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Message from the President, Prof. Hu Qiang

Dear ISAP Subscribers,

It is my great pleasure to address all of you through the first issue of ISAP newsletter for 2022, after assuming office as the President of ISAP for the term of 2021 to 2024. I am delighted to work closely together with the Vice Presidents Céline Rebours (Past President), Stefan Kraan (President-elect), Sze-Wan Poong (Assistant President) and our new elected Executive Committee. This new team comprised esteemed and experienced applied phycologists as well as passionate early career researchers who will undoubtedly contribute fresh new ideas to attract more of their peers to join our cause and bring ISAP to greater heights. You can find more about the team on our webpage.

I would like to thank our outgoing President, Céline Rebours, for her leadership and hard work during the past few years toward the development of our society. I would also like to thank Valéria Montalescot who served as the Secretary/Treasurer and the 2017-2021 Executive Committee for their valuable contribution to ISAP activities. Special thanks to Sasi Nayar for leading efforts within the previous ISAP Newsletter Working Group of the Executive Committee which led to the issues published in 2017 to 2021. I am grateful to Céline Rebours for her willingness to take over from Sasi Nayar as the Editor-in-chief of the Newsletter, and I look forward to ever more exciting newsletters from the Newsletter Working Group under Céline's leadership.

Besides our webpage and newsletters, 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. The links to these pages are given at the end of the newsletter.

During the first half of 2022, the EC members in eight working groups have been actively brainstorming to develop a triennial plan with the aim of not only sustaining the society but to also grow its activities and the number of subscribers. One of the objectives of ISAP is to support the organization of training courses in algal biotechnology for its members. Alejandro Buschmann as Training Course Coordinator and his working group are currently evaluating the proposals and more information will be announced at our webpage real soon. Other activities in the pipeline targeting a wide range of stakeholders (including but not limited to industrial partners, NGOs, seaweed farmers, young scientists, academia, entrepreneurs, and general public):

• webinars on current hot topics (synthetic biology-driven smart bio-manufacturing of algae, natural pigments; carbon capture and utilization; wastewater treatment and resource recovery, feed and fertilizers), workshop on macro- and microalgae identification [Coordinated by the Workshop/Symposia Working group led by Dong Wei]

• online or regional roundtable meetings between young scientists and experts in applied phycology, pre-congress events for young scientists [Coordinated by the Young Career Actions Working group led by Dorinde Kleinegris]

• developing further use of the webpage directory to allow subscribers to exchange information with each other on issues related to applied phycology [Coordinated by the Dissemination Working group led by Priya Pollard]

• setting up an Industrial Advisory Board and tiered sponsorship packages, silent auctions [Coordinated by the Sponsorship Working group led by Stefan Kraan]

• subscribership survey to find out the needs and interests of our subscribers [Coordinated by the Subscribership Working group led by Eugenia Olguín Palacios]

One of the first activities achieved by the new EC was to evaluate the proposal for the 9th ISAP Congress and as announced earlier, our next congress in 2024 will be held in Porto, Portugal from June 18th to June 22nd, 2024. Professor Vitor Vasconcelos from CIIMAR at the University of Porto will be serving

as the chair of local organizing committee. In the past year, ISAP signed another Memorandum of Understanding with the Culture Collection of Algae and Protozoa (CCAP) to promote interactions between these entities and the dissemination of information on topics of common interest, and some other MoUs are currently being negotiated and once these are signed, we will share the good news in due course.

ISAP subscribers enjoy several privileges which include free electronic access to the Journal of Applied of Phycology and Marine Biotechnology through the webpage of the society. If you are not yet a subscriber, please do not hesitate to sign up and take advantage of this offer. After the last General Assembly in 2021, ISAP has come up with an additional category of much reduced subscription fees to attract subscribers from DAC-list countries, so do check this out at our webpage!

I sincerely appreciate it if all subscribers can ensure that they are up to date with subscribership payments given that your support goes a long way in enabling the on-going and future activities of the society. Subscriber fees support the maintenance of the website, funding workshops and training programs in algal biotechnology as well as sponsoring student travel grants. Sponsorships and donations are most welcomed 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 consult our webpage or contact our new ISAP Treasurer Jonalyn Mateo.

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 or the ISAP Assistant President whose contact details can be found at the end of the newsletter.

Don't forget to stay tune to our social media accounts and webpage for the latest updates on the training course, webinars, 8th ISAP Congress to be held in Porto in 2024 and other exciting activities to be announced in due course!

Best regards,

Qiang Hu, Ph.D.

President, International Society for Applied Phycology

Message from the Editor, Céline Rebours

Dear Colleagues,

We are happy to present the first issue of the ISAP Newsletter in 2022! In this issue, we have three main articles and other news, views and announcements including the announcement for the 8th ISAP Congress to be held in Portugal in 2024!

For the preparation of this edition, I would like to warmly thank all the authors for the preparation and submission of very interesting articles and news information. 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 2022 ISAP Newsletter.

The first article by Sánchez-Zurano et al., highlights the importance to have a better understanding of the microalgae-bacteria interactions to control and optimize wastewater treatment in large scale reactors using microalgae. The second article by Pollard et al., describes the challenges met by the seaweed industry in Northern Europe to conserve the fresh harvested biomass and introduced the advantages of ensiling seaweed for downstream biochemical extraction. These are followed by the third short article by Gong and Xu, who present the *Nannochloropsis* Design & Synthesis Initiative (NanDeSyn) Database, which has been designed to advance development in synthetic biology and molecular breeding of the industrial oil-producing microalgae *Nannochloropsis spp*.

We hope you find this issue of the newsletter informative!

As always, please do not hesitate to contact one of us from the editorial team, if you have any ideas of contributing an article in the next issue of the newsletter. **The deadline for submission is September 30th, 2022**. You will find the guidelines at the end of the newsletter.

Happy reading!

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

EU projects devoted to the elucidation of microalgae-bacteria interactions in large-scale systems

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Abstract

Microalgae are mainly used in human-related applications such as the production of cosmetics, nutraceuticals and foods. However, they have a large potential to contribute to other relevant applications such as the production of biopesticides, biostimulants or aquafeed. To further develop these applications the production of low cost and sustainable microalgae biomass is required. To facilitate this, the utilization of open reactors, the reuse of effluents and optimization of production/harvesting and downstream processing technologies are required. In this sense, biological concerns such as microbial interactions or emerging predators, along with engineering aspects are also critical and have to be improved not just in terms of capacity and efficiency but also in terms of robustness. Accordingly, the PRODIGIO AND DIGITALGAESATION projects are designed to enhance microalgal biotechnology and develop new approaches for large-scale applications.

Introduction

Microalgae and cyanobacteria are photosynthetic microorganisms capable of producing valuable biomass using sunlight as an energy source, atmospheric CO2 as a carbon source, and micro and macronutrients (i.e. nitrogen and phosphorus) (Gomaa et al., 2016). This microalgal biomass could be used as an eco-friendly alternative in emerging industrial sectors such as aquaculture and animal feed, human nutrition, cosmetics, biofertilizers and biofuels (Chisti, 2008). Within this framework, the simple nutritional requirements of these photo-autotrophic organisms allow production of microalgae using wastewater as a culture media. Wastewater contains a high content of carbon, nitrogen and phosphorus which are essential for the production of microalgae (Mantovani et al., 2020). Therefore, coupling the production of microalgae with the use of wastewater allows producing valuable biomass at a low cost while the wastewater is simultaneously treated. In this bioremediation process, diverse groups of microorganisms along with microalgae are responsible for wastewater treatment. The main bacterial contributors are heterotrophic bacteria, and autotrophic nitrifying bacteria, i.e., ammonia-oxidizing bacteria, and nitrite-oxidizing bacteria, when established in this way the microalgae-bacteria consortia are highly beneficial in the microalgal based wastewater treatment process (Rossi et al., 2018; Sánchez-Zurano et al., 2020).

However, the large-scale application of microalgae-based remediation is still limited by the specific requirements for biomass growth. For microalgal production, adequate culture conditions are required in terms of environmental variables such as light, pH, temperature, and dissolved oxygen, and related to the reactor design, operating conditions, and the optimal supply of nutrients (carbon, nitrogen, phosphorus, etc.) (Posten, 2009). The availability of nutrients in microalgae-based wastewater systems are either in low amounts and limiting in one particular nutrient, or have large excess amounts of nutrients, introducing other limitations or inhibition factors for both the microalgal and bacterial growth (Aparicio et al., 2022). Considering these variables, adequate systems have been developed and used, such as open raceway reactors since they offer simple maintenance, higher operating volumes and lower energy consumption (Rayen et al., 2019). Moreover, they demonstrated high levels of nutrients removal/recovery and high biomass productivity at pilot-scale (Morillas-España et al., 2021). Despite the increasing use of this technology with all its advantages, its large scale implementation is limited and continues to face major challenges both from a biological and engineering point of view.

Therefore, the University of Almeria is involved in developing new technologies and approaches that allow understanding of biological phenomena taking place in microalgae related processes, especially the contaminations or predators that appear in microalgal cultures, which strongly reduces the performance

of these systems. Moreover, modelling the microbial interactions that appear in microalgae-based wastewater treatment is mandatory for the improvement and stability of the microalgae-bacteria-based process performances. In this sense, The University of Almeria will provide samples from real production systems already in operation in the facilities located in Almeria (Spain) and will share knowledge about data already being obtained from these reactors in two additional EU projects named PRODIGIO and DIGITALGAESATION (Figure 1).

Figure 1. Raceway reactors located in IFAPA and University of Almería facilities.

On the one side, ecological systems, such as microalgal production systems, often experience critical state transitions such that the systems shift from one stable state to another at a critical threshold or tipping point. Because critical state transitions alter the efficiency of microbial communities for the provision of services, anticipating the failure of the system is crucial for the timely implementation of prevention countermeasures that guarantee microalgal production stability and technology profitability in the long term. The PRODIGIO project, led by the Spanish National Research Council (CSIC) in partnership with the IMDEA-Energia Institute, ID Consortium, and the University of Almería from Spain, AR ARMINES / Mines Paris Tech from France, the Alfred Wegener Institute from Germany, the Norwegian University of Life Sciences, and the University of Taiwan, is focused on developing an innovative system failure prediction technology that increases the performance of large-scale microalgae culture systems.

For this purpose, for three years different microalgal production systems located at the University of Almería, ranging in size from bench-scale bioreactors to large scale raceways, will be monitored daily, taking samples for the analysis of environmental, chemical and microbiological variables. The resulting dataset will be analyzed using advanced methods in computational ecology which will allow researchers to discover the biochemical and genetic bases of the mechanisms underlying the collapse of microalgae cultures. The PRODIGIO project is expected to help develop the microalgal biotechnology/industry sector, whose role is crucial in the current framework of developing more sustainable processes that contribute to the improvement of the worldwide bioeconomy.

On the other side, to make microalgae biotechnology more sustainable, feasible and economically viable, it is necessary to develop successful technologies for biomass production. For a feasible microalgal culture, some environmental (temperature and irradiance) and operational variables (dilution rate, culture depth, mixing) should be considered and optimized. To accomplish this purpose, an adequate digitalization approach, which allows the optimization of control and operation of microalgae cultivation processes to maximize their light conversion efficiency is crucial. The DIGITALGAESATION project has received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant to develop a network of individual projects between different European research groups, in which early-stage researchers will undertake research to develop strategies for the control and optimization of microalgae systems from different approaches. Part of this project will be performed in microalgal production systems located at the University of Almería, with the objective

developing of a model-based approach for control and optimization of wastewater treatment in large scale reactors using microalgae, this research will contribute to the further reduction of production costs and further advance this innovative technology.

Conclusions

Large-scale microalgal production systems are influenced by multiple environmental and operational variables that determine the stability and success of the remediation process and biomass productivity. These operational variables are crucial from a biological point of view and advances from determining the interactions between microorganisms that appear in cultures is highly beneficial. The optimization of the operational variables is also essential for making automatic and control decisions that allow the optimization and improvement of biomass production. Therefore, the PRODIGIO and DIGITALGAESATION projects will allow the development of powerful tools to make the application of microalgal biotechnology a reality on an industrial scale and improve the sustainability, performance and prospects of microalgae-based processes.

Acknowledgments

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The advantages of ensiling seaweed for downstream biochemical extraction in a biorefinery.

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Abstract
Seaweed is gaining attention as a valuable resource as it does not require arable land and as such does not compete with food production. There is a lot of diversity between seaweed species as such their physical and chemical compositions are also diverse. Extensive research is being conducted on how valuable compounds present within seaweed can be both extracted and used. However, within the seaweed production process, both the costs and greenhouse gas emissions (GHG) associated with current preservation techniques, that are being applied (drying), are the biggest bottleneck when looking at methods to extract these diverse chemical compounds. One such technique that has the potential to significantly address these issues is ensiling. By ensiling as opposed to drying seaweed, 1. the GHG emissions attributed to seaweed production can be significantly reduced and 2. the nutritional and as such, monetary value of the seaweed silage produced, can also be maintained. Seaweed silage can be made on a large scale and produces solid and liquid fractions. These fractions contain valuable compounds including bioactives which have the potential to be extracted by novel techniques such as green biorefining.

Introduction

Seaweed, like other biomasses, can be highly seasonal. Once harvested macroalgae has a limited time at peak quality since the biomass rapidly begins to degrade. Traditionally macroalgae has been preserved by drying in the sun or with the aid of large ovens to prolong its availability. While both processes are effective at preserving the biomass, they have advantages and disadvantages. Sun drying uses minimal amounts of fossil fuel inputs and can be done with little to no emission of GHG. However, this technique is difficult to implement in damp cold climates (Example: Ireland and other parts of Northern Europe). As such, this technique cannot be done on demand and is not a reliable preservation technique in these regions. When sun drying, the sun also denatures bioactives compounds, reducing the amount present in the biomass. Additionally, the bioactive left in the sundried seaweed operates with a lower efficacy that those that we not dried in the sun. Oven drying eliminates sun denaturation of bio-compounds and can be done on demand, however, it results in the majority of GHG emissions attributed to seaweed production. Sustainable Development Goal (SDG) 13, Climate action "to take urgent action to combat climate change and its impacts" is linked to the Paris agreement of reaching net-zero carbon dioxide CO_2 emissions globally by 2050. To do this, intensive processes with high GHG emissions can and should be minimalized. Drying for preservation with the aid of fossil fuels is once such process and replaced by more sustainable techniques, like ensiling.

Ensiling is an old technique that has been used to preserve fodder over centuries. This is necessary in colder climates where biomass, like grass, are highly seasonal. The process of making silage is one that utilizes a succulent biomass. This biomass is placed under anaerobic, low light conditions and is partially fermented (MacDonald and Reitmeier 2017). During this partial fermentation, Lactic Acid Bacteria (LAB) consume simple plant sugars to produce lactic acid. This acid reduces the pH within the silage silos or bale and inhibits the action of unwanted bacteria. Once the critical pH is achieved, the silage is deemed stable and there is minimal microbial activity taking place within the silo/bale. The stable silage

and can be stored for long periods of time with minimal loss of valuable compounds. An additional advantage of producing a stable silage feedstock from a single harvest, is that a continuous all year-round supply of biomass to proposed bio-extraction processes, can be guaranteed. An all year round as opposed to seasonal feedstock supply chain means that the scale and as such cost, of proposed bio-extraction processes can be minimized.

The compounds that can be extracted from seaweed silage are dependent on the macroalgae being preserved since there is a great diversity in terms of their morphology, anatomy, life span, distribution, and chemical composition. By extension, these useful chemical compounds present in fresh seaweed biomass, can also be present in the preserved seaweed silage. However, some additional high to low value compounds can also be produced during the preservation process. The lactic acid produced by LAB during ensiling can be biorefined from the solid (silage) and liquid (leachate) if present in high enough concentrations.

Other useful products within seaweed and the seaweed silage product that should be investigated further with regards their applicability to biochemical extraction processes, are listed below. It should be noted that there is variation among the different algal groups in terms of the amounts in which compounds are found if they are present.

Mannitol

Mannitol is a sugar alcohol ($C_6H_{14}O_6$) with a lower calorific value than most sugars. It is an effective sweetener in various food products, namely in diabetic diets. The common commercial production of mannitol is currently done under high pressure at high temperatures and utilizes food crops high in glucose and fructose. Mannitol also has pharmaceutical applications like decreasing cellular edema and increasing urinary output.

Proteins, peptides and amino acids

These are found in highest concentrations within Rhodophyta (red seaweeds) followed by Chlorophyta (green algae) and Phaeophyta (brown seaweeds). The composition of algal amino acid comprises of dominant forms of aspartic and glutamic acids (Umami flavor). While other amino acids, such as lysine and leucine are also present in substantial concentrations. This high percentage of protein and amino acids in the biomass makes it an interesting possibility for biorefining.

Minerals

Potassium, Calcium, Iron and Magnesium are present at much higher levels than many, if not most, land vegetables. Seaweed is also a good source of rarer trace elements such as Manganese or Cobalt. All of the essential minerals and trace elements needed for human nutrition are present in seaweeds (Holdt and Kraan 2011).

Carbohydrates

Macroalgae have both storage (laminarin, fucoidan, mannitol, porphyrans, floridian starch and ulvan) and structural polysaccharides (agar, carrageenan and alginate). Structural polysaccharides comprise 40–50% of the macroalgae dry weight. Additionally, carbohydrates within seaweed have been linked to an improved gut health and presents other benefits for health and well-being (Torres et al. 2019).

Lipids and fatty acids

In comparison to land vegetables, macroalgae generally have a low lipids and fatty acid content, 2–4% of the dry weight (Sánchez et al. 2018). Omega 3 and omega 6 acids, polyunsaturated fatty acids, are present in relatively higher levels and are important in aiding the prevention of cardiovascular diseases (Sokoła-Wysoczańska et al. 2018). Macroalgae also contains sterols, terpenoids and tocopherols, phospholipids and glycolipids.

Vitamins

Macroalgae contains both water-and fat-soluble vitamins. Vitamin A, most B vitamins and particularly B12, C, and E are commonly present. However, some species also carry vitamin H and K. Phaeophyta, in particular, *Ascophyllum* sp. and *Fucus* sp., contain higher levels of vitamin E than Chlorophyta and Rhodophyta. Phaeophyta contain a, b, and c tocopherol while Chlorophyta and Rhodophyta contain only

a-tocopherol. Vitamin B12, which is generally obtained from animal sources is also present in many seaweeds including *Porphyra, Ulva, Ascophyllum, Laminaria* and *Palmaria*.

Pigments

Three basic classes of pigments are available in seaweeds, chlorophylls, carotenoids and phycobiliproteins. One of particular pigment of interest in recent times being Fucoxanthin - xanthophyll ($C_{42}H_{58}O_6$), which has fat burning effects, since it increases the expression of thermogenin and its ability to correct abnormalities in glucose metabolism (Sun et al. 2018). On average fucoxanthin prices are €860.00 per 100 mg of pure product.

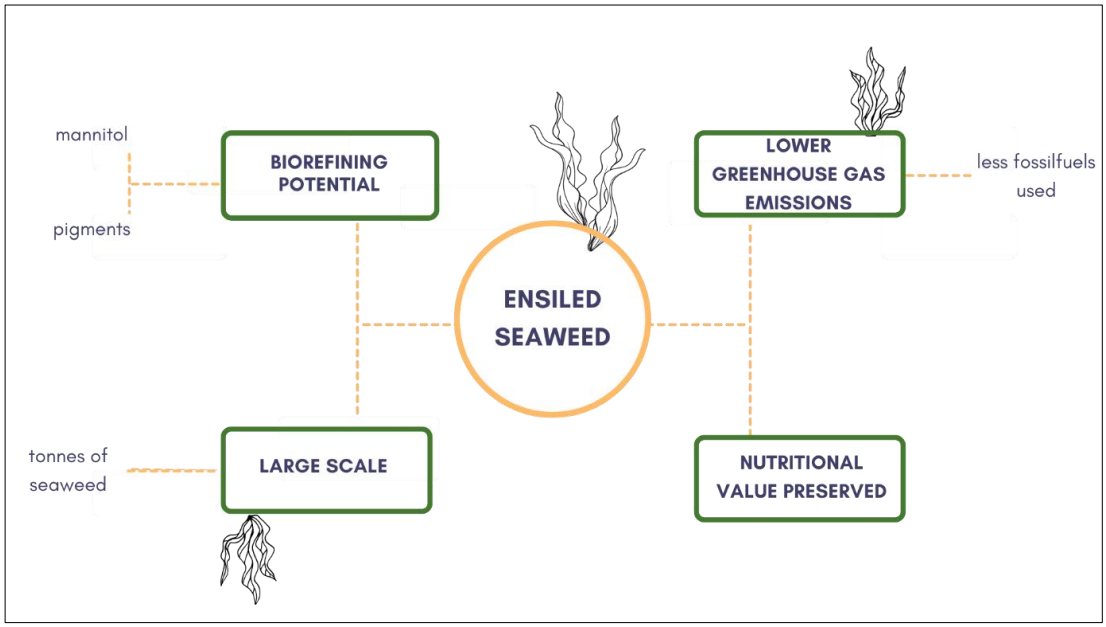

Figure 1: The advantages of ensiling seaweed

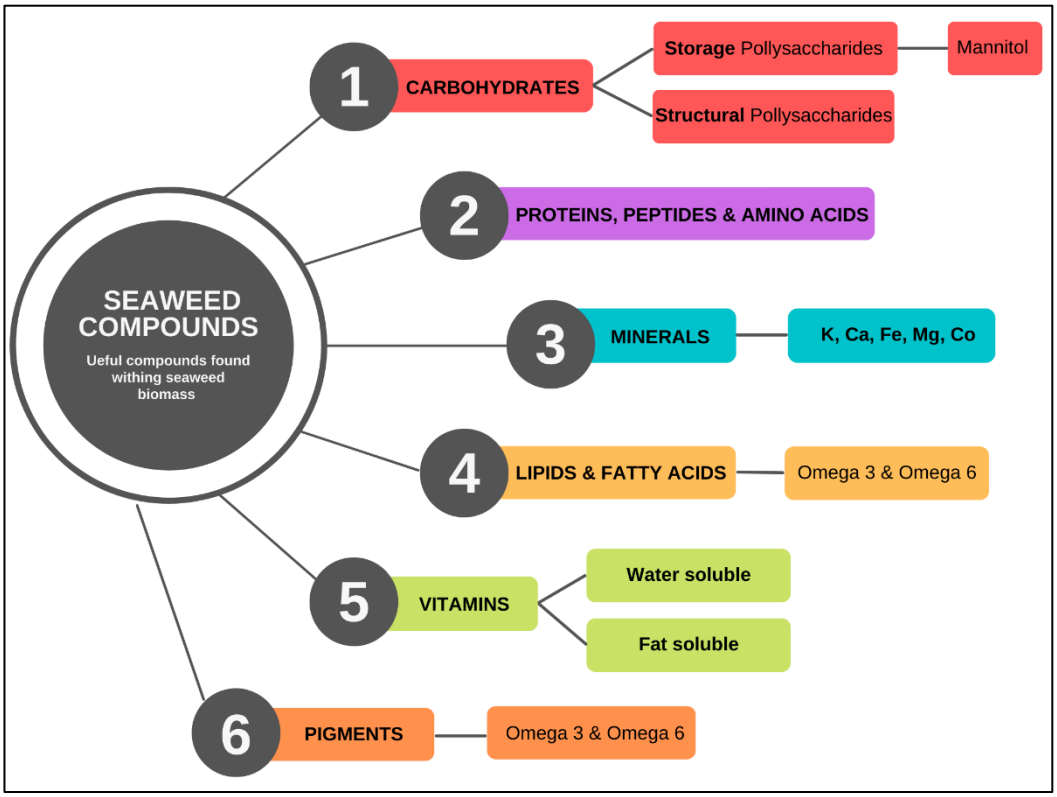

Figure 2: Categories of useful compounds found within seaweed.

Conclusions / Recommendations

Making silage from seaweed is a viable method for biomass preservation and as can also be viewed as a pre-treatment for downstream bioprocesses. More research is necessary into adapt current refinery systems to accept a new type of seaweed input substrate so that compounds can be effectively biorefined and processes to produce novel and bio-substitutes for traditional products.

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NanDeSyn Database Supports International Cooperation on Industrial Oleaginous Microalgae

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Abstract

In order to advance development in synthetic biology and molecular breeding of the industrial oil-producing microalgae *Nannochloropsis spp*, an international team led by the Single-Cell Center (SCC) at Qingdao Institute of Bioenergy and Bioprocess Technology (QIBEBT) of the Chinese Academy of Sciences (CAS) has developed and continued to expand the *Nannochloropsis* Design & Synthesis Initiative (NanDeSyn) Database (http://www.nandesyn.org).

Introduction

Industrial oil-producing microalgae can use light energy to convert carbon dioxide and water into oils on a large scale, making them a potential solution for the sustainable supply of food, feed and fuel. *Nannochloropsis spp.* has been identified as one of the promising species and is currently being studied for this potential. This microalga has been successfully cultivated on a large-scale for industrial oil production. These organisms have a relatively compact haploid nuclear genome of ~30M base pairs. A simple and reliable DNA transformation system and highly efficient genome editing techniques and flexible expression systems have been developed, making them a useful model organism and for production of biomass feedstock for various applications.

The international *Nannochloropsis* research community has generated extensive functional genomics data, as well as developed genetic resources such as plasmids and mutant strains. To disseminate new research findings, share resources, and promote research collaboration (Gong et al., 2020), NanDeSyn has been established to systematically collect and integrate functional genomic and epigenetic data, including the latest genome sequences, gene annotations, transcriptomes, proteomes, and small RNAs of all *Nannochloropsis* species. Notably, single-cell-resolution omics from the single-cell analysis instruments developed at Single-Cell Center (e.g., FlowRACS and RACS-Seq), including ramanomes, single-cell genomes and single-cell transcriptomes, are being incorporated into the database and then integrated with the population-level omics data of *Nannochloropsis spp.*.

The NanDeSyn website also provides online data mining tools such as gene search, genome comparison, collinearity analysis, gene enrichment analysis, metabolic pathway analysis, and genome browser, for each of the species or strains in a standardized manner. Moreover, each gene and its orthologs are annotated with literature references, current research status, and a listing of corresponding vectors and mutant strains to promote the free sharing of these research materials. For each gene, NanDeSyn provides an integrated view of the genome conservation, transcript abundance and protein expression level simultaneously across multiple *Nannochloropsis* species or strains. This feature can be very useful to functional analysis of the genes of interest.

NanDeSyn (Figure 1) is an open international collaborative research network with a goal of jointly developing *Nannochloropsis* into a chassis for photosynthetic production of oils from carbon dioxide. In addition to QIBEBT, the network also includes research institutions active in this field such as Korea Advanced Institute of Science and Technology (KAIST, Korea), Ulsan National Institute of Science and Technology (UNIST, Korea), Korea Research Institute of Bioscience and Biotechnology (KRIBB, Korea), Chungnam National University (CNU, Korea), MSU-DOE Plant Research Laboratory, Michigan State University (PRL, USA), French Alternative Energies and Atomic Energy Commission (CEA, France), Ruhr University Bochum (RUB, Germany), Qingdao National Laboratory for Marine Science

and Technology (QNLM, China), Ocean University of China (OUC, China), University of Maryland (UMD, USA), Institute of Hydrobiology, CAS (IHB, China), University of Illinois (UI, USA), Hainan University (HNU, China), Peking University (PKU, China), Boyce Thompson Institute of Cornell University (BTI, USA); and commercial organizations such as Shenzhen Qianhai Xiaozao Technology Co., Ltd. (China), and Lyxia Corporation (USA)..

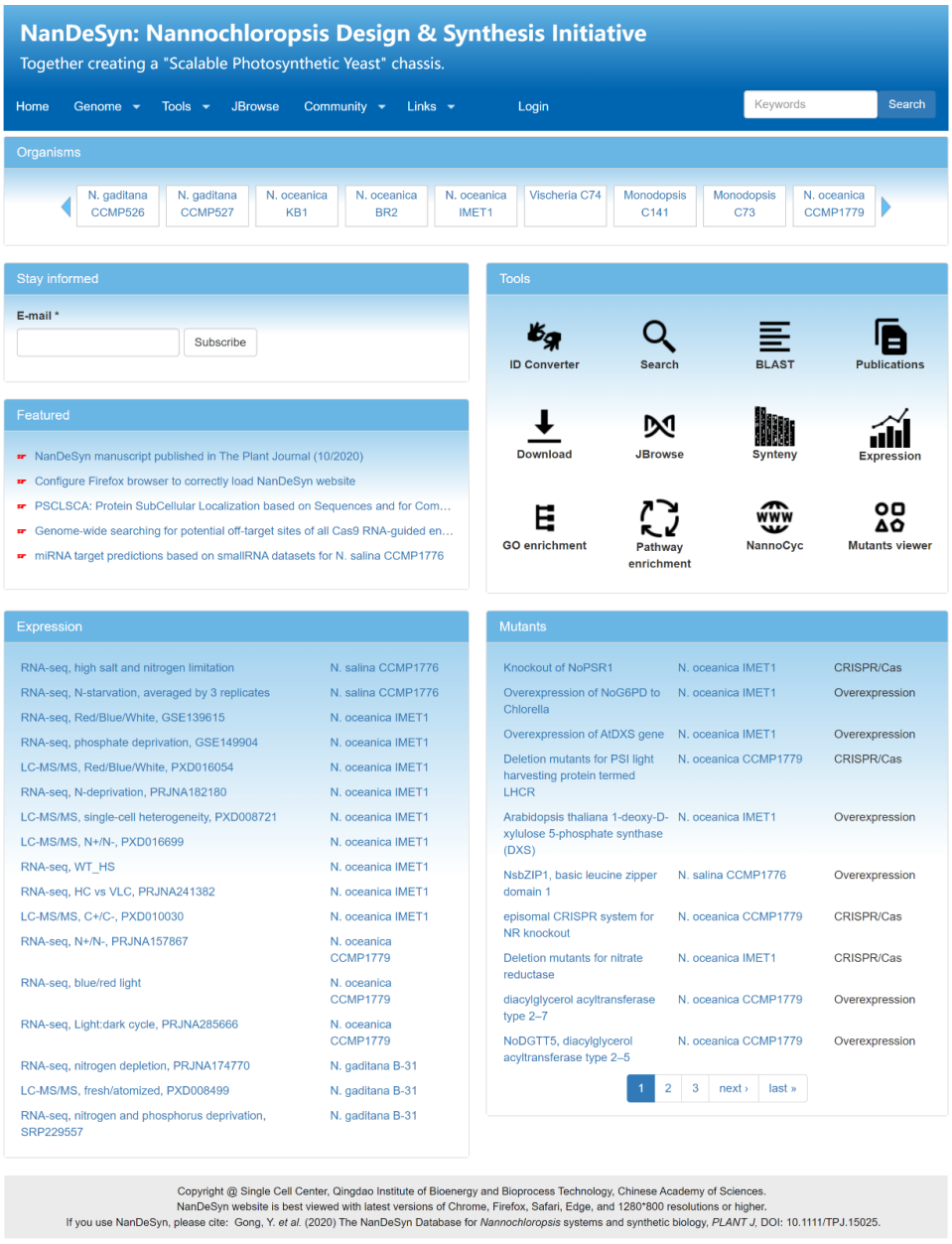

Figure 1. Screenshot of the NanDeSyn Database (http://www.nandesyn.org) that was developed and continues to be expanded by an international team led by the Single-Cell Center (SCC) at Qingdao Institute of Bioenergy and Bioprocess Technology (QIBEBT) of the Chinese Academy of Sciences (CAS).

Conclusions

Members of NanDeSyn are working collaboratively to enhance the fundamental understanding of *Nannochloropsis*, and to promote the translation of these basic discoveries into tangible applications.

References

Gong, Y., Kang, N.K., Kim, Y.U., Wang, Z., Wei, L., Xin, Y., Shen, C., Wang, Q., You, W., Lim, J.-M., et al. (2020). The NanDeSyn database for Nannochloropsis systems and synthetic biology. The Plant Journal 104, 1736-1745.

News and Views

To stay connected with ISAP on social media please and to help grow our algae networking community click the following links and subscribe.

Facebook https://www.facebook.com/AppliedPhycology1

LinkedIn https://www.linkedin.com/feed/

Twitter https://twitter.com/ISAP_Phycology

Instagram https://www.instagram.com/isap_phycology/

YouTube https://www.youtube.com/channel/UCIiLgwJs-hA4b0vf5BzASjQ

Conferences and events

Additional information will be posted on the ISAP webpage and all ISAP social media pages.

ISAP advertised a funding opportunity for a training course on algae biotechnology to be held in 2022. After evaluation of the application, the EC selected Prof. Dr. Ghazala Yasmeen Butt of the Institute of Botany, University of the Punjab, Qaid-i-Azam Camus, Lahore, Pakistan to receive funding for a one week training workshop on "Algal Ecology and Biotechnology". This training is proposed for the period 21-25th November, 2022.

Seagriculture, 7-8th September 2022, Portland (ME) USA.
The Seagriculture Conference USA 2022 gathers top speakers, who will share their know-how within seaweed for feed, food, offshore cultivation, biorefinery of seaweed and much more. The two-day program will go into the many different applications of seaweed that exist now and will combine plenary sessions with interactive poster presentations, trade shows and debate sessions, among others. The USA edition comes in addition to the European conference which takes place every year in another country in Europe. https://seagriculture-usa.com/

EABA: Fucoxanthin & Phaeodactylum Webinar, 20th September 2022.
A 60-minute webinar on Fucoxanthin and *Phaeodactylum* with multiple speakers and a debate to the end. More details will be posted on the event website: https://algaeworkshops.org/algae-workshops/fucoxanthin-and-phaeodactylum/

AQUACULTURE EUROPE, 27th – 30th September 2022, Rimini Italy.
AE2022 will discuss how aquaculture is facing its challenges, and the solutions put in place to develop a sustainable, responsible and productive and climate neutral European aquaculture sector for key marine and freshwater fish, shellfish and algal species are the main themes for AE2022 event in Rimini. The AE2022 parallel sessions will cover the full scope of European aquaculture and will comprise submitted oral and ePoster presentations. AE2022 will also feature an international trade exhibition, industry forum, student sessions and activities, satellite workshops and updates on EU research. https://www.aquaeas.org/

Algae Biomass Organisation, Algae Biomass Summit, 3rd to 28th October 2022.
The 2022 Algae Biomass Summit will once again be a virtual conference. ABO are continuing the virtual format to maximize global participation in this important event, and to leverage the online collaboration tools that have proven so successful for Summit attendees and sponsors. https://www.algaebiomasssummit.org/

EABA: Phycocyanin from algae webinar, 5th October 2022.
Phycocyanin is a bright blue protein produced by both cyanobacteria and some species of eukaryotic algae to increase photosynthetic efficiency. Its bright blue color has led to the use of Spirulina extracts as food colorants, its fluorescent properties have uses in medical imaging and, thanks to its strong antioxidant activity, there is much interest in uses in the field of human and animal health. This 60-minute webinar brings together producers and users to give a glimpse into how Phycocyanin production is evolving, how it is currently being used, and what future prospects we should be looking forward to. https://algaeworkshops.org/algae-workshops/phycocyanin-from-algae-2022/

EABA: Products unique to algae: new frontiers Webinar, 18th October 2022.
A 3.5 Hour webinar that will discuss products unique to algae. Click the event link more details. https://algaeworkshops.org/algae-workshops/products-unique-to-algae-new-frontiers/

Algae Europe, 13th – 15th ecember 2022, Roma, Italy
One of the key success factors of AlgaEurope is the close cooperation between EABA - European Algae Biomass Association and DLG Benelux. The main target of EABA is to act as a catalyst for fostering synergies among scientists, industrialists, and decision-makers in order to promote the development of research, technology, and industrial capacities in the field of Algae. DLG Benelux is part of DLG International: the leading German consulting company of the DLG group for the Agribusiness and Food Industry offering international expertise in setting up trade fairs and providing project management and consultancy services - national and international. Read more about EABA and DLG Benelux. AlgaEurope is a unique opportunity to learn and understand all about algae production and commercialization and interact with over 350 key players from more than 45 countries. Further information can be found at: https://algaeurope.org/callforabstracts/

European Algae Industry Summit, 19th – 20th April 2023.
Active Communications International (ACI) is pleased to announce the 11thAnnual European Algae Industry Summit will take place on 19th & 20th April 2023 in Lisbon, Portugal. The event will once again bring together key companies within the algae industry including leaders from cosmetics, food, feed, nutraceuticals, pharmaceuticals & textiles businesses as well as key algae producers across the globe allowing attendees to gain a deeper understanding of recent industry developments and, most importantly, economically viable applications. https://www.wplgroup.com/aci/event/european-algae-industry-summit/

The 24th International Seaweed Symposium (ISS2023) February 19th – 23rd 2023, Hobart, Tasmania (Australia)
The International Seaweed Association (ISA) is an international organization dedicated to the encouragement of research and development of seaweed and seaweed products. Their mission is to promote applied phycology on a global basis, and to stimulate interactions among researchers, industrialists and government representatives in all relevant institutions, organizations and industries and in all countries. The 2023 Symposium is being hosted by the University of Tasmania's Institute for Marine and Antarctic Studies on behalf of ISA.

Further information: https://www.iss2023.net/

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. Thomas[1], K. R. Roman[2] and A. R. Camello[3*]
[1]Affliation of first author with institutional address
[2]Affliation of second author with institutional address
[3]Affiliation 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 tile.

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.

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