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Editorial: Algal biotechnology: Current trends and nanotechnology prospective

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Editorial on the Research Topic
Algal biotechnology: Current trends and nanotechnology prospective

Algae biotechnology is an ever-expanding field of research that aims to use the biological properties of algae to develop products and solutions for diverse sectors, from food and energy to medicines and cosmetics. Algae are considered highly versatile and sustainable organisms, as they are able to carry out photosynthesis and grow quickly in different environments, in addition to producing bioactive compounds with interesting properties.

In this context, nanotechnology has played an important role in algae biotechnology, allowing the development of new technologies and products with greater efficiency and precision. Nanotechnology involves the manipulation and control of materials at the nanometer scale, which allows the creation of new structures, devices, and systems with unique and promising properties.

Thus, the combination of algae biotechnology with nanotechnology has generated current and prospective trends that have the potential to revolutionize various sectors, such as biofuel production, the pharmaceutical industry, agriculture and food production. In addition, algae biotechnology can contribute to reducing the environmental impact of various human activities, providing sustainable and innovative solutions to current and future challenges.

In this Research Topic, four original research articles, one brief research repot article, and one review article were published, the latter entitled "*Remarkable Natural Biological Resource of Algae for Medical Applications*," (Dai et al.), in which the authors talk about the algal biomass and algal-derived bioactive compounds, including fatty acids, polysaccharides, carotenoids, phycobiliprotein, terpenes, and so on, have been widely concerned in the screening and application of natural pharmaceuticals. That review provides an in-depth review of the current understanding of algal-based medical application, with a focus on the main pharmaceutical activity and current application stage including *in vitro* animal, and clinical studies.

Of the original research articles, one was published with the title "*Construction and Validation of a Chloroplast Expression Vector for the Production of Recombinant Proteins in Chlorella vulgaris*" (Bolaños-Martínez et al.). This research aimed to establish a chloroplast transformation method for the freshwater green-algae species *C. vulgaris* based on a specific expression vector (pCMCC, which was named after Chula Mexico C*hlorella* chloroplast) constructed with endogenous recombination regions, namely, *16S–trn I* (left) and *trn A–23S* (right), and the *Prrn* promoter. Therefore, the designed expression vector, in combination with an optimized electroporation protocol, constitutes a viable approach to successfully develop transplastomic lines of *C. vulgaris* for the potential low-cost production of biopharmaceuticals using this algal species.

The authors of the article "*Applications of algae for environmental sustainability: Novel method of formulating bioplastic from marine green algae*" (El Semary et al.), present a study aimed at generating biodegradable bioplastic from all macroscopic marine green algae biomass from the Persian Gulf, Saudi Arabia, using a simplified method.

The article titled "*In vitro assessment of antimicrobial, anti-inflammatory, and schistolarvicidal activity of macroalgae-based gold nanoparticles*" (Kamal et al.). This study proposed a fast, convenient and efficient biosynthesis of gold NPs (Au-NPs) using the ethanol extracts of three macroalgae: *Cystoseira myrica, Cystoseira trinodis* (Phaeophyceae) and *Caulerpa prolifera* (Chlorophyta), and the produced Au-NPs were tested for their antibacterial, antifungal, anti-inflammatory, and schistolarvicidal activity, with promising results.

The article entitled "*Evaluation of Polycladia myrica mediated selenium nanoparticles (PoSeNPS) cytotoxicity against PC-3 cells and antiviral activity against HAV HM175 (Hepatitis A), HSV-2 (Herpes simplex II), and Adenovirus strain*" (Touliabah et al.), showed that nanoparticles synthesized from the brown seaweed *Polycladia myrica* exhibit antiviral activity (40.25 ± 2.61, 8.64 ± 0.82 and 17.39 ± 1.45%) against HAV-10, Adenovirus and HSV-2 respectively.

Finally, the brief research report article entitled "*Polystyrene nanoplastics alleviate the toxicity of CuO nanoparticles to the marine green microalgae Tetraselmis helgolandica* var. *tsingtaoensis (formerly Platymonas helgolandica* var. *tsingtaoensis)*" (Liu et al.). The results of this study clarify the understanding of the joint toxicity of engineered nanoparticles (ENPs) and nanoplastics (NPLs), on the marine microalgae *Tetraselmis helgolandica* var. *tsingtaoensis* (Chlorophyta).

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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