



Microbes Outperforming Chemicals

PRODUCT GUIDE

LEADER IN MICROBE TECHNOLOGY FOR PROFESSIONAL GROWERS

LIRIOPE



DIPPED IN
SEED & PLANT STARTER

LILY



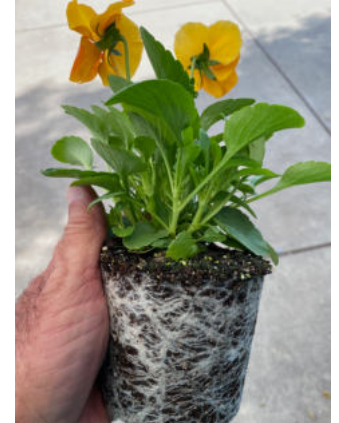
SEED & PLANT STARTER
WAS APPLIED TWICE

SUWANNEE



SUWANNEE WAS DIPPED
IN SEED & PLANT STARTER

PANSY



MICROBE REMEDY WAS
APPLIED TWICE



CANNA SEED

Canna Seed in left picture was planted without applying any microbes (55% germination rate). Canna Seed in the right picture was planted applying Seed & Plant Starter, (over 95% germination rate). Seed Package stated 73% average germination rate.



SUNNY SUNDAYS



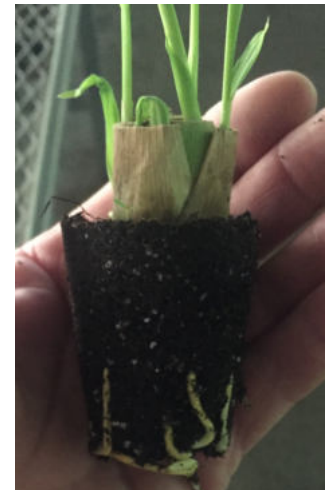
MICROBE REMEDY APPLIED MONTHLY
WINNING ROSE AMERICAN ROSE SOCIETY

POINSETTIA



APPLIED MICROBE REMEDY

LEMON GRASS



APPLIED SEED & PLANT STARTER
PICTURE 3 WEEKS AFTER STICKING



866-D Bridge Valley Road, Columbia, PA 17512

sales@microbialsciencelaboratories.com

www.microbialsciencelaboratories.com

717-327-1010

MICROBIAL SCIENCE LABORATORIES, LLC is a leader in Microbe Technology for the Greenhouse Industry. Our Scientists have been growing and drying microbes for over 30 years.

Our microbe formulas enhance plant growth by overwhelming the soil with microbes, adding over 1 billion per gram with vast amounts of beneficial strains. They contain Phosphate solubilizing and Phosphate Mineralizing Bacteria–Fungi, contain plant growth promoting Rhizo-Bacteria, contain free living Nitrogen fixing bacteria, contains extracellular enzyme producing Bacteria–Fungi, reduce Abiotic stress, increases nutrient uptake, enhances budding, flowering and fruiting, promotes root growth, root architecture, plant establishment and many more benefits.

Our microbes should be used at the time of planting seed, cuttings, plugs, bare root or transplanting, then monthly as needed.

Quotes from Growers:

- We dipped groundcover cuttings for 5 – 15 minutes in Seed & Plant Starter. This crop always has poor rooting issues during the growing season. This year we experienced no rooting issues and massive roots.
- Microbe Remedy was applied to Nepeta. After 3 weeks the roots were coming out of the bottom of the quart pots. The quantity of fine root hair is amazing. When applying Microbe Remedy we experience increased root development.
- Large Propagator – We apply Microbe Remedy monthly to all of our cuttings. It is a vital component at contributing to healthier rooted liners and seedling trays.
- Geranium Macrorrhizum Ingwersens variety propagation of non-active growing meristem individual pieces. Plants were dipped (totally submersed) for 10 minutes in Seed & Plant Starter, using 1 tablespoon per gallon of water. Seed & Plant Starter produced both root and foliage growth faster and the rooting was uniform throughout the entire crop.
- Seed & Plant Starter was mixed into the soil just prior to planting Poinsettia's. Microbe Remedy was applied after two weeks and then monthly. Root growth dramatically increased.

STATE OF THE ART MICROBE RESEARCH FACILITY





USED BY PROFESSIONAL GROWERS

Use for Seeding, Planting Cuttings, Bare Root, Plugs, Transplanting,
as a Monthly Maintenance & and for Growth of Established Plants

- CONTAINS 1 BILLION BENEFICIAL MICROBES PER GRAM
- CONTAINS PHOSPHATE SOLUBILIZING & PHOSPHATE MINERALIZING BACTERIA - FUNGI
Provides increased phosphorous availability, enhances seed germination, flowering process, promotes root growth
- CONTAINS PLANT GROWTH PROMOTING RHIZO-BACTERIA
Hormones produced by bacteria enhances seed germination and increase yields
- CONTAINS FREE LIVING NITROGEN FIXING BACTERIA
Nitrogen fixation increases plant available nitrogen, promotes vegetative growth
- CONTAINS EXTRACELLULAR ENZYME PRODUCING BACTERIA – FUNGI
Promotes decomposition, transformation, and cycling of nutrients
- CONTAINS MICROBIAL SYNERGISTS TO PROVIDE MICROBES WITH ENERGY DURING THE CRITICAL LAG PHASE WHEN FIRST INTRODUCED INTO THE SOIL
- REDUCES ABIOTIC STRESS
- INCREASES NUTRIENT UPTAKE
- ENHANCES THE BUDDING, FLOWERING AND FRUITING PROCESS
- PROMOTES ROOT GROWTH, ROOT ARCHITECTURE, PLANT ESTABLISHMENT

CONTAINS NON PLANT FOOD INGREDIENTS

Bacillus firmus 100,000,000 CFU per gram, Bacillus amyloliquefaciens 100,000,000 CFU per gram
Bacillus subtilis 100,000,000 CFU per gram, Bacillus licheniformis 100,000,000 CFU per gram,
Bacillus megaterium 100,000,000 CFU per gram, Bacillus pumilus 100,000,000 CFU per gram,
Bacillus azotoformans 100,000,000 CFU per gram, Bacillus coagulans 100,000,000 CFU per gram,
Paenibacillus polymyxa 100,000,000 CFU per gram, Paenibacillus durum 100,000,000 CFU per gram,
Pseudomonas aureofaciens 20,000,000 CFU per gram, Pseudomonas fluorescens 20,000,000 CFU per gram,
Pseudomonas putida 20,000,000 CFU per gram, Streptomyces coelicolor 20,000,000 CFU per gram,
Streptomyces lydicus 20,000,000 CFU per gram, Streptomyces griseus 20,000,000 CFU per gram,
Trichoderma reesei 20,000,000 CFU per gram, Trichoderma hamatum 20,000,000 CFU per gram, Trichoderma harzianum 20,000,000 CFU per gram

55.00 % Dextrose, 20.00 % Sucrose, 3.00 % Amino Acids (hydrolyzed soy protein), 3.00 % Brewers Yeast Extract, 3.00 % Active Yeast,
2.00 % Humic Acid (leonardite) 1.25 % Kelp (Ascopylum nodosum), 0.75 % Hydrated Sodium Calcium Aluminosilicate (Drying Agent)

- Microbe Remedy can be mixed with any fertilizer
- Microbe Remedy has a two year shelf life in the pail, once mixed, use within 24 hours
- No need to Refrigerate
- Store sealed in original container in 40 – 75 degree temperature

MICROBE REMEDY IS AVAILABLE IN: 5 lb. & 25 lb. Sizes



MICROBE REMEDY APPLICATION RATES

GREENHOUSE RATES

- * Prepare a stock solution by dissolving 1 - 1.5 lbs. in 8 gallons of clean potable water
- * Use higher rate on plants exposed to or susceptible to abiotic stress (heat, cold, drought, humidity)
- * Run stock solution through injector system @ 1 : 100 dilution
- * Apply the stock solution to 10,000 square feet of table space as a Sprech application
- * Apply every 3 - 6 weeks throughout crop cycle
- * Apply at 3 week intervals during periods of abiotic stress (heat, cold, drought, humidity) or on plants susceptible to abiotic stress

CONTAINER RATES

- * Thoroughly dilute in a sufficient volume of water and apply to soil
- * Apply every 2 - 4 weeks or as required

PLANT HEIGHT	CUTTINGS & TRANSPLANTS	MAINTENANCE PHASE	VEG GROWTH PHASE	TRANSITION TO BLOOM PHASE	BLOOM PHASE
6 - 24 inches	0.5 - 1 tsp	1 - 2 tsp	1 - 2 tsp	1 - 2 tsp	1 - 2 tsp
25 - 36 inches	0.75 - 1.25 tsp	1.5 - 2.5 tsp	1.5 - 2.5 tsp	1.5 - 2.5 tsp	1.5 - 2.5 tsp
37 - 52 inches	1 - 1.5 tsp	2 - 3 tsp	2 - 3 tsp	2 - 3 tsp	2 - 3 tsp
53 - 72 inches	1.5 - 2 tsp	2.5 - 3.5 tsp	2.5 - 3.5 tsp	2.5 - 3.5 tsp	2.5 - 3.5 tsp
72 + inches	2 - 3 tsp	4 - 5 tsp	4 - 5 tsp	4 - 5 tsp	4 - 5 tsp

Ornamental Trees, Shrubs, Herbaceous Perennials, Annuals, Roses – Planting

- * Utilize as plant starter to promote establishment and enhance root architecture
- * Dissolve product at the rate of 1 tablespoon per gal of potable water
- * Drench root ball or bare roots with product mixture prior to backfilling hole
- * Utilize product mixture volumes as outlined below then back fill hole

PLANT SIZE	VOLUME
5 gal	16 - 32 oz
10 gal	32 - 48 oz
15 gal	48 - 64 oz
Per 1 inch caliper	1 gal

Ornamental Trees, Shrubs, Herbaceous Perennials, Annuals, Roses - Post Plant

- * Begin applications once ornamentals break dormancy or when soil temperatures reach 50° F
- * Apply at the rate of 1.5 - 2 oz per 1,000 square feet of bed space.
- * Thoroughly mix the required dosage in sufficient volume of water (5 – 50 gallons per 1,000 sq ft of bed space) and apply product mixture as a soil drench or sprech to landscape plantings.
- * Use higher water volume for sprech applications. Water volume should be adjusted based on canopy when applying as sprech.
- * Product mixture should be applied in such a manner as to wet top 1/4 - 1/2 inch of soil in order to facilitate root colonization.
- * Apply product mixture every 4 - 6 weeks throughout the growing season
- * Apply as soil drench or sprech through low pressure watering nozzles such as fan nozzles, drench watering systems, hydraulic sprayers, handheld or backpack sprayers.

ROOT OR WHOLE PLANT DIPPING - CUTTINGS, PLUGS, BARE ROOT

- * Thoroughly dissolve 1 – 2 teaspoons of material in 1 gallon of potable water (preferably non chlorinated)
- * Use higher rate on woody cuttings and lower rate on herbaceous cuttings
- * Place cuttings in solution for 5 – 10 minutes just prior to plant out
- * Use 10 minute timeframe on woody cuttings and 5 minute timeframe on herbaceous cuttings
- * For optimum results plant cuttings immediately after root dip

A new batch should be made up every 24 hours – Agitate often

Seeding	1 – 1 ½ oz 30 – 45 grams	1000 sq ft 100 sq meters	Apply after seeding and irrigate with 1/8 inch of water after application
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USED BY PROFESSIONAL GROWERS

Use for seeding, dipping cuttings, bare root, plug trays or transplanting

- CONTAINS 1 BILLION BENEFICIAL MICROBES PER GRAM
- CONTAINS ENDO & ECTO MYCORRHIZAL FUNGI
Enhances Seed germination, promotes plant establishment, and facilitates uptake of water and nutrients
- CONTAINS PHOSPHATE SOLUBILIZING & PHOSPHATE MINERALIZING BACTERIA
Provides increased phosphorous availability, enhances seed germination, flowering process, promotes root growth
- CONTAINS PLANT GROWTH PROMOTING RHIZO-BACTERIA
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- RETAINS NITROGEN IN THE SOIL TO ENHANCE SEED GERMINATION AND STIMULATE VEGETATIVE GROWTH
- STIMULATES ROOT GROWTH, ROOT ARCHITECTURE AND PLANT ESTABLISHMENT
- PROVIDES INCREASED RESISTANCE TO ABIOTIC STRESS

CONTAINS NON-PLANT FOOD INGREDIENTS

Active Ingredients

Endomycorrhizal Fungi

Glomus intraradices 5 propagules per gram, Glomus mossae 5 propagules per gram, Glomus deserticola 5 propagules per gram,

Glomus fasciculatum 5 propagules per gram, Glomus clarium 5 propagules per gram,

Glomus microaggregatum 5 propagules per gram, Glomus monosporum 5 propagules per gram

Ectomycorrhizal Fungi

Pisolithus tinctorius 25,000 spores per gram Rhizopogon villosulus 5,000 spores per gram,

Rhizopogon luteolus 5,000 spores per gram, Rhizopogon amylopogon 5,000 spores per gram, Rhizopogon fulvicleba 5,000 spores per gram

Rhizosphere Microorganisms

Bacillus subtilis 100,000,000 CFU per gram, Bacillus licheniformis 100,000,000 CFU per gram,

Bacillus megaterium 100,000,000 CFU per gram, Bacillus pumilus 100,000,000 CFU per gram,

Bacillus coagulans 100,000,000 CFU per gram, Bacillus amyloliquefaciens 100,000,000 CFU per gram,

Azospirillum amazonense 50,000,000 CFU per gram, Azospirillum lipoferum 50,000,000 CFU per gram,

Pseudomonas putida 50,000,000 CFU per gram, Pseudomonas fluorescens 50,000,000 CFU per gram,

Streptomyces lydicus 50,000,000 CFU per gram, Streptomyces griseus 50,000,000 CFU per gram,

Trichoderma reesei 50,000,000 CFU per gram, Trichoderma harzianum 50,000,000 CFU per gram

Inactive Ingredients

40.00 % Rock Dust, 7.00 % L - Amino Acids, 5.00 % Potassium Humate (leonardite)

GUARANTEED ANALYSIS

Total Nitrogen (N).....1.00 %

1.00 % Water Soluble Nitrogen

.00 % Water In-Soluble Nitrogen

Available Phosphate (P₂O₅).....3.00 %

Soluble Potash (K₂O).....3.00 %

Calcium (Ca).....1.50 %

NUTRIENTS DERIVED FROM

Hydrolyzed Soy Protein, Bone Meal, Kelp

SEED & PLANT STARTER IS AVAILABLE IN: 5lb & 25lb. Pails

SEED & PLANT STARTER APPLICATION RATES

Seed Starter – Slurry Method

- * Utilize as seed starter to promote germination
- * Suggested general rate is 0.5 - 1 lb per 100 lbs of seed
- * Use higher rate on seeds that are difficult to germinate or seeds that produce seedlings prone to environmental stress
 - * 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	0.8 - 0.16 oz
5 lb	1 oz	0.4 - 0.8 oz
10 lb	2 oz	1.6 - 3.2 oz
50 lbs	10 oz	4.0 - 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

Greenhouse Injectors

It is not advisable to go through a Greenhouse Injector

The Seed & Plant Starter contains Rock Dust

You can spray over top of the soil after planting seed or cuttings at a rate of 1 lb. per 800 gallons of water

Cuttings & Plugs– Dip

- * Thoroughly dissolve 1 – 2 teaspoons of material in 1 gallon of potable water (preferably non chlorinated)
 - * Use higher rate on woody cuttings and lower rate on herbaceous cuttings
 - * Place cuttings in solution for 5 – 10 minutes just prior to plant out
- * Use 10 minute timeframe on woody cuttings and 5 minute timeframe on herbaceous cuttings
 - * For optimum results plant cuttings immediately after root dip

A new batch should be made up every 24 hours – Agitate often

Ornamental Trees, Shrubs, Herbaceous Perennials, Annuals, Roses - Pre Plant

- * Utilize as plant starter to promote establishment and enhance root architecture
- * Dissolve product at the rate of 1 teaspoon per gal of potable water
- * Drench root ball or bare roots with product mixture prior to backfilling hole
- * Utilize product mixture volumes as outlined below then back fill hole

PLANT SIZE	VOLUME
6 "	8 oz
1 gal	16 oz
5 gal	48 oz
10 gal	64 oz
15 gal	128 oz

Soil – Growing Media Rates

- * Inoculate soil, growing media prior to filling pots and trays or when up potting
- * Use chart below to determine rate

AMOUNT	COVERAGE
0.25 lb	1 cu yd / large cavity
0.50 lb	1 cu yd / small cavity

Meta-Pak

(Liquid)

Metabolic Enhancer – Peptides, L-Amino Acids & Kelp

- * Enhances Plant Growth, Development and Increases Yield
- * As Seed Starter (Enhances Germination, Promotes Lateral Root Development)
 - * Improves Efficiencies of Applied Fertilizers
 - * Provides Increased Resistance to Abiotic Stress
 - * Enhances Desirable Characteristics of Crops
(Color, Brix, Caliper, Homogeneity)

Meta-Pak contains a unique blend of peptides, free L-amino acids and kelp extracts it is specifically formulated to enhance metabolic efficiencies and provide plants with increased resistance to abiotic stress.

Enhanced metabolic efficiency translates to improved efficiency of applied fertilizers thereby improving overall plant growth and yield. Increased abiotic stress tolerance permits plants to recover quickly from environmental extremes such as heat, cold, drought, salinity, mechanical injury and excessive foot traffic.

Peptides and L – amino Acids have the capacity to positively influence plants by enhancing metabolic efficiencies. Baby Boomers can surely remember the pre-electronic ignition days when you brought your car in for a “tune up”. The mechanic would gap the spark plugs, set the points and replace your condenser to “enhance the metabolic efficiency of your car’s engine”. It did not matter if you used high test gasoline when your car was out of tune (metabolic imbalance) it did not efficiently utilize fuel or run properly.

This analogy can be used to describe the relationship between **peptides, L – amino acids** and plants! No matter how much fuel (fertilizer) you apply to the soil or foliage if your plants metabolism is not fine-tuned it will not grow to its full genetic potential. Plant metabolism is defined as the prerequisite physical and biochemical processes necessary to support life.

Abiotic stress, sometimes referred to as environmental stress, negatively impacts plants in a multitude of ways. Continuous exposure to abiotic stress causes major disruptions to the plant, often resulting in shock brought on by a drastic reduction in nutrient assimilation.

When exposed to abiotic stress plants communicate internally through a series of complex signaling mechanisms that elicit multiple stress responses. These signaling mechanisms recognize the negative environmental stimuli and transmit stress signals allowing the plant to recover and restore homeostasis. **Peptides, L – amino acids and phytohormones** are the fundamental signaling molecules associated with the abiotic stress response in plants.



Pansy on left just arrived / Pansy on right arrived six days earlier and was treated with Microbe Remedy in the soil, and Meta-Pak as a foliar spray.

Guaranteed Analysis

Total Nitrogen (N).....	2.50 %
2.50 % Water Soluble Nitrogen	
0.00 % Water In-Soluble Nitrogen	
Soluble Potash (K ₂ O).....	1.50 %

Nutrients Derived From

Protein Hydrolysate, Kelp Extract (Derived From *Ascophyllum nodosum*)

Contains Non Plant Food Ingredients

Peptides.....	14.85 %
L – Amino Acids.....	0.65 %

Meta-Pak

Instructions For Use

Shake – agitate product thoroughly prior to each use. Product may be applied as soil drench, foliar spray or sprench.
Do not mix – dilute more product than will be utilized in 24 – 48 hours. Never store diluted fertilizer. May be tank mixed with primary nutrients, secondary nutrients, micronutrients, microbial inoculants and pesticides.

Always perform jar test to check for compatibility.

Storage & Handling

* Product should be stored in a cool area out of direct sunlight.

* Store between 40°F / 4.4°C - 90°F / 32.2°C to optimize shelf life. Do not allow product to freeze.

* Keep container tightly sealed. When stored properly product has a 2 year shelf life * Refer to SDS for detailed instructions

General Agricultural Rates – Post Plant

METHODOLOGY	RATE	FREQUENCY	NOTES
Foliar Spray (Best method)	24 - 48 oz per acre 1.75 – 3.5 L per hectare Or create 1 % solution * Dilute 1.28 oz per gal of water * Dilute 40 ml per 4 liters of water	Growth: Every 30 days throughout crop cycle Stress: Every 45 days throughout crop cycle	Spray foliage until point of run off. Apply when stomata are open (under 85 degrees) to optimize results
Soil Drench / Sprenc	32 - 64 oz per acre 2.35 – 4.7 L per hectare	Growth: Every 30 days throughout crop cycle Stress: Every 45 days throughout crop cycle	Apply in a sufficient volume of water to achieve desired uniform coverage

Foliar & Sprenc Applications: Meta-Pak should be applied when stomata are open to maximize the plant's capacity to assimilate the beneficial compounds. In general stomata open during the day to provide carbon dioxide for photosynthesis, conversely stomata close at night to preserve moisture during their non-photosynthetic phase. If it is extremely hot and dry (arid) during the daylight hours stomata tend to close in order to preserve moisture. One parameter often used to determine stomatal regulation is the temperature humidity index. If the sum of the air temperature and relative humidity are between 120 – 140 stomata tend towards opening and it is an advantageous time to apply foliar nutrients. Spray foliage until point of runoff. Water volume may be adjusted based on size and density of canopy. Never make foliar applications in full sun or when temperatures exceed 85°F. After planting cuttings, wait until roots are established before applying Meta-Pak.

Greenhouse Application Rates

PLANT TYPE	METHODOLOGY	RATE	FREQUENCY	NOTES
Bedding Plants, Houseplants	Sprenc	32 oz per acre of table space 2.35 liters per hectare Or 1% solution	Growth: Every 30 days throughout crop cycle Stress: Every 45 days throughout crop cycle	Apply in a sufficient volume of water to achieve desired coverage. Drench foliage & growing media

* Make initial application early in season or during initial growth flush

Ornamental Rates (Annuals, Herbaceous Perennials, Trees, Shrubs)

METHODOLOGY	RATE	FREQUENCY	NOTES
Foliar Spray	32 oz per acre 2.35 L per hectare Or create 1 % solution * Dilute 1.28 oz per gal of water * Dilute 40 ml per 4 liters of water	Every 45 days throughout growing season	Spray foliage until point of run off. Apply when stomata are open to optimize results
Soil Drench / Sprenc	48 oz per acre 3.5 L per hectare	Every 60 days throughout crop cycle	Apply in a sufficient volume of water to achieve desired uniform coverage

AZALEA & RHODY

MICROBE BLEND

Specifically Formulated For Acidic Soils Under pH 5

Nutrient Solubilization

- * Most soils contain an abundance of inorganic P and K, the problem is its usually in an insoluble form and cannot be assimilated by the plant.
- * Select beneficial soil bacteria and fungi have the capacity to convert insoluble phosphatic and potassium-based compounds into plant available forms.
 - * Beneficial soil bacteria & soil fungi produce secondary metabolites which includes organic acids
- * This secondary metabolite is responsible for the conversion of insoluble, inorganic, mineral-based 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 phosphate-based minerals as calcium phosphate and iron phosphate are then solubilized by these low molecular weight organic acids into plant available P
- * Inorganic potassium-based minerals such as feldspar, muscovite, orthoclase, biotite, mica is solubilized by organic acids into plant available K
- * The hydroxyl and carboxyl groups associated with 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 P, K, Ca, Mg, S, Fe, Mn & Zn availability to the plant.**

Nutrient Mineralization

- * Most soils contain an abundance of organic P, the problem is its usually in an insoluble form and cannot be assimilated by the plant.
- * Select beneficial soil bacteria and fungi have the capacity to convert insoluble phosphatic based compounds into plant available forms.
 - * Beneficial soil bacteria & soil fungi produce secondary metabolites which includes enzymes.
- * This secondary metabolite is responsible for the conversion of insoluble, organic based phosphorus into plant available forms.
 - * Most soils contain an abundance of phytic acid an indigestible, organic form of phosphorus
- * Organic phosphates such as phytic acid are mineralized by enzymes released by the soil bacteria and fungi.
- * Phosphate Mineralizing Enzymes include but are not limited to phytase, acid phosphatase, alkaline phosphatase & D-glycerophosphates
 - * Release of phosphatases enzymes hydrolyze organic P and split the from their organic residues. .
 - * The mineralization processes results in increased P, Ca, Mg, S, Fe, Mn & Zn availability to the plant.
 - * **The mineralization process results in increased P, Ca, Mg, S, Fe, Mn & Zn availability to the plant.**

Contains Extracellular Enzyme Producing Bacteria – Fungi

- * Includes cellulases, hemi-cellulases, xylanases, chitinases, proteases, amylases, lipases, chitinases
- * Extracellular enzymes promote the decomposition, transformation and cycling of nutrients in soil profile
 - * Decomposition liberates carbon and nutrients from complex materials in soil profile
- * In particular cellulase producing bacteria promote the degradation of cellulose residues in soil profile
- * Cellulose is a complex polysaccharide comprised of thousands of d-glucose subunits (Six Carbon Sugar)
- * Cellulose is the structural component of primary cell wall in plants, most abundant organic compound on earth
- * Cellulolysis is a biological process mediated by a select group of extracellular enzymes called cellulases
- * Three specific cellulase enzymes (secondary metabolites) mediate cellulolysis (conversion of cellulose > glucose)
 - * 1, 4- β -endoglucanase (cleaves of β -1, 4-glycosidic bonds along a cellulose chain)
 - * 1, 4- β -exoglucanase (cleaves non-reducing portion of chain & splits fibrils from crystalline cellulose)
 - * β -glucosidase (hydrolyzes cellobiose and water-soluble cellodextrin to glucose)
- * Glucose released during degradation of cellulose is utilized by organisms as food source (drives metabolic functions)
- * Glucose released during degradation of cellulose is utilized by plants as a precursor to structural carbohydrates

Reduction In Nitrogen Loss / Leaching

- * Beneficial soil bacteria significantly reduce the incidence of nitrogen leaching in the soil profile
- * Nitrogen (particularly nitrate) is very mobile in the soil profile and it often leaches past the root system before it has a chance to sequester it
 - * Soil bacteria temporarily incorporate free nitrogen into their bodies utilizing it to satiate their metabolic functions.
 - * This storehouse of nitrogen is then given back to the plant through a complex process known as nutrient mineralization.
 - * Nutrient mineralization occurs when protozoa consume soil bacteria in order to satiate their own carbon & nitrogen requirements.
- * Soil bacteria contain more N than the protozoa require therefore the protozoa essentially spit this excess nitrogen back into the rhizosphere (soil influenced by roots) where it is then absorbed by the plant roots.

Microbial Synergists

- * Contains full spectrum of targeted microbial synergists and growth factors to promote microbial growth & proliferation
- * Provides them with energy during critical lag phase of development when metabolic requirements drastically increase
 - * Contains organic protein source to satiate nitrogen requirements of beneficial bacteria & fungi
- * Contains multiple carbon sources (simple & recalcitrant) which serves as food source for beneficial bacteria & fungi
- * Each organism in formula has a preferred carbon source, by targeting carbon source to organism you optimize microbial growth
 - * Inoculants absent microbial synergists exhibit limited growth potential in soil microclimates

CONTAINS NON PLANT FOOD INGREDIENTS

Active Ingredients

Saccharomyces cerevisiae 500,000,000 cfu per gram, Bacillus amyloliquefaciens, 300,000,000 cfu per gram,
Bacillus megaterium 300,000,000 cfu per gram, Bacillus pumilus 300,000,000 cfu per gram,
Bacillus subtilis 300,000,000 cfu per gram, Bacillus coagulans 300,000,000 cfu per gram,
Penicillium bilaie 10,000,000 cfu per gram, Trichoderma harzianum 100,000,000 cfu per gram,
Trichoderma viride 100,000,000 cfu per gram, Trichoderma reesei 100,000,000 cfu per gram

INERT INGREDIENTS

62.00 % Sucrose, 15.95 % Non Calcined DE (Microbial Carrier), 10.00 % Dextrose, 5.00 % Hydrolyzed Soy Protein,
5.00 % Humic Acid (leonardite), 2.00 % Hydrated Sodium Calcium Aluminosilicate (Drying Agent)

82.00 % Water Soluble By Weight

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, nematocides, fumigants) as they can compromise integrity of or kill the beneficial organisms herein contained.
 - * If co-application with pesticides is required tank mix the product with pesticide and apply within 8 – 12 hours
- * When applied in rotation with pesticides its advisable to allow 5 - 7 days between application of pesticide and this product.
 - * Never apply product mixture just prior to a pesticide application
- * Never tank mix with pesticides that contain imazilil, propiconazole, tebuconazole and triflumizole.
 - * 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 / 0.45 kg in 7.6 liters of water) and add slurry while agitating

Maintenance - Post Plant

- * Begin applications once ornamentals break dormancy or when soil temperatures reach 50° F / 10° C
- * Apply at the rate of 1.5 - 2 oz per 1,000 square feet / 45 - 60 grams per 92 sq meters of bed space.
- * Thoroughly mix the required dosage in sufficient volume of water (5 – 50 gallons per 1,000 sq ft of bed space) and apply product mixture as a soil drench or sprench to landscape plantings.
- * Use higher water volume for sprench applications. Water volume should be adjusted based on canopy when applying as sprench.
- * Product mixture should be applied in such a manner as to wet top 1/4 - 1/2 inch of soil to facilitate rhizosphere colonization.
 - * Apply product mixture every 4 - 6 weeks throughout the growing season
- * Apply as soil drench or sprench through low pressure watering nozzles such as fan nozzles, drench watering systems, hydraulic sprayers, handheld or backpack sprayers.

Deep Root Feed

- * Apply as required throughout the growing season to maintain plants and enhance root architecture* Thoroughly dissolve product at the rate of 1 lb per 100 gal / 0.45 kg in 378 liters of potable water
- * Mix required volume and inject using a grid system by spacing holes on 2 -3 foot centers, in a grid pattern, extending at least to the drip line of the plant. Inject prepared solution into the soil to a depth of at least 3" for shrubs and 6" for trees. Utilize a total volume 1 gal of finished solution per 5 feet of plant height injecting equal amounts of product mixture into each hole.

PLANT SAFETY

- * Product has been tested on numerous plant species with no apparent phytotoxic response
- * However the product has not been tested on every plant variety in combination with all possible tank mixes, under every conceivable environmental condition. We always recommend testing product on a small number of plants to check for adverse plant response PRIOR to full scale field application

POINSETTIA'S



Above pictures taken around November 1, 2021

Grower applied Microbe Remedy at the rate of 4 oz. per 100 gallons on his Poinsettia's.
Grower applied Microbe Remedy at the time of planting, then monthly for 4 months.

CALLA LILY'S



We are liking the results on what we have trialed. We are also using Microbe Remedy in propagation, and you can definitely see enhanced rooting. Here are pictures of the Calla Lily's.



HEUCHERA AUTUMN BRIDE

Pictures applying Microbe Remedy as a weekly drench during the crop cycle of Heuchera Autumn Bride.

72 cells were treated weekly with Microbe Remedy @ 4 oz. per 5 gallons of water at 1:30. No fertilizer was used, only Microbe Remedy.

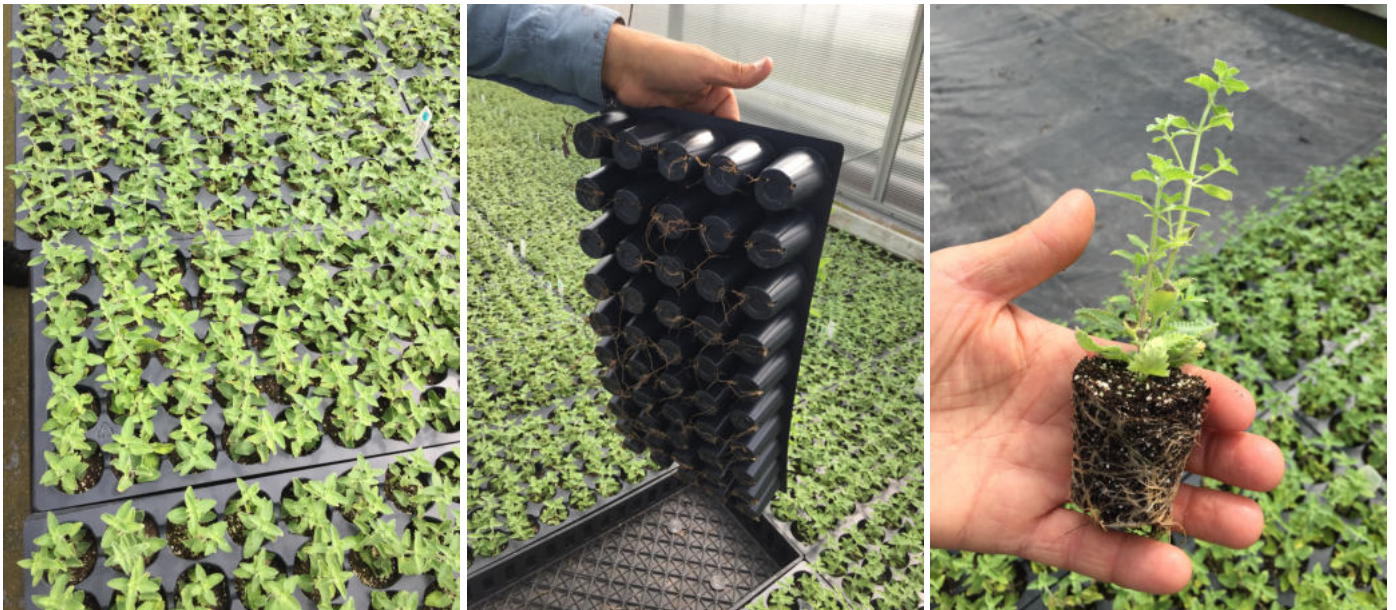
Plants were treated with 4 applications of Microbe Remedy.

This is an excellent method to grow compact cells.

Nighttime temp. is 58 – 60 and daytime temp. is 68 – 70.



250,000 Lavender pots were planted using Microbe Remedy. Enhanced rooting was visible though out the trial.



NEPITA

NEPITA WAS DIPPED (SUBMERSED) IN SEED & PLANT STARTER FOR 10 MINUTES
 ROOTS ARE SHOWING OUT OF THE BOTTOM OF THE TRAY
 PICTURES WERE TAKEN 3 WEEKS AFTER PLANTING



EASTER LILY

Microbe Remedy was used twice on Easter Lilies
 OH Grower - "These are the best Easter Lilies I have grown in 40 years"



Geranium

Geranium Macrorrhizum Ingwersens variety propagation of non-active growing meristem individual pieces. Plants were dipped (totally submersed) for 5 minutes in Seed & Plant Starter, using 1 tablespoon per gallon of water. Geraniums were then planted into the soil on March 20, 2020. Pictures were shot on April 5, 2020, 16 days after planting. Seed & Plant Starter produced both root and foliage growth faster and the rooting was uniform throughout the entire crop.



Left Picture
No Microbes

BUTTERFLY WEED



Right Picture

Seed & Plant Starter applied week 6
Microbe Remedy applied week 11

Asclepias tuberosa cells - Seed sown week 1 of 2019
Pictures taken week 13

MICROBE REMEDY

BLUEBERRY / CRANBERRY (VACCINIUM)

Nutrient Solubilization & Nutrient Mineralization

- * Most soils contain an abundance of P and K 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 such as organic acids & enzymes.
 - * These secondary metabolites 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 mineral 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 in to 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 & phosphatases hydrolyze organic P & K or split the P & K from organic residues. * Phosphate & Potassium Mineralizing Enzymes include but are not limited to phytase, acid phosphatase, alkaline phosphatase & D-glycerophosphatase.
- * The solubilization and mineralization processes results in increased P, K, Ca, Mg, S, Fe, Mn & Zn availability to the plant.
- * Increased phosphorous availability enhances flowering - fruiting process, promotes root growth, root architecture, plant establishment
- * Increased potassium availability activates enzyme systems, promotes translocation of nutrients & assimilates, facilitates N uptake & assimilation for protein synthesis, regulates turgor pressure during periods of drought & maintains water balance

Contains Plant Growth Promoting Rhizo-Bacteria

- * Stimulating plant growth was once entirely attributed to supplemental applications of N, P, K fertilizers
- * The emphasis for stimulating plant growth has shifted to the use of Plant Growth Hormones produced by soil organisms
 - * 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
- * Auxins stimulate flowering, root architecture, issue differentiation, lateral root initiation, polar root hair positioning & root gravitropism
 - * Gibberellins control cell elongation, cell division, cell differentiation & stress reduction
- * Cytokinins stimulate flowering, control cell division in roots & shoots, increased resistance to drought, enhances chlorophyll synthesis
 - * Hormones produced by bacteria increase yields independent of supplemental fertilizer applications

Contains Extracellular Enzyme Producing Fungi

- * Includes cellulases, hemi-cellulases, xylanases, chitinases, proteases, amylases, lipases, chitinases
- * Extracellular enzymes promote the decomposition, transformation and cycling of nutrients in soil profile
 - * Decomposition liberates carbon and nutrients from complex materials in soil profile
 - * In particular cellulase producing bacteria promote the degradation of cellulose residues in soil profile
- * Cellulose is a complex polysaccharide comprised of thousands of d-glucose subunits (Six Carbon Sugar)
- * Cellulose is the structural component of primary cell wall in plants, most abundant organic compound on earth
- * Cellulolysis is a biological process mediated by a select group of extracellular enzymes called cellulases
- * Three specific cellulase enzymes (secondary metabolites) mediate cellulolysis (conversion of cellulose > glucose)
 - * 1, 4- β -endoglucanase (cleaves of β -1, 4-glycosidic bonds along a cellulose chain)
 - * 1, 4- β -exoglucanase (cleaves non-reducing portion of chain & splits fibrils from crystalline cellulose)
 - * β -glucosidase (hydrolyzes cellobiose and water-soluble celloextrin to glucose)
- * Glucose released during degradation of cellulose is utilized by organisms as food source (drives metabolic functions)
- * Glucose released during degradation of cellulose is utilized by plants as a precursor to structural carbohydrates

MICROBE REMEDY BLUEBERRY / CRANBERRY (VACCINIUM)

Nitrogen Fixation

- * Nitrogen fixing bacteria convert atmospheric di-nitrogen (N₂) into ammonia (NH₃)
- * Ammonia is then protonated to ammonium (NH₄) in soil with pH less than 7 where it is then assimilated by plants
- * Process is mediated by nitrogenase enzyme (secondary metabolite) produced by the organisms themselves
- * Azospirillum are classified as free living but prefer to colonize soil in close proximity to plant roots (rhizosphere) in lieu of open soil
 - * Azospirillum colonize surface of plant roots via attachment (glycoprotein) & anchoring (polysaccharide)
- * Azospirillum amazonense will colonize the rhizosphere of genus vaccinium as they adapt well to acidic soil environments
 - * Nitrogen fixing capacity of formula is well adapted to a variety of soil micro-climates
- * Nitrogen fixation increases plant available nitrogen, increases yield and reduces the need for supplemental fertilizer applications

Reduction In Nitrogen Loss

- * Beneficial soil bacteria significantly reduce the incidence of nitrogen leaching in the soil profile
- * Nitrogen is very mobile in the soil profile and it often leaches past the root system before it has a chance to sequester it
 - * Soil bacteria incorporate free nitrogen into their bodies utilizing it to satiate their metabolic functions.
- * Most of the N would have been lost through the leaching process had the bacteria not incorporated it into their cell mass and stored it.
 - * This storehouse of nitrogen is then given back to the plant through a complex process known as nutrient mineralization.
- * Nutrient mineralization occurs when protozoa consume soil bacteria in order to satiate their own carbon & nitrogen requirements.
- * Soil bacteria contain more N than the protozoa require therefore the protozoa essentially spit this excess nitrogen back into the rhizosphere (soil influenced by roots) where it is then absorbed by the plant roots.

CONTAINS NON-PLANT FOOD INGREDIENTS

Active Ingredients

Penicillium bilaiae 250,000,000 CFU per gram, Azospirillum amazonense 250,000,000 CFU per gram,
 Trichoderma reesei 250,000,000 CFU per gram, Trichoderma harzianum 250,000,000 CFU per gram,
 Trichoderma viride 250,000,000 CFU per gram, Lactobacillus reuteri 250,000,000 cfu per gram,
 Bacillus coagulans 250,000,000 CFU per gram, Bacillus amyloliquefaciens 250,000,000 CFU per gram,
 Bacillus subtilis 250,000,000 CFU per gram, Bacillus pumilus 250,000,000 CFU per gram,
 Saccharomyces cerevisiae 250,000,000 CFU per gram

Inert Ingredients

53.00 % Dextrose, 27.95 % Non Calcined Diatomaceous Earth (microbial carrier), 10.00 % Sucrose, , 4.00 % Hydrolyzed Soy Protein,
 4.00 % Humic Acid (leonardite), 1.00 % Hydrated Sodium Calcium Aluminosilicate (Drying Agent)

APPLICATION SPECIFICS

APPLICATION	AMOUNT	COVERAGE	FREQUENCY
Soil Drench	2.0 - 4.0 bs 2.24 – 4.48 kg	Acre Hectare	Every 2 – 4 weeks throughout growing season

- * Utilize higher rate and frequency during periods of abiotic stress (heat, cold, drought, salinity, humidity)



MICRO-SIL

WHAT IS MICRO-SIL

Ionized, Activated Mono & Poly Silicic Acid
Mono Silicic Acid is the Plant Available Portion of Silicon
Complex of Soluble Silica & Hydrogen
Tetrahedral Polymer That Provides Life Sustaining Silicon To Plants
Liquid Delivery System with Low Application Rates
Synergistic With Biologically Enhanced Formulations

GUARANTEED ANALYSIS

24 % Available Silicon Ionized (Derived From Activated Mono & Poly Silicic Acid)

BENEFITS OF MICRO-SIL

- Enhances plant growth and development
- Provides plants with increased resistance to abiotic stress
- Increases fructose and glucose content (Increases Brix Levels)
- Increases the occurrence of beneficial Trichomes in foliar tissue
- Enhances photosynthetic capacity of plants, Increases chlorophyll content
- Promotes efficient CO₂ usage by plants
- Enhances nutrient availability (phosphorus, nitrogen, calcium and potassium)
- Enhances soil fertility, Increases nutrient availability (Primary, Secondary, Micronutrients)
- Fortifies the cuticle in epidermal tissue (first line of defense)
- Mono-silicic Acid stimulates the formation of secondary and tertiary roots
- Immobilizes heavy metals in soil profile
- Increases productivity and enhances plant quality
- Reduces fertilizer and pesticide requirements
- Significantly decreases agricultural water usage
- Non-toxic, environmentally friendly

Microbial Science Laboratories Micro-Sil is 24% Monosilicic acid. It is the form of silicon readily available to the plant. Potassium silicate has to be broken down into Monosilicic acid before the plant can absorb it. Much of the silicon in Potassium Silicate can leach out of the soil as it waits to be converted into Monosilicic Acid.

Suggested pH for application is 10. If applied within 24 hours after mixing with water, you can apply it without raising the pH. If you need to raise the pH, you can use potassium hydroxide or sodium citrate. Always test a small area first to be sure Micro-Sil is compatible with the trial plant.

It is recommended that you use Microbe Remedy with Micro-Sil.

MICRO-SIL

GENERAL APPLICATION RATES

APPLICATION	AMOUNT	COVERAGE	DILUTION	FREQUENCY - TIMING
Greens & Tees	24 oz	Acre	1 : 1000	4 - 6 times per growing season
Fairways – Sports Turf	16 oz	Acre	1 : 1000	4 - 6 times per growing season
Sod Installation	16 – 24 oz	Acre	1 : 1000	Post Installation
Sod (Prior To Lift)	24 oz	Acre	1 : 1000	Prior to lift
Ornamentals	16 – 24 oz	Acre	1 : 1000	3 - 4 times per growing season
Vegetables & Fruits	24 - 32 oz	Acre	1 : 1000	Pre-flower, Post Flower, Fruit Set
Drip Irrigation	2.5 - 3.0 oz	Acre	1 : 1500	Twice per week

Dilution rate may be adjusted based on soil type and or canopy, minimum dilution is 1 : 500
For optimum results pre-dilute 8 – 12 hours prior to application (facilitates conversion of poly-silicic acid to mono-silicic acid)

May be tank mixed with Microbe Remedy, Liquid Fertilizers & Bio-Stimulants

Tank pH must be alkaline (> 10) in order for Micro-Sil to stay in solution

Agitate thoroughly when adding to tank & prior to application

Do not tank mix with acids or heavy metals as precipitation will occur

Micro-Sil is shelf stable for 10 years from date of manufacture

Sold in 1 gallon jugs, 5 gallon pails and 55 gallon drums.



SUSTAINABLE RICE PROGRAM

Difference in root systems of a plant grown under the conventional method using chemical pesticides and fertilizers (left), and a plant grown under the Integrated Program that includes the application of Microbe Remedy and Micro-Sil



NO NEED FOR ROOTING HORMONES

USE

Natural Powerful Microbes

“SEED & PLANT STARTER”

- Contains Endo & Ecto Mycorrhizal Fungi
- Contains 1 Billion Beneficial Microbes per Gram
- Increases Nutrient Uptake
- Promotes Root Growth, Root Architecture & Plant Establishment
- Contains Phosphorous Solubilizing & Mineralizing Bacteria-Fungi
- Contains Plant Growth Promoting Rhizo-Bacteria
- Contains Extracellular Enzyme Producing Bacteria-Fungi
- Contains Nitrogen Fixing Bacteria
- Reduces Abiotic Stress
- Contains L-Amino Acids, Kelp Extract, Calcium & Humic Acids
- NPK - 1-3-3
- Organic & Natural

**Most Rooting Hormones are IBA, (Indole-3-Butyric Acid)
Included in Seed & Plant Starter are Bacillus, Pseudomonas, & Azospirillum,
which synthesize the hormone that produce IBA.**

Rooting Hormones are synthetic and enhance root growth. Seed & Plant Starter enhances seed germination, promotes root growth and enhances plant establishment organically, plus all of the other benefits listed above. Seed & Plant Starter will produce more roots, thicker roots and more fine root hairs.