



Fertilizers provide the essential and necessary nutrients to plants in the form of soluble salt compounds and have a direct effect on plant growth. Our increased dependence and potential overuse on fertilizer can have some determinantal effects on plants, crops, soil, groundwater and water ways such as ponds, lakes and streams.

Excess fertilizer increases the salt concentration in soils and can hurt beneficial soil microorganisms. Too much fertilizer can cause a spurt of sudden plant growth with a poor and insufficient plant root system to supply the necessary water and nutrients to the plant. The roots of the plant are its lifeline. They reach out into the soil to establish an avenue for the transportation of nutrients and water to the rest of the plant. A lack of an adequate root structure reduces the amount of flowers and foliage and overall health of the plant. This can lead to increased susceptibility to plant diseases and expiration.

Excess fertilizer can harm the environment and become pollutants that damage water quality. Nitrogen and phosphorus can leach in ground water and waterways and promote the growth of algae (algae blooms).

Biostimulants:

Biostimulants consist of a wide range of minerals, botanical or microbial materials that can stimulate the natural processes in plants. They help to improve resistance to biotic and abiotic stress factors and help improve the overall health of plants. Biotic stress factors are caused by other living organisms, including insects, bacteria, fungi, and weeds that affect plant development and productivity. Abiotic stress is climatic and physiographic components of the environment. The most common abiotic stress to plants and crops is salinity of the soil and water, drought and low soil fertility. Several types of biostimulants can help combat

these problems and help the plant become more viable. The application of biostimulants can enhance crop yield and quality by improving their tolerance to stress. Biostimulants can assist in making horticultural and agricultural crops more sustainable and more environmentally friendly.

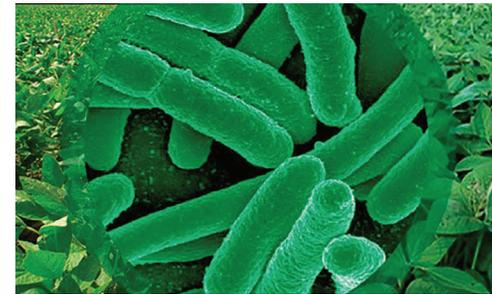
Biostimulants have been shown to increase many factors that affect plant growth including, root morphogenesis which is the process by which the structure of roots are generated and organized. The process associated with morphogenesis is root formation, root growth and root initiation.

Biostimulants can increase in microbial activity leading to increased nutrient availability and improving soil conditions for plant growth. Specifically, they improve nutrient-use efficiency.

There are many categories of biostimulants including but not limited to humic substances, acids, extracts, liquid manure composting, vitamins, beneficial elements and beneficial bacteria. Acid-based biostimulants include humic and fulvic acids. These are some of the most common organic substances on earth and make up much of the organic matter in soils. They are recognized and used to improve soil structure, enhance plant nutrition and improve the cation exchange capacity. Seaweed is a common extract used to improve soil structure, improve CEC and the improvement of nutrient uptake. They do not affect a fertilizer, but they increase the amount of fertilizer and speed up the process of availability to the plant.

JRM Biostimulants:

All JRM biostimulants are formulated to address specific enhancements to the plant and soil. The synergistic formula addresses the nutritional, biochemical and biological requirements from initiation through plant growth and establishment. Each ingredient in each formula was chosen based on its specific benefit to the plant as well as the synergies it affords to the system as a whole. Our biostimulants are for all plants, flowers, vegetables and trees.



Azospirillum lipoferum

The beneficial bacteria in the formulations contain only pure microbial cultures. They are sourced from the leading biological materials resources and standards organizations offering an extensive collection of bacterial manufactured under ISO certifications and accreditation. All microbial cultures are certified as Bio-Safety 1 which is the safest classification in the industry. The media utilized to grow each culture is completely metabolized by the microorganisms during each phase of the fermentation process. Once the cultures are done growing and are in the spore state, they are checked by microscopic evaluation indicating that all growth media is metabolized. There is no media found in the finished product.

All stages of fermentation use state of the art methodologies under highly controlled quality standards. The cultures are tested numerous times during the entire manufacturing process. Equipment and media is sterilized to ensure no contamination. Final blending is performed by precise ribbon blenders which are sterilized after each use.

Most soils contain an abundance of potassium and phosphorous but it is in its insoluble form and cannot be assimilated by the plant. Select beneficial bacteria in our formulations have the capacity to convert the two insoluble nutrients into plant available forms. The beneficial bacteria and fungi produce secondary metabolites (organic acids and enzymes) which are responsible for conversion to plant available forms. The increased availability of phosphorous promotes root initiation and root growth resulting in plant establishment and enhanced nutrient assimilation. The increased availability of potassium enhances an increase in root diameter and activates multiple enzymes which support root functionality.

All supplement ingredients in the formulas are sourced from certified organic suppliers. These ingredients

include secondary metabolite products such as organic acids and enzymes. Added to the formulations are diverse biological products such as mycorrhizae, rhizobia and other bacteria. Microbial synergists are incorporated in the formula which include carbon, nitrogen, phosphorous and vitamins. Included in all the formulated products are plant growth hormone producing Rhizo-Bacteria, also known as PGPRB.

E-Z Root™

E-Z Root™ is a microbial based product specifically formulated to help grow new plants from rooted and unrooted cuttings. The naturally occurring bacteria improves soil conditions for root and plant growth. The formula includes an eight (8) species mix of beneficial bacteria which include 4 species of Bacillus, 2 species of Pseudomonas and 2 species of Azospirillum. Each species contain 1.5×10^8 CFU's per gram each which is one of the highest in the industry.



The two strains of Azospirillum, amazonense and lipoferum are nitrogen-fixing bacteria known as (PGPRB) which colonize on the root surface or the intercellular species of the host plants. Nitrogen which is one of the most needed nutrients from fertilizer is often the one most lacking in soils. The Azospirillum species are able to supply nitrogen from the atmosphere (atmospheric di-nitrogen (N_2) and in plant available ammonia (NH_3)). These species and other PGPRB products also promote biosynthesis of plant growth hormones such as gibberellin, auxins and other hormones that promote plant and root growth.

Included in the formula are supplemental amino acids, phosphorous, potassium, boron, calcium, dextrose, brewer's yeast, kelp extracts, humic acids and an organic based fertilizer. Supplemental calcium and boron supports auxin (IAA) transportation to the roots. For a complete list of ingredients and application rates, please refer to the technical brochure, form 240.

E-Z Root™ can be applied as a dip, a drench in soils or as an additive in hydroponic systems.



Plant Thrive

Plant Thrive is a microbial based product formulated to improve soil conditions for plant growth and establishment. The formula contains an eighteen (18) species mix of highly active beneficial bacteria with four strains of beneficial fungi. There are four strains of Bacillus with 1.75×10^8 CFU's per gram each, two species of Pseudomonas with 1.5×10^8 CFU's per gram each, two strains of Azospirillum with 1.25×10^8 CFU's per gram each, six additional strains of Bacillus with 6.0×10^7 CFU's per gram each, one strain of Pseudomonas with three strains of Streptomyces with 1.5×10^7 CFU's per gram each. Three strains of Trichoderma at 1.5×10^7 CFU's per gram each and seven spores per gram of Rhizophagus intraradices.

There are primary mechanisms for disease suppression. Bacterial strains compete for the same space and in some cases the same food source as pathogens in the rhizosphere. When the rhizosphere is colonized by the beneficial organisms they can inhibit the proliferation of pathogenic fungi. Chitinase is

a secondary metabolite produced by a variety of strains in this formulation. This enzyme is responsible for hydrolyzing chitin, the primary constituent in the cell wall of the pathogenic fungi. When beneficial organisms come into contact with the cell wall they are stimulated and can produce this enzyme. The pathogen will no longer regulate metabolic functions or maintain homeostasis and expire. Select strains of Trichoderma directly feed on pathogens and utilize it as a food source.

The plant growth hormones are secondary metabolites produced by the beneficial soil bacteria. These PGPRB products produce plant growth hormones that stimulate flower and vegetative growth, root architecture, lateral root initiation, reduce plant stress.

Supplemental amino acids, dextrose, kelp, hydrolyzed soy, humic acids and brewer's yeast are included in the formula to enhance plant and root growth.

Seed Generator

Seed Generator is a microbial based product formulated to stimulate seed germination and enhance root initiation, root growth, root formation and root architecture. There are eight species of beneficial bacteria which include 4 species of Bacillus, 2 species of Pseudomonas and 2 species of Azospirillum. Each species contain 3.0×10^8 CFU's per gram each. Included are 2 species of Trichoderma with 5.0×10^7 CFU's per gram each.

The synergistic formula addresses the nutritional, biochemical and biological requirements of initial seed germination, root initiation, root germination and growth. An organic 1-4-6 fertilizer is incorporated with supplemental calcium, humic acid, potassium, kelp, phosphorous and brewer's yeast.

Seed Generator does not contain dextrose or any sugars. Applied sugars cause abscisic acid to accumulate in seeds. This delays germination and inhibits early seedling development. Abscisic acid (ABA) is a stress hormone. Secondly, sugar lowers the water potential of the growing media which reduces the likelihood that water will flow into the seed.

Seed Generator can be applied to seed either as a dusting or as a slurry. Some growers have found the slurry is more effective as it adheres to seed better.

Product	Applications	Benefits
E-Z Root™	Rooted/Unrooted cuttings, Hydroponics, dip for starting plants, drench in soils, greenhouse irrigation.	Stimulate root growth. Enhance root development. Increase resistance to environmental stress.
Plant Thrive	Soil amendment, foliar spray, drench with new and existing plants, and Hydroponics.	Improves soil conditions for plant growth and establishment. Improves root growth and development. Increase resistance to plant and environmental stress.
Seed Generator	Seed coating, soil amendment, drench in soils.	Stimulate seed germination, promotes root growth and development.

JRM biostimulants do not claim specific benefits with regards to biotic stress, disease suppression and plant pathogens; these claims require EPA registration.

