



# The Mechanisms and Benefits of Plant Biostimulants Derived from Mammalian Tissue By-Products

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## DESCRIPTION

As more people demanding more and better food and crops, finding eco-friendly and sustainable ways to make fertilizers from natural sources is a big aim in agriculture. Biostimulants are products that can affect how plants use their metabolism and enzymes to improve their growth and quality. They also help plants deal with harsh conditions, especially when they are young. The European Biostimulants Industry Council (EBIC) says that biostimulants are "substance(s) and/or micro-organisms that can make plants or the soil around them use natural processes to get more benefits from nutrients, use nutrients more efficiently, handle harsh conditions better, and have better crop quality". Plant bio-stimulants are substances or microorganisms that stimulate natural plant processes to enhance nutrient uptake, nutrient use efficiency, tolerance to abiotic stress, and crop quality. Plant bio-stimulants can be derived from various sources, such as seaweed, humic substances, amino acids, protein hydrolysates, and microbial inoculants. Among these sources, mammalian tissue by-products have attracted attention as potential bio-stimulants due to their availability, low cost, and rich content of bioactive compounds.

Mammalian tissue by-products are the residual materials from the slaughterhouse industry that are not used for human consumption. These include blood, bone, meat, skin, hair, horn, hoof, and other organs. These by-products can be processed into different forms, such as hydrolysates, extracts, meals, and powders. The processing methods can affect the composition and activity of the bio-stimulant products. The main bioactive compounds in mammalian tissue by-products are proteins and peptides, amino acids, nucleic acids and nucleotides, vitamins, minerals, hormones, growth factors, and enzymes. These compounds can act on plants through different mechanisms, such as:

- Modulating plant hormone levels and signaling pathways
- Enhancing plant metabolism and enzyme activity
- Improving plant nutrition and nutrient mobilization

- Inducing plant defense responses and antioxidant systems
- Stimulating plant growth and development
- Promoting beneficial soil microorganisms and rhizosphere interactions

## Benefits of plant bio-stimulants derived from mammalian tissue by-products

- Bio-stimulants assist in combating the effects of environmental stresses. Bio-stimulants help plants cope with harsh conditions by making them grow stronger roots and stems. This way, they can absorb and move water and nutrients better throughout their life cycle.
- Bio-stimulants boost grain fill and quality. Bio-stimulants make plants grow better and healthier by providing them with essential nutrients that activate their metabolism. They also trigger specific processes at certain stages of development that can lead to higher yield, more uniformity and better crop quality.
- Bio-stimulants stimulate plant growth and work differently from regular fertilizers and give plants the nutrients they need to grow faster. They turn on genes that affect how cells divide and grow, how roots and shoots develop, and how flowers and seeds form and mature.

However, there are also some challenges and limitations associated with the use of mammalian tissue by-products as plant bio-stimulants. The variability in composition and quality of the raw materials and products; the potential presence of pathogens, toxins, allergens, hormones, antibiotics, or heavy metals; The ethical and religious concerns of some consumers and buyers; The lack of clear regulation and standardization of bio-stimulant products; The need for more research on the mode of action, efficacy, compatibility, and safety of bio-stimulant products

In conclusion, plant bio-stimulants derived from mammalian tissue by-products are a promising source of natural compounds that can improve plant performance and crop productivity. However, more studies are needed to optimize the processing methods, characterize the bioactive compounds, elucidate the

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mechanisms of action, evaluate the benefits under different conditions, address the potential risks and challenges, and

develop effective application strategies for these biostimulant products.