secreted by macroalgae are likely to cause adverse effects on other marine organisms, and therefore affect the diversity and stability of the coastal ecosystem (Hiraoka et al. 2004).



Figure 1: *Ulva prolifera* green tide occurred along the Qingdao coast, China (photographed in Qingdao in the summer of 2008).



Figure 2: Large amounts of *Ulva prolifera* gathered on the coast (photographed in Qingdao in June 2014).



Figure 3: Green tide biomass removed from the sea by bulldozers and other large equipment (photographed in July 2022, Qingdao, China).

Morphological and molecular analyses confirmed that *U. prolifera* has been the causative species of green tide in the Yellow Sea of China (Zhang et al. 2008). The macroalga is light or dark green, composed of single-layer cells forming hollow tubes (Figure 4). It can adapt to a wide range of environment conditions and maintain a high growth rate; hence it has a competitive advantage over other photosynthetic organisms. In the period of rapid growth, *U. prolifera* biomass increase was reported at 36% and 43% on a daily basis in 2009 and 2010, respectively (Fan et al. 2013). In controlled field experiment results, the average daily increase in *U. prolifera* biomass was 23%, and a maximum daily biomass increase of 56.2% was reported in the accelerated growth stage (Zhang et al. 2013). *U. prolifera* has many proliferation pathways (Zhang et al. 2011; Wang et al. 2020). The life cycle is isomorphic alternation of generations. Both the algae and the spores have strong resistance to stress (Zhang et al. 2010; Gao et al. 2011). Therefore, rapid growth and strong proliferation ability of *U. prolifera* are significant contributing factors for the scale and impact of these green tide outbreaks.

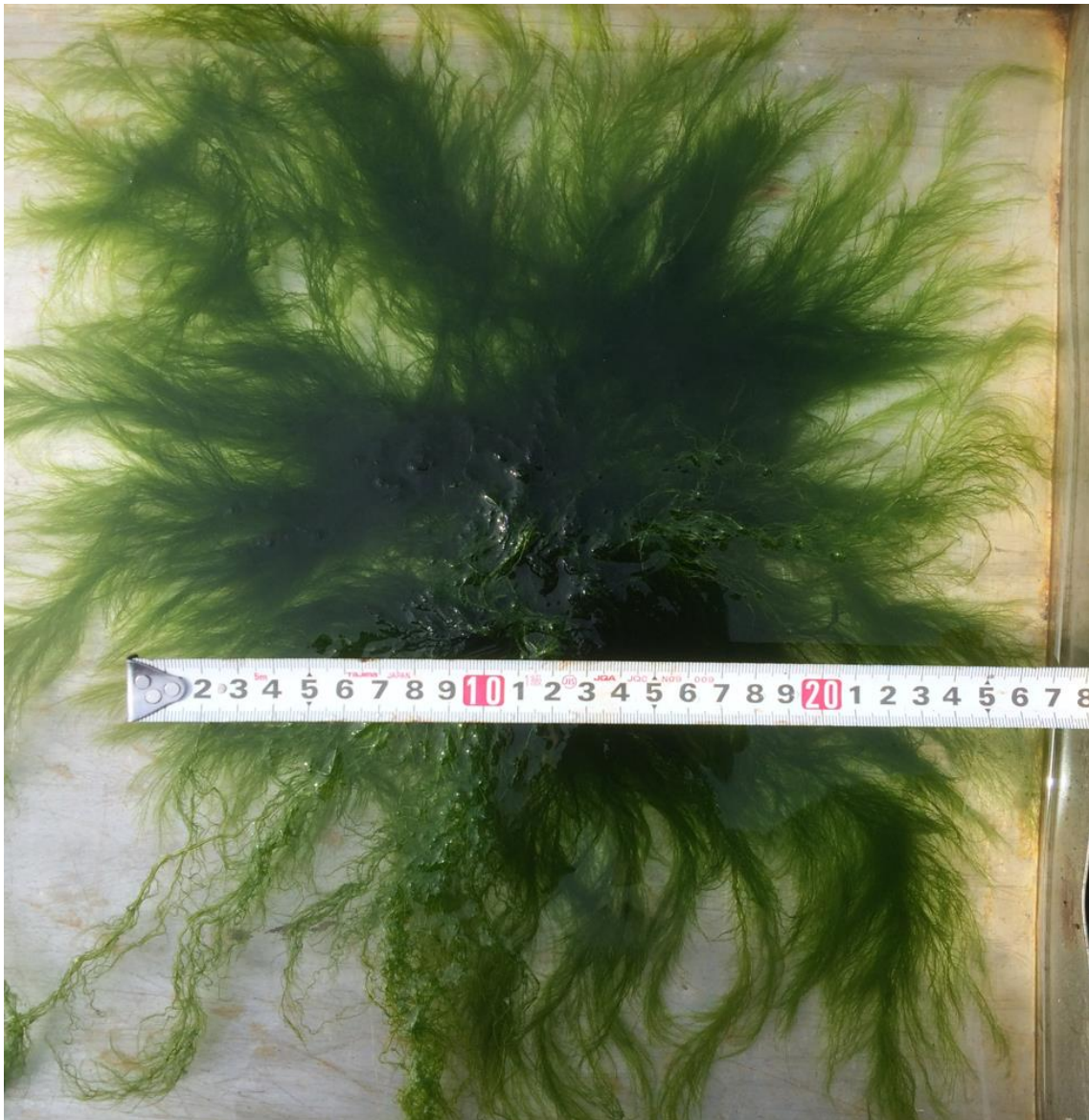


Figure 4: A typical floating *Ulva prolifera* occurring in the Yellow Sea (photographed in May 2016).

U. prolifera is a good source of biological material that is non-toxic and rich in nutrition. They can be used as food, feed, biofertilizer, biomaterials and bioenergy.

U. prolifera has a pleasant taste and has a rich nutritional value and is widely used in people's daily diet. In coastal communities of certain countries, including China, Japan, and South Korea, *U. prolifera* is included in their local cuisines. For example, coastal residents in northern China make steamed stuffed

buns and soup with fresh and tender *U. prolifera*. It can also be used as seafood condiment and food additive in various foods, such as noodles, biscuits, crisp noodles, twist and puffed food (Lin 2007). *U. prolifera* is also used as feed additive to improve animal feed nutrient composition, increasing feed conversion rates, promoting animal growth, enhancing animal immunity, and improved survival rates (Lin 2007).

U. prolifera contains a variety of biologically active compounds such as polysaccharides, proteins, fatty acids, and volatile components (Jin et al. 2011). The polysaccharides can support immune regulation, present antioxidant and antiviral properties, and have been shown to lower blood lipid and blood glucose (Wei et al. 2014). *U. prolifera* also has water retention qualities. The hygroscopicity of *U. prolifera* macroalgal powder is 98% of the hygroscopicity reported for glycerin. Its polysaccharides and hyaluronic acid have similar moisturizing properties. It can also reduce the damage of ultraviolet rays to fibroblasts of human skins. These characteristics make *U. prolifera* an ideal bioresource for cosmetics application (Cai et al. 2018; Guo et al. 2014).

U. prolifera can be mixed with paper pulp after pretreatment to produce paper products after grinding. Such papers possess the properties of oil resistance, water resistance and microorganism resistance (Wang et al. 2016). *U. prolifera* can be used to make activated carbon that has large specific surface area, rich pore structure, stable physical and chemical properties and good chemical adsorption capacity (Gao et al. 2015). It contains a variety of substances such as sugars, lipids and proteins. Decomposition of *U. prolifera* generates large amounts of compounds that are similar in chemical composition to that in fossil fuels and thus are good materials for producing bio-oil (Wang et al. 2006; Chen et al. 2017).

U. prolifera grows rapidly and possess multiple functional sites (such as amino, hydroxyl, carboxyl, and sulphate groups) on the cell walls that can both adsorb and absorb toxic compounds, thereby reducing or eliminating harmful substances from the polluted waters (Wu et al. 2018; Zhao et al. 2020).

With the occurrence of green tides not showing any signs of slowing down, and with the wide range of potential applications of *U. prolifera* biomass, there is a need to identify methods for harvesting this biomass in a timely manner and utilizing it in the various ways mentioned above. Further research is required to turn these green tides from a problematic event into an opportunity where the valuable macroalgae biomass can be converted into valuable products rather than be a costly problem for local communities.

References

- Cai, C., Guo, Z., Yang, Y., Chen R, Jiang, T., Jia, R., He P. 2018. Application of green tide algae *Ulva prolifera* from south yellow sea of China. *Pak J Bot* 50 (2):727-734.
- Charlier, R.H., Morand, P., Finkl, C.W., Thys, A, 2007. Green tides on the Brittany coasts. *Environ Res, Eng Manage* 3 (41):52-59.
- Chen, W., Yang, H., Chen, Y., Xia, M., Yang, Z., Wang, X., Chen, H. 2017. Algae pyrolytic poly-generation: influence of component difference and temperature on products characteristics. *Energy* 131:1-12.
- Fan, S., Fu, M., Li, Y., Wang, Z., Fang, S., Jiang, M., Wang, H., Sun, P., Qu, P. 2012. Origin and development of Huanghai (Yellow) Sea green-tides in 2009 and 2010. *Acta Oceanologica Sinica* 34(6):187-194 (In Chinese with English abstract).
- Gao, S., Shen, S., Wang, G., Niu, J., Lin, A., Pan, G. 2011. PSI-driven cyclic electron flow allows intertidal macro-algae *Ulva* sp. (Chlorophyta) to survive in desiccated conditions. *Plant Cell Physiol* 52 (5):885-893.
- Gao, Y., Yue, Q., Gao, B., Sun, Y. 2015. Optimization preparation of activated carbon from *Enteromorpha prolifera* using response surface methodology and its adsorption studies of fluoroquinolone antibiotics. *Desalination Water Treatment* 55 (3):624-636.
- Guo, Z., Cai, C., Geng, Z., Hua, L., Feng, Y., Jia, R., He, P. 2014. Study on potential use of crude polysaccharides from *Ulva prolifera* in cosmetic. *Chinese J Marine Drugs* 33(2): 57-62 (In Chinese with English abstract).

- Hiraoka, M., Ohno, M., Kawaguchi, S., Yoshida, G. 2004. Crossing test among floating *Ulva* thalli forming green tide in Japan. *Hydrobiologia* 512 (1-3):239-245.
- Jin, H., Xu, N., Yan, X. 2011. Research progress on the bioactive compounds of seaweed *Enteromorpha*. *Marine Sciences* 35(4): 100-106 (In Chinese).
- Lin, W. 2007. Development and utilization of *Enteromorpha*. *Food and Nutrition in China* (9): 23-25 (In Chinese).
- Nelson, T.A., Haberlin, K., Nelson, A.V., Ribarich, H., Hotchkiss, R., Alstyn, K.L.V., Buckingham, L., Simunds, D.J., Fredrickson, K. 2008. Ecological and physiological controls of species composition in green macroalgal blooms. *Ecology* 89 (5):1287-1298.
- Pedersen, M.F., Borum, J. 1997. Nutrient control of estuarine macroalgae: growth strategy and the balance between nitrogen requirements and uptake. *Mar Ecol Prog Ser* 161:155-163.
- Schramm, W., Nienhuis, P. 1996. Marine benthic vegetation: recent changes and the effects of eutrophication. vol 123. Berlin: Springer Press, 1996: 7-43.
- Sun, S., Wang, F., Li, C., Qin, S., Zhou, M., Ding, L., Pang, S., Duan, D., Wang, G., Yin, B. 2008. Emerging challenges: Massive green algae blooms in the Yellow Sea. *Nature precedings* 2266 (1):1-5.
- Wang, G., Chen, M., Wang, J., Li, D., Zeng, C. 2010. A method for pyrolysis of large algae into liquid fuel and gas fuel: CN101033405B, 2010-08-25 (In Chinese).
- Wang, G., Lin, A., Pei, J., Zhu, D., Li, J., Zhang, F. 2016. A method of papermaking with large seaweed: CN102587191B, 2016-03-16 (In Chinese).
- Wang, G., Wang, H., Gao, S., Huan, L., Wang, X., Gu, W., Xie, X., Zhang, J., Sun, S., Yu, R., He, P., Zheng, Z., Lin, A., Niu, J., Wang, L., Zhang, B., Shen, S., Lu, S. 2020. Study on the biological mechanism of green tide. *Oceanologia et Limnologia Sinica* 51(4): 789-808 (In Chinese with English abstract).
- Wei, J., Pei, D., Liu, Y., Liu, Y., Di, D. 2014. Research progress of polysaccharides from *Enteromorpha*. *Marine Sciences* 38(1): 91-95 (In Chinese).
- Wu, H., Zhang, J., Yarish, C., He, P., Kim, J.K. 2018. Bioremediation and nutrient migration during blooms of *Ulva* in the Yellow Sea, China. *Phycologia* 57 (2):223-231.
- Yabe, T., Ishii, Y., Amano, Y., Koga, T., Hayashi, S., Nohara, S., Tatsumoto, H. 2009. Green tide formed by free-floating *Ulva* spp. at Yatsu tidal flat, Japan. *Limnology* 10 (3):239-245.
- Zhang, H., Ma, J., Hu, X., Yang, J., Zhang, T., Chen, B., Xu, R., Ye, S. 2011. Reproductive characteristics of the floating algae in green tide. *J Shanghai Ocean University* 20(4):600-606 (In Chinese with English abstract).
- Zhang, J., Huo, Y., Yu, K., Chen, Q., He, Q., Han, W., Chen, L., Cao, J., Shi, D., He, P. 2013. Growth characteristics and reproductive capability of green tide algae in Rudong coast, China. *J Appl Phycol* 25 (3):795-803.
- Zhang, X., Mao, Y., Zhuang, Z., Liu, S., Wang, Q., Ye, N. 2008. Morphological characteristics and molecular phylogenetic analysis of green tide *Enteromorpha* sp. occurred in the Yellow Sea. *J Fishery Sciences China* 15(5):822-829 (In Chinese with English abstract).
- Zhang, X., Wang, H., Mao, Y., Liang, C., Zhuang, Z., Wang, Q., Ye, N. 2010. Somatic cells serve as a potential propagule bank of *Enteromorpha prolifera* forming a green tide in the Yellow Sea, China. *J Appl Phycol* 22 (2):173-180.
- Zhao, P., Wang, X., Niu, J., He, L., Gu, W., Xie, X., Wu, M., Wang, G.J.A.R. 2020. Agar extraction and purification of R-phycoerythrin from *Gracilaria tenuistipitata*, and subsequent wastewater treatment by *Ulva prolifera*. *Algal Research* 47:101862.

Training in microalgae-related industrial processes

TOMAS LAFARGA¹, CINTIA GÓMEZ¹, ANDREW WARD², F. GABRIEL ACIEN^{1*}

¹Department of Chemical Engineering-CIESOL, University of Almeria, Almeria, Spain

²The Australian Centre for Water and Environmental Biotechnology, The University of Queensland, Australia

**Corresponding author: facien@ual.es*

Introduction

Microalgae-related production processes are a fast-growing sector involving largely different expertise from biology, to engineering and control, and marketability aspects. A large number of researchers and entrepreneurs are interested in this field; hence it is necessary to promote the development of specific courses related to this topic. The University of Almería has a large tradition in the development of training courses in this field, the last one being delivered from July 3rd to 7th, 2023, with the patronage of ISAP and support from other entities. In this intensive course about microalgae-based processes, experts from academia and industry explain the major aspects of these processes. The course covered all the aspects related to microalgae-based processes, from (i) the modelling of strains and light utilization to (ii) the design, operation and control of photobioreactors, (iii) harvesting and processing of the biomass to achieve reliable and high-value products, and (iv) techno-economic and sustainability of large-scale processes. Fundamental and practical aspects were covered always including the participation of internationally recognized researchers, young researchers and the exchange of experiences between the assistants. Lecturers had extensive experience in bioeconomy, climate change, and the development of processes to make industrial production more sustainable in the future. The course was oriented towards PhD students or equivalent experienced students in microalgae biotechnology and chemical engineering fields from whatever fundamental area as microbiology, biology or biological/ biochemical engineering, chemistry and biochemistry. The course was also intended to allow those working in the industry to upgrade their knowledge in microalgae biotechnology.

Organization

The course was organized by the “Desalinization and photosynthesis” research group at the University of Almeria, as part of the “Study Abroad Summer Programme”. The course was supported by the University of Almeria and EU projects such as PRODIGIO, REALM and DIGITALGAE. Other projects such as ALGAENAUTS and PARAQUA also collaborate in the development of the course. To remark on the participation of two companies such as Biorizon Biotech SL and Aqualia SA, in addition to the patronage of ISAP. A total of 20 students from different countries around the world finally attended the course.



Figure 1: Image of participants in the course.

Training activities

The main goals of the course were:

1. to provide the basic knowledge, and needed skills to grow microalgae, characterize the biomass and conceptualize microalgae processes;
2. to demonstrate the feasibility of microalgae-related processes and identify the markets in which these processes can be suitable;
3. to provide access to real data and experience of microalgae-related industrial processes

The programme of the course included 2 h lectures and 3 h training activities for each one of the five modules on which it was divided:

- MODULE 1: Biology and basic principles of microalgae cultures
- MODULE 2: Fundamentals of microalgae photobioreactors
- MODULE 3: Harvesting and processing of microalgae biomass
- MODULE 4: Economic and sustainability analysis of microalgae processes
- MODULE 5: Commercial application and techno-economic assessment of microalgae processes

Professors of the course included Jose María Fernández Sevilla (UAL), Gabriel Acién (UAL), Tomás Lafarga (UAL), Paula Pérez-López (PSL), Luisa Gouveia (LNEG) and Andrew Ward (ACWEB). Also, a large list of young researchers participated in the training activities. The Training course was performed at the SABANA demo facility at the IFAPA research centre in Almeria (Spain), using the demonstration facility already in operation by the University of Almeria. The course was completed by visiting two industrial sites, the one from Biorizon Biotech SL devoted to the production of microalgae for agriculture applications and the one from Aqualia SA devoted to wastewater treatment using microalgae.



Figure 2: Photo during one of the lectures provided by Prof. Andrew Ward (Australia).



Figure 3: Photo during some of the training activities performed at the demonstration facility.



Figure 4: Photo during the visits to the facilities of Biorizon Biotech SL producing microalgae for agriculture-related applications (left) and the facilities of AQUALIA SA treating wastewater using microalgae.

Participant testimonials

“It was a great course, on which we have the opportunity to learn and share on this interesting topic”

“We enjoy the course, the content of the lectures and the training activities”

“It was an amazing event on which we have the opportunity to meet with other colleagues and close collaborations for further research and entrepreneurs activities”

Conclusions

The training course was completed, and all the objectives initially planned were achieved. The materials of the course are already available for the students, and professors remain at the disposal of the students for further questions and projects. We will perform the training course in further editions, improving the content and quality of contents, especially in modelling and simulation of large-scale facilities.

Acknowledgements

The training course was supported by the “Study Abroad Programme” from the Vice-rectorate of Internationalisation at the University of Almeria thanks to the collaboration of the IFAPA research centre and EU projects PRODIGIO, REALM, DIGITALGAE, PARAQUA and ALGAENAUTS.

The 21st Symposium of the Phycology Branch of Chinese Society for Oceanology and Limnology

GAOFEI SONG*

Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan, China

**Corresponding author: song@ihb.ac.cn*

The 21st Symposium of the Phycology Branch of Chinese Society for Oceanology and Limnology (CSOL), was held at the Institute of Hydrobiology, Chinese Academy of Sciences, in Wuhan from August 9th to 10th, 2023. Over 300 phycologists from more than 45 universities, research institutions and representatives from enterprises attended the symposium in person, and over 500 people attended online. Due to the demand of epidemic prevention and control, the symposium was held online and offline simultaneously for the first time. The organizer received 288 abstracts, including 98 oral presentations.

The symposium included four sessions: keynote lectures, oral presentations, posters presentations and special topic discussions. The topics cover biodiversity and ecology, breeding and biotechnology, physiology and biochemistry and molecular biology, as well as two mini-symposia specifically on biology of cyanobacteria and Chlamydomonas.

Under the guidance of the local government, the organizing committee of the Symposium took different measures to ensure the successes of both epidemic prevention and academic exchanges. Participants expressed their satisfaction with the symposium and appraised it as ‘a safe, efficient and high-quality academic feast’.



Figure 1: Photos taken during the symposium in Wuhan. a. Main symposium venue. b. A session room.

Algae 2030 and the ISAP 2024 Congress, Porto, Portugal

VITOR VASCONCELOS^{1,2*}

¹ Faculty of Sciences, University of Porto, Rua do Campo Alegre, 4169-007 Porto, Portugal;

² Interdisciplinary Center of Marine and Environmental Research (CIIMAR/CIMAR), University of Porto, Terminal de Cruzeiros do Porto de Leixões, Avenida General Norton de Matos, S/N, 4450-208 Matosinhos, Portugal

**Corresponding author: vmvascon@fc.up.pt*

Abstract

The 8th Congress of the International Society for Applied Phycology (ISAP 2024) will be held from 16th to 21st of June 2024 in Porto, Portugal. Over these days, themes such as: Biodiversity and applications of algae; Climate change impact on algae; Algae and energy; Algae biorefineries; Algae for food and feed; Algae and bioremediation will be approached, from basic science knowledge to innovative industrial applications. There will be opportunities to visit the vibrant algae industry in Portugal. Portugal hosts a diverse array of robust algae-based companies, some of them may be visited during your stay for the ISAP 2024 Congress: Algaplus, Allmicroalgae, A4F, Algatec-Ecobusiness Park, Necton, Buggy Power. Special sessions, technical tours, B2B meeting as well as activities focused on PhD students will also be organized, together with an inviting social program that will make ISAP 2024 a landmark in Phycological Conferences.

Foreword

The ISAP 2024 Congress will happen in Porto, Portugal (Figure 1) from the 16th to the 21st of June 2024. ISAP 2024 will have the general theme “Algae 2030: risks and opportunities” and it will be an excellent forum of discussion and establishment of new partnerships. During five days, you will have the opportunity to present your most recent work, discuss new ideas and establish interdisciplinary consortia to apply to European and worldwide funding agencies more successfully. There will also be time and opportunities to visit interesting sites that develop different applications of micro- and macro-algae in Portugal and students will have opportunities to exchange ideas and create new networking that will be fundamental for their professional development. Abstract submission started on September 18th, 2023, and all information are found on the webpage of the congress: <https://isap2024.com/>

Porto

Porto has been Europe’s Leading City Break Destination 4 times. Although Porto is a city that should be visited all year round, we want to give our visitors the opportunity to visit us during mid-summer. Not just because days are longer but also because temperatures are milder and there will be the opportunity to experience St John festivities after the conference. The night of 23rd to 24th of June is loved by all those that are in Porto, the incredible environment in the streets of Porto, from the river banks to the ocean promenades, sharing the joys of mid-summer with grilled sardines, all night dances, fireworks and the incredible sound of thousands of plastic hammers that we dare to hit on anyone’s head that passes by you, in a gesture of salutation and enjoyment. São João festival originated as a pagan festivity back in the 14th century as a celebration and thanks to the sun god for a good harvest and abundance. It was later Christianised as a celebration to São João by the Church, but many of the pagan customs persist even to this day, like the usage of wild leek, basil and the bonfires. All in all, in its many incarnations, this festival has been celebrated in Porto for about 700 years and it is truly part of the city’s identity. São João festival in Porto is celebrated on June 23rd, and it usually begins with a dinner between friends/family, in a restaurant or on a barbecue at a friend’s place. It is a night that starts pretty early for Portuguese standards, at around 18h30 (if you are at a friend’s place) or a bit later on if you are going to a restaurant). The typical dishes of São João festival in Porto are grilled sardines, grilled peppers, caldo verde (the famous Portuguese green broth soup) and fresh tomato salad. The meat lovers usually go for grilled spareribs, or

for some beautiful bifanas (pork sandwiches). As São João festival in Porto is a very busy night, you should definitely book a table in a restaurant – don't leave it to the last minute! Take a look at my suggestions of restaurants for large groups in Porto.

Many people choose restaurants in Ribeira, right next to D. Luís bridge, where fireworks take place at midnight, or in Foz (after Ribeira, also close to the riverside). Another great location for restaurants is the Douro riverbank on the Gaia side. After dinner, comes the fireworks at Luiz I bridge. Not surprisingly, the fireworks at D. Luís bridge are the high point of São João festival night in Porto. The banks of the Douro River get filled with thousands of people who watch a beautiful symphony of bright colours that draw shapes in the air, much to the delight of everyone. The fireworks just finished. What now? Now it begins the most fun part of São João festival in Porto. Generally, after the fireworks on D. Luiz I bridge, the crowd walks from Ribeira to Foz (or even to Matosinhos beach, which is nearly 10km away). Of course, no one gets to Matosinhos – sometimes not even to Foz, because there are a lot of distractions on the way. Porto is extremely well served on hotels, hostels and apartments that will be suitable for all budgets, including students. More than 1700 options available. You must live it to believe it!

ISAP 2024 will be hold just two months after the celebration of 50th years of democracy in Portugal – the carnations revolution – on the 25th April 1974.

The Venue

The ISAP 2024 will be held at Centro de Congressos of Alfândega do Porto, the Best Congress Centre in Europe Business Destinations Travel Awards 2014, 2015 & 2017 (Figure 2). The Centre is located in the historic centre of Porto on the banks of the Douro River in an historic building restored by Arq. Souto Moura. It has 36,000 m² of useful area, 22 multifunctional spaces and 400 park spaces. <https://www.ccalfandegaporto.com/en/location/>



Figure 1: View of Porto city.



Figure 2: Centro de Congresso Alfandega do Porto (credits By Jose A. - Oporto (Portugal), CC BY 2.0, <https://commons.wikimedia.org/w/index.php?curid=39904176>).

Getting to Porto

By air: Francisco de Sá Carneiro Airport is about 20 km from the city centre. This very modern airport was refurbished for the Euro 2004 football championships, which were partly hosted by Porto. The Metro connects the city centre of Porto and Gaia via the line E. Expect to pay about 20 to 25 € for a taxi ride to the city centre. You can use our flight comparison engine to book cheap airlines tickets to Porto airport.

By train: Campanhã station: Porto's main station, east of the town centre. Metro lines A, B, C, E, F will take you there. This is where you arrive or leave from for Lisbon or Spain. Left luggage available. Sao Bento station: in the town centre, remarkable for its architecture; this station links to the north of Portugal, to Guimarães or Braga. Left luggage available. www.cp.pt

Weather in June in Porto

In Porto, the climate is temperate oceanic, with mild, rainy winters and pleasantly warm, sunny summers. The city is located on the northern coast of Portugal, on the estuary of the Douro River. The wind blows frequently: in the cold half-year, it is caused by Atlantic depressions, and can be strong, while in summer, a cool breeze from the sea blows in the afternoon. During the night and in the early morning, in periods of good weather, fog can form all year round. The average temperature of the coldest month (January) is of 9.7 °C (49 °F), which of the warmest month (August) is of 20.9 °C (70 °F). Here are the average temperatures.

The Algae environment in Portugal

Since ancient times, in North Portugal, such as in Apulia, seagrasses were collected from June until the end of the year to be dried and used as fertilizer in agriculture. Several folk-dance groups still remember us about these traditions. In this northern area of Portugal, agricultural goods are still cultivated in "maseiras", sandy terrains by the sea, using seaweeds as organic fertilizers.

Porto host CIIMAR, the Interdisciplinary Centre of Marine and Environmental Research, a major research Centre with a strong connection to the University of Porto holding several research teams working on algae. CIIMAR research and innovation strategy on algae issues deals with molecular studies, from gene mining to taxonomy, from ecology to restoration, from biochemical studies to biotechnological applications. CIIMAR hosts the Culture Collection – LEGE_CC (<https://lege.ciimar.up.pt/>) that has more

than 2000 strains of these organisms that have been used for a diverse array of innovative biotechnological applications (Figure 3). Innovation is translated into patent applications, industry driven projects to spin offs and algae-based industries, being examples; the Algaplus, founded in 2012 by two CIIMAR alumni, to the recent spin offs Inclita Seaweeds Solutions and Fykia Biotech.



Figure 3: CIIMAR Microalgae and cyanobacteria collection – LEGE_CC

Portugal hosts a diverse array of robust algae-based companies, some of them may be visited during your stay for the ISAP 2024 Congress: ALGApplus, Allmicroalgae, A4F, Algatec-Ecobusiness Park, Necton, Phytoalgae, to name a few. Small producers of Spirulina may also be found, with bio and sustainable productions: TomarNatural and 5essencia.

Research Centres in Portugal such as CIIMAR, CESAM, CCMAR, MARE, Okeanus and CEB, have teams that work in diverse areas of micro and macroalgae with the aim to develop innovative applications.

Algae 2030 and the ISAP 2024 Congress

The ISAP 2024 Congress has as general theme “Algae 2030: risks and opportunities” being proposed the following general themes:

- Biodiversity and applications of algae
- Climate change impact on algae
- Algae and energy
- Algae biorefineries
- Algae for food and feed
- Algae and bioremediation

Special sessions, technical tours, B2B meeting as well as activities focused on PhD students will be organized, together with an inviting social program that will make ISAP 2024 a landmark in Phycological Conferences.

Looking forward seeing you all in Porto in June 2024.

Vitor Vasconcelos – Chair of the ISAP 2024 Congress

News and Views

Promote YOUR COMPANY with the International Society of Applied Phycology

The International Society of Applied Phycology would like to offer your company/organisation the **opportunity to conduct public engagement activities with us**. We are please to announce that there are a **wide variety of sponsorship options** available to meet your needs.

We would also like to invite you to participate in our **triennial international conference** that attracts over 500 of the world's leading phycological researchers from world-renowned universities, research institutes and companies!

Contact us on applied.phycologysoc@gmail.com for more information.



ISAP is on different social media platforms!

To help grow our algae networking community we encourage to follow, like and subscribe of our various platforms. All platforms can be accessed via this linktree https://linktr.ee/isap_phycology or scan the QR Code below.





**8TH CONGRESS OF THE
INTERNATIONAL SOCIETY FOR
APPLIED PHYCOLOGY - 2024
16-21ST JUNE, 2024, PORTO, PORTUGAL**



In collaboration with the ISAP EC, the congress is being organised by



CIIMAR
www.ciimar.up.pt



Faculdade de Ciências da Universidade do Porto
www.fc.up.pt



Board Member - BlueBio Alliance
www.bluebioalliance.pt

More details will be posted on the [ISAP webpage](#) and all ISAP social media pages

ISAP advertised a funding opportunity for a training course on Algal-Biotechnology in April 2023. This is part of the mission and commitment of ISAP to promote and contribute to the education of a young generation of scientists and engineers dealing with Algal Biotechnology. Out of the four applications, the society decided to allocate funds to the proposal made by Dr Leila Ktari from the National Institute of Marine Sciences and Technologies (INSTM) in Tunisia. INSTM has organized a face to face and online Training course on Applied Phycology titled “Seaweed cultivation and biotechnology” on 12-16th September 2023. The workshop information and programme can be found on our [ISAP webpages](#).

Conferences and events

20th International conference on Harmful Algae (ICHA) | In Person

5th – 10th November 2023, Hiroshima (Japan)

Harmful Algae Conference aims to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results on all aspects of Harmful Algae Conference. It also provides a premier interdisciplinary platform for researchers, practitioners, and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered, and solutions adopted in the fields of Harmful Algae Conference.

More Information: <https://icha2023.org/>

Aquaculture Africa 2023 | In Person

13th – 16th November 2023 | Lusaka (Zambia)

The conference offers a great opportunity for aquaculture researchers, practitioners, decision makers and other stakeholders to meet, network and discuss all aspects of aquaculture in Africa. Exhibitors from all over the globe are expected to exhibit their products in the amazing exhibition Center. Visits to some famous touristic attractions in Lusaka and Zambia will be arranged. Special exclusionary or aquaculture tours will also be arranged to nearby fish farms (both large, medium and small scale; aquafeeds plants, fish markets and some aquaculture R&D centers.

Further information: <https://was.org/meeting/code/AFRAQ23>

European Congress of Marine Biotechnology (ECMB) 2023 | In Person

22nd – 24th November 2023 | Malaga (Spain)

The European Congress of Marine Biotechnology is a great opportunity to present your research to the scientific community, and for that reason, we would like to welcome your participation. The Congress comprises the following major theme; Marine Biodiversity, Sustainability, and Chemical Ecology; Aquaculture Biotechnology; Biofouling and Antifouling; Marine Genetics and Bioinformatics; Algae Biotechnology; Marine Natural Products and Biopolymers; Marine Foods and Feeds; Marine Nutraceutical, Pharmaceutical, and Cosmeceuticals; Bioremediation and Marine Organisms for Biocontrol in Agriculture; Biotechnology Regulation: New Challenges for Blue Economy.

Further information: <https://eventos.uma.es/44215/detail/european-congress-of-marine-biotechnology.html>

AlgaEurope 2023 | In Person

12th – 15th December 2023 | Prague (Czech Republic)

AlgaEurope is a unique opportunity to learn and understand all about algae production and commercialization and interact with over 400 key players from more than 45 countries. Algae have become a multi-billion sector in terms of biotechnology development that is expected to grow rapidly, providing valuable goods and services in multiple applications. Despite centuries of scientific and commercial interests, the term “algae” has no taxonomic meaning. In the light of rapidly growing business interests associated with the term algae, a clear, simple definition of algae is not only required but essential for developing the necessary standards, and regulatory and legal issues.

More information: <https://algaeeurope.org/registration/>

AQUAFARM 2024 | In Person

14th – 15th February 2024 | Pordenone (Italy)

International conference & trade show on aquaculture, algaculture and fishing industry dedicated to the sustainable production of food from water. Two days dedicated to professionals within the sector of aquaculture, shellfish farming, algaculture and sustainable fishing.

Further information: <https://www.aquafarm.show/en/>

Ocean Sciences Meeting (OSM) 2024 | Hybrid18th -23rd February 2024 | New Orleans, Louisiana (United States of America)

The Ocean Sciences Meeting (OSM) is the flagship conference for the ocean sciences and the larger ocean-connected community. Every two years, the Ocean Sciences Meeting unifies the oceans community to share findings, connect scientists from around the world, and advance the impact of science. The Ocean Sciences Meeting 2024 is co-sponsored by the American Geophysical Union (AGU), the Association for the Sciences of Limnology and Oceanography (ASLO), and The Oceanography Society (TOS). The Ocean Sciences Meeting is committed to the OSM24 theme of Inspire. Discover. Restore. Through the following; Exciting future generations of ocean enthusiasts and colleagues to explore the new frontiers in ocean science; Uncovering new research and work to share knowledge of our interconnected ocean, and to ensure its health for future generations.

More Information: <https://agu.confex.com/agu/OSM24/prelim.cgi/Home/0>

ALGAEFARM / NOVELFARM 2024 | In Person20th – 21st March 2024 | Pordenone (Italy)

The event in the event dedicated to algaculture is now in its third edition. The goal has always been to give a leading role also to the algae and microalgae cultivation sector, already present in the previous editions. AlgaeFarm becomes the perfect opportunity to meet the best professionals engaged in a continuously growing sector such as that of the production of algae in aquaculture or in greenhouses. Not only that, but this exhibition space also dedicated to algaculture offers a great wealth of ideas for all those people interested in new business opportunities or for farms that want to reconvert their production. As per the mission of the event, AlgaeFarm will also be accompanied by conferences and debates dedicated to algae and microalgae. We will have the opportunity to learn more about the latest news both in the field of research and in the development of new technologies for the cultivation and application of the product.

More information: <https://novelfarmexpo.it/en/algae-farm-algaculture-event/>

AQUA 2024 | In Person26th – 30th August 2024 | Copenhagen (Denmark)

The theme of AQUA 2024 is "Blue Food: Green Solutions" Co-organized by the European Aquaculture Society (EAS) and the World Aquaculture Society (WAS).

Further information: <https://www.aquaeas.eu/events/future-eas-events>

International Society for Applied Phycology (ISAP) Newsletter Article Submission Guidelines

Contributing an article to the ISAP newsletter

Members or non-members of ISAP are welcome to contribute articles, news clips or announcements to the newsletter. We do particularly encourage undergraduate and graduate students to contribute.

Past issues of the newsletter

Archives of the newsletter can be accessed on our website:

<https://www.appliedphycologysoc.org/newsletters>

Frequency of publication

Biannual.

The audience

The newsletter is read by about 600 members of the ISAP who are applied phycologists from universities, research institutes, industry, policy makers and other algae enthusiasts. It is also read by those who frequent our Facebook and LinkedIn in page where the newsletter is uploaded. The newsletter can also be accessed through National Library of Australia (NLA), as part of the agreement for the issue of the ISSN number.

Type of articles

We solicit and publish technical articles pertaining to applied phycology from any type of ecosystem. Each issue typically comprises two articles, one on microalgae and the other on macroalgae.

Other types of contributions may include announcements pertaining to conferences, workshops, symposia, training courses and events, project updates, book reviews as well as review of technology and services.

Article formatting

All submissions should be in **MS word (.doc or .docx) format typically of 250 – 2500 words**. Word files should be named with the surname (family name) of the corresponding author e.g., Camello.docx.

Please format your article in plain font ideally using **Times New Roman, font size 11**. Please bold titles and italicize sub-titles. Use appropriate symbol font for units. Please avoid the use of excessive space between characters or words. ISAP newsletter adopts metric unit of measurement. Scientific names should be in full, with genus and species in italics.

The manuscript should be organized as follows

- Title
- Author list with affiliation and corresponding author
- Summary or Abstract
- Main body of the manuscript
- Conclusions and/or recommendations
- Acknowledgments (optional)
- References
- Tables (optional)
- Figures (optional)
- Figure captions (optional)

Title

Typically, **100 characters**, in bold.

Authors and affiliation

Each article should list all authors with their first name and middle name abbreviated. Superscripts may be used to indicate the institutional affiliation of the authors. An asterisk symbol is used to highlight the corresponding author and their contact email ID. For e.g.,

N.V. Thomas¹, K. R. Roman² and A. R. Camello^{3*}

¹Affiliation of first author with institutional address

²Affiliation of second author with institutional address

³Affiliation of third author with institutional address

*Corresponding author: camello.a@aad.gov.au

Summary or Abstract

A summary or abstract, typically **100-150 words** should summarize what the article is about and the salient findings.

Main body of the manuscript

The articles must be written in plain English with the broad objective of conveying technical information that can be understood by non-specialists and members of the public. Technical jargon should be avoided. Figures and tables may be cited in the main body of the manuscript but must not be embedded. Similarly, in-text citation of references must be adopted. In-text citations should follow the author-year format. For e.g., (Roberts and Emilio, 2003).

Conclusions / Recommendations

No more than 50 – 100 words with closing opinion with recommendations for further work.

References

Citations need not be extensive and may be restricted to pertinent reviews or those applicable to the subject matter. Only literature cited in the main body of the manuscript should appear in the reference list. The citations should be listed **alphabetically and chronologically**. The format adopted by the newsletter is as below:

Journal article

Thomas, P.A. and Oscar, M.A. 2005. Culture of *Nannochloropsis gaditana* in bubble column reactor. Journal of Applied Phycology 134: 31-38.

Book

Whatman, C.F. 2008. Pond water quality. CRC Press, Boca Raton, FL, USA. 455p.

Book chapter

Michaelis, M. 2008. Bacterioplankton in aquaculture ponds. 48 -52pp In: Pond water quality, Whatman, C.F. (Ed.). CRC Press, Boca Raton, FL, USA.

Report

Roman, H.G. and Pete, G.S. 2012. Seaweed cultivation in ponds. Report no. RD12/0208-1. Environmental Protection Authority, Canberra, ACT, Australia. 80p.

Tables

Small, concise tables that complement the data in the text are encouraged. Tables may be created using the word table tool. Tables must **be submitted separate to the main manuscript** and must contain the title.

Photos / Figures / Images / Line art

Photos or image files should be of high resolution (typically >300dpi), in colour or Black and white (B&W) and should be supplied in **.jpg** or **.tiff** or **.png** format. Up to 15 figures or images can be included with each article. Image or photo files should be labelled with the surname (family name) of the corresponding author followed by the Figure number for e.g., **McTierFigure1.jpg**

Figures or photographs used in the manuscript should have in-text citation. Please do not embed photos or images into the main body of the manuscript. Figure legends or captions should be in word format with the description of each of the figure used. The photographs or figures used must be original and must have been taken by one of the co-authors. If not, the owner, the source of the photograph or figure must be acknowledged.

Copyrights and ownership

All materials submitted must belong to the authors. If not, contribution from other parties must be clearly acknowledged in the article. The corresponding author takes all responsibility pertaining to compliance with copyrights and permission to publish the material, when an article is submitted to the newsletter for publication.

Submitting an article

If the complete submission, that includes the manuscript, tables and figures, are <10Mb we encourage the corresponding author to attach the manuscript and the supporting files to an email message and email to the Editor at celine.rebours@moreforsking.no. If the files are too large to be communicated over email, please let the Editor know. We will then create a secure folder on OneDrive and share it with you for the files to be dropped and shared with the Editorial team.

ISAP Contacts and Officers

President: Pr. Qiang Hu

Faculty of Synthetic Biology,
Shenzhen Institute of Advanced Technology, Guangdong, CHINA 51806
E-mail: q.hu@siat.ac.cn
http://english.siat.cas.cn/SI2017/GIAT2017_21057/

Vice President (Outgoing President)

Editor-in-Chief, ISAP Newsletter: Dr. Céline Rebours

Møreforsking AS
Postboks 5075, Larsgården, 6021 Ålesund, NORWAY
E-mail: celine.rebours@moreforskning.no
<http://www.moreforsk.no/>

Vice President (President-elect): Dr. Stefan Kraan

The Seaweed Company
TSC R&D Unit, Carnmore West, Oranmore H91AT0X, Co Galway, IRELAND
E-mail: stefan.kraan@theseaweedcompany.com
www.theseaweedcompany.com

Assistant President: Dr. Sze-Wan Poong

Universiti Malaya
C308, Institute for Advanced Studies Building, 50603 Kuala Lumpur, MALAYSIA.
E-mail: applied.phycologysoc@gmail.com
<https://ioes.um.edu.my/>

Communications Coordinator and Social media Administrator: Priya Pollard

Bantry Marine Research Station
Gearhies, Bantry, Co. Cork, IRELAND
E-mail: ppollard@bmrs.ie
<https://www.bmrs.ie/>