

Bio-Fertilizer and Pestcontrol

Microalgae biomass production can be used to obtain different kinds of extracts economically important in commerce. Generally, during the exponential growth phase, the maximum microalgal biomass yield is achieved. This biomass can be recovered from the broth by microfiltration or centrifugation. The microalgal active compounds are enclosed in the cell walls and/or linked to various structures.

Different microalgae-based products (MBS and MBF) are available commercially for use in agriculture as innovative and promising products to improve crop yields. The chemical characteristics of the MBS and MBF are one of the most critical aspects of their use. In fact, both the different microalgal species and the industrial process used for the production of MBS and MBF might affect their final compositions. Typically, MBS and MBF labels report information regarding their composition, including the mineral element concentrations, the amino acids and phytohormone contents.

Microalgae biomass showed to contain micro- and macronutrients, especially N, phosphorous (P), and K, and might be considered as an organic slow-release fertilizer. Moreover, microalgae can contain also important quantities of protein hydrolysates which are also included among the active ingredients of plant biostimulants, and their use in a foliar spray application might enhance the biological activity in crops growth and development. Microalgae contains also amino acids that are a well-known biostimulant with positive effects on plant growth and crop yield. Moreover, amino acids can contribute to mitigate the injuries caused by abiotic stresses. Finally, microalgae can contain polysaccharides (such as β -glucan) that are reported to be involved in the improvement of plant growth. These compounds seem to interact with leucine-rich repeat membrane receptors that can activate mechanisms leading to the regulation of several genes involved in the cell expansion.

Microalgae, especially cyanobacteria, can be considered as one of the main biological agents for the control of pathogenic fungi and soil-borne diseases in plants because they produce biologically active compounds that generally correspond to low-molecular-weight chemical structures with biocidal activity with antifungal, anti-biotic, toxic activities and against nematodes. These activities are attributed to phenolic compounds, polyphenols, tocopherols, carbohydrates, proteins, oils, saponins, allelochemicals, nitrogen-rich peptides and sesquiterpenes. These compounds act through different forms as structural and functional modifications, disruption of the cytoplasmic membrane, enzymes inactivation and inhibition of protein synthesis in the targeted microorganisms. The addition of microalgae in plant crops stimulates the immune system in relation to pathogens through different metabolic processes of plants, such as the activation of enzymes with defense function.