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Editorial

Special Issue "Advances in Algal Biomass Applications"

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This Special Issue, entitled "Advances in Algal Biomass Applications," brings together a collection of papers covering various topics, such as the cultivation, harvesting, processing, and utilization of algal biomass, submitted by experts in these fields. Each of these papers highlights the latest developments in algal biomass research; as a collection, they showcase the potential of this sustainable source of food, fuel, and other high-value products.

Several submissions focus on optimizing the cultivation of algae to improve biomass production. Ratomski and Hawrot-Paw (2021) explore the effects of the type and timing of lighting, and the pH of the culture medium on the growth of *Chlorella vulgaris* biomass, with the optimal conditions being affected by the methods employed for biomass validation. They suggest that the most accurate method for biomass evaluation is gravimetric dry weight assessment > cell counting > chlorophyll content. The authors also highlight the importance of establishing the optimal parameters for the growth and development of microalgae biomasses before starting any large-scale production process [1]. Many microalgae species produce commercially attractive enzymes with a wide range of potential uses; for example, certain enzymes demonstrate antioxidant activities, including superoxide dismutase, catalase, and peroxidase activities. The submission by Roy and co-workers (2021) reviews the many challenges of growing algae at a commercial scale despite the potential of *Dunaliella* as a source of these high-value compounds. They review a range of abiotic stress strategies for enhanced antioxidant accumulation in the cells and explore how tuning the different cultivation parameters can activate different antioxidant systems [2]. The authors also touch upon the fact that downstream processing must be tailored to the specific application of the biomass/extracts. The submission by Hernández-Sandoval and co-workers (2022) examines how nitrogen source and concentration can affect protein and polyunsaturated fatty acid (PUFA) enrichment in the cells of the diatom *Thalassiosira weissflogii*, which is used as a live food for the reared larvae of marine organisms. However, the highest cell density, biomass, and peak protein yield were not significantly different among treatments, suggesting the need to compare the maintenance costs for a given production to achieve cultivation parameters that yield the best yield-to-cost ratio [3]. The submission by Letchindjio and co-workers (2021) presents a study on how the control algorithms used in engineering and control systems for process optimization can be used for lipid productivity optimization in continuous cultures of microalgae. Extremum seeking control (ESC) is a method for controlling a system by continuously seeking the optimal value of a certain parameter or set of parameters that affect(s) the system's performance. It works by measuring the system's output and then adjusting the parameters to either increase or decrease the output until the optimal value is reached; whereas adaptive slope seeks to adjust the slope of the input signal in response to changes in the output signal. ESC can be used to continuously seek out the optimal values of cultivation parameters, while adaptive slope seeking can be used to adjust the input signals in response to changes in the output signals, such as changes in biomass production [4]. The purpose of the study in question is to increase productivity, not to reduce the total cost of production. They conclude that input energy is also minimized with the help of this new approach to optimizing lipid productivity in continuous cultures of microalgae.

Microalgae have several applications with respect to renewable energy sources, one being CO_2 mitigation. The submission by Arora and co-workers (2021) assesses greenhouse

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Citation: Nielsen, B.V. Special Issue "Advances in Algal Biomass Applications". *Appl. Sci.* **2023**, *13*, 5698. https://doi.org/10.3390/app13095698

Received: 24 April 2023
Accepted: 28 April 2023
Published: 5 May 2023

gas emissions when using CO_2 from several different sources (namely, from an existing coal-based plant vs. building a new, natural gas-based plan) to achieve a sustainable algal biorefinery. The authors found that biomass is the lowest carbon CO_2 source; existing fossil fuel power plants are an intermediate source; and purpose-built natural gas-based power plants provide the highest fuel emissions; thus, sourcing CO_2 from a biomass-based plant makes the bio-crude production process carbon negative [5].

The use of algal biomass has the potential to address many environmental challenges and contribute to the development of a sustainable bioeconomy. However, several challenges still need to be addressed, such as improving the economic feasibility of algal biomass production and scaling up production to meet demand [6,7]. Nonetheless, the research presented in this Special Issue is a valuable resource for researchers, practitioners, policymakers, and stakeholders interested in promoting sustainable development. We thank the authors, reviewers, and editors who contributed to this Special Issue, and we look forward to further advances in algal biomass research. After the success of this first Special Issue, a second issue, entitled "Advances in Algal Biomass Applications II," is now accepting submissions.

Conflicts of Interest: The author declares no conflict of interest.

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