EcoMicrobials™

EcoFlora

EcoFlora is a complete microbial amendment (bacteria and fungi) that brings life back to impoverished soils and foliage of plants, resulting in faster plant development, better growth, vigor and productivity of all crops.

EcoFlora directly provides essential nutrients to the roots and foliage of plants.

The strains of EcoFlora benefit plants by:

- Increasing acquisition of nutrients by fixing nitrogen and solubilizing phosphorus
- Producing active metabolites (phyto-hormones) that stimulate plant growth and productivity
- Improving soil structure that retains nutrients and water
- Promoting plant health by inducing Systemic Resistance
- Producing active metabolites that reduce the stress caused by adverse environmental conditions and deleterious organisms

EcoFlora is certified in the USA by the Organic Materials Review Institute (OMRI) and The California Department of Food and Agriculture (CDFA) for use in the production of organic food and fiber.

How to apply EcoFlora

EcoFlora is a powder that can be applied directly to the soil as an amendment, or can be dissolved in water and applied to the soil or foliage with any type of equipment used for these applications.

EcoFlora can be activated following strict methods to wake the microbes, multiply them and produce active metabolites prior to crop application.

Strain composition

Bacillus firmus (25 million per gram)
Bacillus amyloliquefaciens (25 million per gram)
Bacillus subtilis (25 million per gram)
Bacillus licheniformis (25 million per gram)
Bacillus megaterium (25 million per gram)
Bacillus pumilus (25 million per gram)
Bacillus azotoformans(25 million per gram)
Bacillus coagulans (25 million per gram)
Paenibacillus polymyxa (25 million per gram)
Paenibacillus durum (25 million per gram)
Pseudomonas aurofaciens (5 million per gram)
Pseudomonas fluorescens (5 million per gram)
Pseudomonas putida (5 million per gram)
Streptomyces coelicolor (5 million per gram)
Streptomyces lydicus (5 million per gram)
Streptomyces griseus (5 million per gram)
Trichoderma harzianum (5 million per gram)
Trichoderma reesei (5 million per gram)
Trichoderma hamatum (5 million per gram)

Mechanisms of action

Free Living Nitrogen Fixing Bacteria
(*Paenibacillus durum, P. polymyxa, Bacillus azotoformans*)

Convert atmospheric di-nitrogen (N2) into plant available ammonia (NH3). Process is mediated by nitrogenase enzyme (secondary metabolite). Paenibacillus are mesophilic, facultative anaerobes, which function in both aerobic & anaerobic soil environments. Paenibacillus form tough endospore covering to protect them against harsh environmental conditions. Azotobacter are aerobic organisms which thrive in neutral and alkaline soil environments. Azotobacter form protective cysts, which mitigate the negative effects of dry soil conditions & UV light.

Phosphate Solubilizing & Phosphate Mineralizing Bacteria
(*Bacillus subtilis, B. amyloliquefaciens, B. firmus, B. megaterium, P. polymyxa*)

Mineral phosphates (inorganic) are solubilized via organic acids (secondary metabolites) produced by bacteria. Organic acids include gluconic acid, 2-ketogluconic acid, lactic acid, isovaleric acid & acetic acid.

Organic phosphates are mineralized via phosphatase enzymes (secondary metabolites) produced by bacteria. Enzymes include phytase, acid phosphatase, and D-glycerophosphatase. Solubilized mineral phosphates are rapidly & efficiently sequestered by endomycorrhizal fungi (synergy). They facilitate root growth, root development, rapid root strike and overall plant establishment, as well as enhance the germination process.

Plant Growth Promoting Rhizo-Bacteria (PGPRB)
(*Bacillus subtilis, B. amyloliquefaciens, B. firmus, B. licheniformis, B. pumilus, Paenibacillus polymyxa*)

Gibberellin Production = *B. pumilus, B. licheniformis*
Auxin (Indole Acetic Acid) = *B. subtilis, B. amyloliquefaciens, B. firmus*
Cytokinins = *P. polymyxa, B. subtilis*.

Auxins control root architecture, vascular tissue differentiation, lateral root initiation, polar root hair positioning & root gravitropism. Gibberillins control cell elongation, cell division, cell differentiation & stress reduction. Cytokinins control cell division (cytokinesis) in roots & shoots, increased resistance to drought, and chlorophyll synthesis. PGPRB promote plant growth independently of supplemental fertilizer applications.

Rhizo-Bacteria, which Stimulate Induced Systemic Resistance (ISR)
(*Bacillus subtilis, B. amyloliquefaciens, B. pumilus*)

Induced Systemic Resistance results from exposure of plant roots to specific Plant Growth Promoting Rhizo Bacteria (PGPRB). The process is dependent on signaling via the phytohormones jasmonic acid and ethylene, which results in production of phenolic compounds. Essentially biotic stimuli elicits Induced Systemic Resistance response that increases resistance to environmental stress (heat, drought, cold, disease).

Bacteria, Actinobacteria & Fungi Antagonistic To Pathogenic Organisms (*Streptomyces lydicus, S. griseus, S. coelicolor, Trichoderma hamatum, T. reesei, Pseudomonas fluorescens, P. putida, Bacillus subtilis, B. pumilus, B. licheniformis*)

They release a variety of secondary metabolites which are antagonistic to pathogenic fungi & viruses. Produce antibiotics which inhibit vital cellular functions of pathogens (Protein synthesis, DNA replication, etc). Produce chitinase (breaks down chitin based cell wall of pathogenic fungi). Produce a variety of cell wall degrading enzymes & ethyl acetate to control pathogenic fungi. Control pathogen through inactivation of virulence traits

Strains present in EcoFlora are maintained cryopreserved at -80 degrees Celsius. The strains are multiplied individually under liquid conditions in aseptic systems that guarantee no contamination. The produced microbes are spray dried under aseptic conditions. The dry strains go through a strict quality control process where presence of contaminants, viable counts and activity are determined. Finally, the strains are blended into the formulation to guarantee the composition of each batch.

Application

EcoFlora is a powder that dissolves readily in water, and can be applied directly to the soil or foliage with any type of equipment used for these applications. EcoFlora can be used dry for the preparation of soils or as amendment to planting holes.

EcoFlora should be applied at moments when the plant has the highest nutrient requirements, such as at planting time, three leaves formation, before flowering and during fruit formation. However, continuous applications during the growth cycle have proven most effective. Best results are achieved by dividing the first monthly dose in two applications, applied every two weeks.

Dose Rates

Growing Media Amendment

Incorporate 0.55 to 1 oz. of EcoFlora per cubic yard of growing media (20 to 37 gr/m^3).

Nursery

Apply EcoFlora weekly or every two weeks at a rate of 1.8 oz per 100 square yards (0.61 gr/m^2).

Greenhouse

Before planting, immerse the trays with plants in a solution made with EcoFlora at 1% concentration (weight/volume).

Apply EcoFlora to soil and foliage two weeks after planting using sprinklers or micro-irrigation systems at a dilution rate of 1 or 2%. Continue applications every two weeks or monthly.

When using injection system dissolve 1.2 lbs. of EcoFlora in 6 to 8 gallons of water (1/2 kg in 22 to 30 liters). Inject the solution to soil and foliage at a dilution rate of 1:100. Apply 600 to 800 gallons for each 10,000 ft^2 (2300 to 3000 liters for 1000 m2). This is equivalent to 0.54 to 0.72 gal/$yard^2$ (2.44 to 3.26 L/m^2) or 0.018 oz./$yard^2$ (0.61 gr/m^2). Apply at planting and repeat application every 2 to 4 weeks.

Ornamentals, Row Crops

Apply EcoFlora to soil at planting at a rate of 6 oz./acre (420 gr/ha), then apply to soil and foliage at a rate of 4 to 8 oz. per acre (280 to 560 gr/ha) every 4 to 6 weeks. For strawberries apply a dose rate of 8 oz. per acre (560 gr/ha) every month. For grapes apply a dose rate of 4 to 6 oz. per acre (280 to 420 gr/ha) per month. For a lower cost program apply product at planting or 3 leaves stage at 6 oz./acre (420 gr/ha), pre-florescence and pre-fruit formation at a rate of 4 to 10 oz. per acre (280 to 700 gr/ha).

Foliar application over the fruits at a 1:5,000 to 1:10,000 dilution will protect them from fungal diseases. Weekly applications of EcoFlora at 2.8 oz./acre (200 gr/ha) will help control plant diseases.

Root crops

In crops such as ginger and turmeric apply EcoFlora to seed, emergence, two weeks and four weeks after planting at a rate between 1.8 to 2.3 oz./acre (124 to 161 gr/ha).

For potatoes apply EcoFlora at planting or 3 leaves stage at 6 oz./acre (420 gr/ha), pre-florescence and pre-fruit formation at a rate between 4 and 10 oz. per acre (280 to 700 gr/ha).

Fruit and nut trees

Apply EcoFlora to soil at a rate of 3 to 5 oz. per acre (210 to 350 gr/ha) every month. Apply EcoFlora to foliage at a dilution of 1:5,000 to 1:10,000 prior to flowering and fruit formation.

In case of disease, apply EcoFlora every week at a dilution of 1:5000 to 1:10,000. Apply to foliage and/or soil according to the origin of the disease. Weekly applications of EcoFlora at 2.8 oz./acre (200 gr/ha) will help control plant diseases.

Grains

Immerse the seed to be used in an acre in 1.5 oz. of EcoFlora (100 gr/ha). Apply EcoFlora to soil and foliage at a rate of 4 to 7 oz. per acre (300 to 500 gr/ha) at emergence and pre-florescence.

Flowers

Apply EcoFlora every week at 2.85 to 4.2 oz./acre (200 to 300 gr/ha).

Weekly applications of EcoFlora at 6 to 8 oz./acre (420 to 560 gr/ha) will help control plant diseases.

For intensive flower production systems in greenhouses we recommend a monthly edaphic application of 7 oz./acre (500 gr/ha). Apply to the foliage 0.35 to 0.53 oz. per bed of 34 m2 diluted in 2.6 gallons of water (10 to 15 gr in 10 L of water). Apply this dose every week or two weeks. Modify this dose rate for different size beds or beds that require different amount of water.

Golf courses

Dissolve EcoFlora in water and apply at a rate of 0.45 oz. per 100 square yards (15 gr/100 m^2) of greens or tees, and 0.2 oz. per 100 square yards (7 gr/100 m^2) of fairways. Apply the product by weekly or monthly.

If bacterial or fungal disease is evident increase the dose rate to 0.9 oz per 100 square yards (30 gr/100 m^2), and apply the product every two weeks.

Hydroponic systems

Dissolve monthly 1/4 oz. of EcoFlora for every 55 gallons of water in the culture system (3.4 gr/ 100L).

Recommendations

Flush irrigation systems and sprayers with plenty of water from any pesticide residue before applying EcoFlora. Avoid applying pesticides one week before and one week after applying EcoFlora.

For best results, apply EcoFlora early in the morning or late in the afternoon.

Keep product dry in an airtight container. Avoid exposure to direct sunlight.