

aCELLerate™

aCELLerate is a microbial based product specifically formulated to stimulate seed germination and enhance root morphogenesis the process by which the anatomical structures of the roots are generated and functionally organized. The processes associated with root morphogenesis are root initiation, root formation, root growth and root architecture.

The synergistic formulary addresses the nutritional, biochemical and biological requirements of the root system from initiation through plant establishment. Each ingredient in formula was chosen based on the benefit it affords the plant as well as the synergies it affords the system as a whole!

Nutrient Solubilization & Nutrient Mineralization

- * Most soils contain an abundance of P and K the problem is its usually in an insoluble form and cannot be assimilated by the plant.
- * Select beneficial soil organisms have the capacity to convert insoluble phosphatic and potassium-based compounds into plant available forms.
- * Beneficial soil bacteria & soil fungi produce secondary metabolites (organic acids, enzymes) which are responsible for the conversion of insoluble phosphorus and potassium into plant available forms.
 - * In acidic soils P tends to bind with Aluminum (Al) and Iron (Fe) to form insoluble Aluminum Phosphate & Iron Phosphate.
 - * In alkaline soils P tends to bind with Calcium (Ca) & Magnesium (Mg) to form insoluble Calcium Phosphate & Magnesium Phosphate.
- * Inorganic minerals such as calcium phosphate and iron phosphate are solubilized by low molecular weight organic acids into plant available P
 - * Inorganic minerals such as muscovite, orthoclase, biotite, mica are solubilized by organic acids into plant available K
 - * Hydroxyl and carboxyl groups of organic acids chelate the cations bound to P & K which in turn converts them into soluble P & K.
- * Organic Acids include but are not limited to gluconic acid, 2-ketogluconic acid, lactic acid valeric, succinic, isovaleric acid & acetic acid.
 - * The solubilization process results in increased phosphorous and potassium availability to the plant.
 - * Organic phosphates such as phytic acid and mono-esters are mineralized by enzymes released by the soil bacteria and fungi.
- * Release of organic anions, siderophores & phosphatase enzymes hydrolyze organic P & K or split the P & K from their organic residues.
 - * Phosphate & Potassium Mineralizing Enzymes include but are not limited to phytase, acid phosphatase, alkaline phosphatase & D-glycerophosphatase.
- * The solubilization and mineralization processes ultimately results in increased P, K, Ca, Mg, S, Fe, Mn & Zn availability to the plant.
- * Increased phosphorous availability promotes root initiation, root formation, root growth, enhanced root architecture ultimately resulting in plant establishment and enhanced nutrient assimilation
- * Increased potassium availability enhances root morphology, promotes increased root diameter and activates multiple enzyme systems which support root functionality

Plant Growth Hormone Producing Rhizo-Bacteria

- * Stimulating root growth was once entirely attributed to supplemental applications of Phosphate based fertilizers
 - * The emphasis for stimulating root growth has shifted to the use of Plant Growth Hormones
 - * Plant Growth Hormones are secondary metabolites produced by beneficial soil bacteria
 - * Collectively these organisms are referred to as Plant Growth Promoting Rhizo-Bacteria or PGPRB
- * Plant Growth Promoting Rhizo-Bacteria produce plant growth hormones such as auxins, cytokinins, gibberellins, ethylene
 - * The predominate plant growth hormone that influences root growth is the auxin class
 - * The predominate auxin responsible for root growth is indole – 3 – acetic acid (IAA)
- * IAA promotes root initiation, root formation, root elongation, increases root diameter, root branching and enhances root architecture
 - * Another class of hormones closely associated with root growth are cytokinins
 - * Cytokinins promote cell division (cytokinesis), cell differentiation and root morphogenesis
 - * The predominant cytokinins are kinetin, zeatin & 6 - benzylaminopurine
 - * BOTH auxins & cytokinins must be present in a precise ratio in order to stimulate root morphogenesis
 - * The ratio of auxins (dominant hormone) to cytokinins (subservient hormone) is critical to root morphogenesis
- * Formula contains multiple species-strains of bacteria that produce indole – 3 – acetic acid via tryptophan pathway & independent of tryptophan pathway and cytokinin dominant kelp

Supplemental Kelp Extract

- * Contains highly concentrated cold water kelp extract derived from Ascophyllum nodosum
- * Kelp is concentrated via centrifugation prior to drying in ambient temperatures to avoid degradation of hormonal component
 - * The kelp utilized contains plant growth hormones (cytokinins, auxins) but is cytokinin dominant
- * The auxins promotes root initiation, root formation, root growth, enhanced root architecture resulting in plant establishment

- * The cytokinins stimulate flowering, stimulate cell division, provides increased resistance to drought, & enhances chlorophyll synthesis
- * As previously mentioned auxins (dominant) and cytokinins (subservient) must be present in the proper ratio for root morphogenesis to occur
- * In addition to hormones kelp contains alginates, micronutrients, vitamins and minerals which feed plant and microbial component (synergy)
 - * Kelp portion of formula stimulates root initiation, root growth, root development which results in rapid root strike and enhanced nutrient assimilation**

Supplemental L Amino Acids

- * Enhances plant metabolism & increases metabolic efficiencies
- * Metabolic balance / homeostasis is essential for root morphogenesis
- * Critical metabolic processes include protein synthesis, stress reduction, photosynthesis, stomatal regulation, phytohormone production
 - * Increases foliar nutrition efficiencies & facilitates translocation of nutrients within leaf tissue
 - * Will increase assimilation of P, B, Ca, Kelp, Dextrose in formula by increasing cell membrane permeability (synergy)
 - * Will then facilitate translocation of P, B, Ca, Kelp, Dextrose within leaf tissue (synergy)
 - * Act as a chelating mechanism by neutralizing charge of minerals / nutrients
 - * L-Amino Acids Glutamic Acid, Arginine, Lysine, Proline & Methionine are essential for pollination & flowering mechanism
 - * Provides beneficial soil organisms with organic nitrogen source for protein synthesis (synergy)
- * Supplies rhizobacteria with the amino acid Tryptophan which promotes synthesis of the auxin indole -3-acetic acid (synergy)
 - * L-Amino Acid portion of formula promotes metabolic homeostasis, enhances IAA synthesis, improves nutrient efficiencies & enhances flowering mechanism**

Supplemental Brewers Yeast Extract

- * Brewers yeast extract is rich in L – amino acids, minerals, vitamins and plant growth factors
 - * Brewers yeast extract has a profound positive effect on root growth and development
- * Many studies indicate that brewer's yeast extract is comparable to IAA in its ability to enhance rooting (in particular # of roots)
 - * Brewers yeast extract also supports the growth of mycorrhizal fungi and rhizosphere bacteria (synergy)
 - * Brewers yeast portion of formula promotes root growth and enhances microbial growth**

Supplemental Calcium

- * Calcium is synergistic with auxins as it is responsible for translocation of the hormone within the plant (synergy)
- * Auxins produced by microorganisms or contained in kelp must be transported to the roots in order to stimulate initiation and growth
- * Auxin transport system in plants depends upon the structural features of cellular membranes analogous to transport of inorganic ions
 - * Supplemental calcium ensures adequate calcium ions are present to produce enough biphasic calcium (Ca^{2+}) to facilitate auxin transport across cellular membranes (synergy)
 - * The importance of Calcium is often overlooked in relation to the flowering process as well
 - * Calcium is required for pollen tube development, initiation of photoperiodic flowering mechanism and it participates as the biochemical messenger in the fertilization process, particularly pollen - pistol interactions
 - * Supplemental calcium supports auxin (IAA) transportation into roots and enhances flowering processes**

Supplemental Humic Acid

- *Supplemental applications of humic acids enhances root development and improves overall soil conditions
 - * Formula contains a broad range of humic acids & fulvic acids derived from bioactive leonardite
- * Humic acid stimulates root initiation by mitigating oxidation of critical plant hormones such as auxins (IAA) & cytokinins (synergy)
 - *Improves nutrient availability, chelates micronutrient (synergy with L Amino Acids) and enhances cation exchange capacity
 - * Synergistic with microbial component provides recalcitrant carbon source for beneficial soil organisms (synergy)
 - * Supplemental humic acid enhance root growth and supports preservation of auxins (IAA) and cytokinins**

NUTRIENTS DERIVED FROM

Protein Hydrolysate, Bone Meal, Kelp (*Ascophyllum nodosum*), Sodium Tetraborate Decahydrate

ALSO CONTAINS NON-PLANT FOOD INGREDIENTS

Active Ingredients

Bacillus subtilis 300,000,000 CFU per gram, Bacillus licheniformis 300,000,000 CFU per gram,
 Bacillus megaterium 300,000,000 CFU per gram, Bacillus amyloliquefaciens 300,000,000 CFU per gram,
 Pseudomonas putida 300,000,000 CFU per gram, Pseudomonas fluorescens 300,000,000 CFU per gram,
 Azospirillum amazonense 300,000,000 CFU per gram, Azospirillum lipoferum 300,000,000 CFU per gram,
 Trichoderma harzianum 50,000,000 CFU per gram, 50,000,000 CFU per gram

Inert Ingredients

34.00 % Hydrated Sodium Calcium Aluminosilicate

19.95 % Non-Calcined Diatomaceous Earth (carrier for microorganisms)

5.00 % Humic Acid (leonardite), 4.00 % Brewers Yeast Extract

GENERAL INFORMATION

* May be tank mixed with fertilizers, biostimulants and microbial foods (sugars, humic acids, kelp)

* It is advisable not to co-apply product with pesticides (fungicides, herbicides, insecticides, nematicides, fumigants) as they can compromise integrity of the beneficial organisms herein contained. If absolutely required tank mix the product with pesticide and apply within 1 hour.

* Never tank mix with pesticides that contain imazalil, propiconazole, tebuconazole and triflumizole.

* When applied in rotation with pesticides it's advisable to allow 5 - 7 days between application of pesticide and this product.

* Never apply product mixture just prior to a pesticide application

* Do not mix product and store, apply all tank mixes within 8 hours of preparation.

* Agitate tank while adding product and during entire application process

* Always perform jar test when mixing product with other inputs to test for physical compatibility

* To facilitate mixing process you may create slurry (1 lb. in 2 gal of water) and add slurry to tank while agitating

* Optimal results achieved if product is applied early morning, evening or on an overcast day.

SOIL APPLICATION

* Blend with soil prior to planting to promote root growth and development

* Incorporate at the rate of 1 tablespoon per 2 cubic feet of soil

SOIL-LESS MEDIA APPLICATION

* Adjust pH of soil-less media to range of 5.8 – 6 for optimum results

* Prepare 1 : 100 solution (1g/100ml) and then pour the solution through media (rockwool, coco, perlite)

* Dip un-moistened cuttings in the rooting powder and plant in media

SEED STARTER – SLURRY METHOD

* Utilize as seed starter to promote germination

* Suggested general rate is 1 lb. per 100 lbs. of seed

* Lay out seeds on waterproof tray

* Dampen seeds with water (preferably non-chlorinated)

* Shake Seed Treatment on to dampened seeds

* Homogeneously mix water, Seed Treatment and seed until seed are covered by slurry

* Allow slurry to dry thoroughly on seed coat (testa)

* For optimum results plant seeds immediately after slurry dries

AMOUNT OF SEED	AMOUNT OF WATER	AMOUNT OF SEED TREATMENT
1 lb	½ oz	0.16 oz
5 lb	1 oz	0.8 oz
10 lb	2 oz	3.2 oz
50 lbs	10 oz	8.0 oz

SEED STARTER - DUSTING

* Dust seed with product mixture at the rate of 0.15 - 0.25 oz per lb of seed

* Use higher rate on seeds that are difficult to germinate or seeds that produce seedlings prone to environmental stress

* For optimum results plant seeds immediately after dusting