OVERVIEW OF BIOSTIMULANT CLASSIFICATION AND INDUSTRY PERSPECTIVE

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There are many, but what is the definition of biostimulant? How are these products categorized? We will start off with definitions of commonly used terms around biostimulant products used in agriculture. The current categories in which biostimulant products fit, or do not fit into, are continually evolving as industry and regulatory work towards fine-toning definitions. As more products become commercially available, producers need to be aware of their advantages, as well as challenges, to maximize their effectiveness.
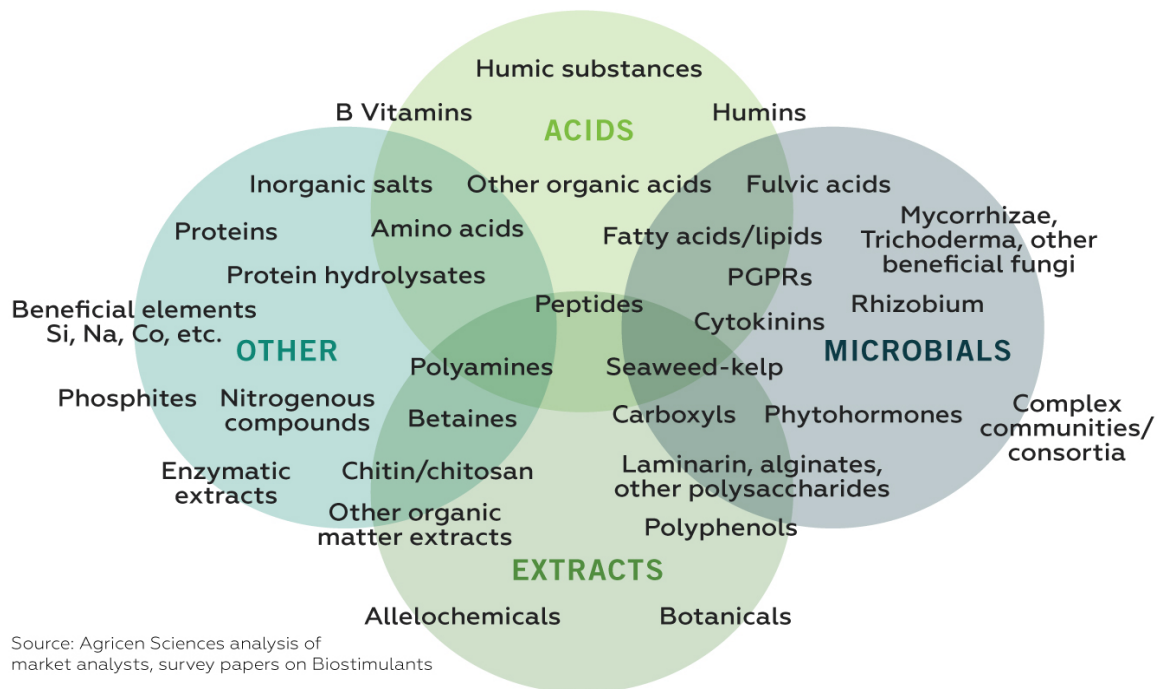
In 2018, the biostimulant market was valued at $2.19 billion and at that time, the projected growth rate into 2024 was expected to be 12.5% (Albrecht, 2019). However, in 2022 the market was valued at 2.6 billion, with an anticipated compound annual growth rate of 7.4% from 2023 to 2030. Market value increase is attributed to adoption of seaweed extracts, microbials, and acids.

What are biostimulants?

The overall classification of these products are biologicals. From there, biologicals can be broken into two major categories: biostimulants and biopesticides. Biopesticides are products that protect against or directly control fungal and bacterial pathogens, insects, or weeds. Biopesticides are heavily regulated by the Environmental Protection Agency (EPA). In general, biostimulants are substances that enhance plant growth, health, and productivity or provide direct/indirect benefits to a plant's development and are not regulated by EPA.

In 2018, the farm bill included some of the first definitions of biostimulants as "a substance or microorganism that, when applied to seeds, plants, or the rhizosphere, stimulates natural processes to enhance or benefit nutrient uptake, nutrient efficiency, tolerance to abiotic stress, or crop quality and yield." Since then, the definition has been modified to "plant biostimulant means a product stimulating plant nutrition processes independently of the product's nutrient content with the sole aim of improving one or more of the following characteristics of the plant: (a) nutrient use efficiency, (b) tolerance to abiotic stress; and (c) crop quality traits."

However, biostimulants can have any of the following affects on the plant; the water use efficiency, root structure and growth, nutrient use efficiency, reduce stress tolerance, induced systemic resistance, and disease tolerance. The most popular ingredients include humic substances (humic and fulvic acids), seaweed extracts, beneficial bacteria, and beneficial fungi. Other ingredients can include chitosans, protein hydrolysates, and inorganic compounds such as silicon. Of the different forms of biostimulants, acid-based materials account for the largest in the market, followed by seaweed (Albrecht, 2019).

Humic substances

B Vitamins   **ACIDS**   Humins

Inorganic salts   Other organic acids   Fulvic acids

Proteins   Amino acids   Fatty acids/lipids   Mycorrhizae, Trichoderma, other beneficial fungi

Protein hydrolysates   PGPRs

Beneficial elements Si, Na, Co, etc.   Peptides   Cytokinins   Rhizobium

OTHER

Polyamines   Seaweed-kelp   **MICROBIALS**

Phosphites   Nitrogenous compounds   Betaines   Carboxyls   Phytohormones   Complex communities/ consortia

Enzymatic extracts   Chitin/chitosan   Laminarin, alginates, other polysaccharides

Other organic matter extracts   Polyphenols

EXTRACTS

Allelochemicals   Botanicals

Source: Agricen Sciences analysis of market analysts, survey papers on Biostimulants

The possibilities of these types of products are endless. Many new products contain various combinations of different biostimulant substances. Producers should pay close attention to the active ingredients in products is needed to ensure the maximum effectiveness in production systems.