

EcoAdvance® Premium Biology

Feed the Soil to Feed the Plant

Ecogrowth rock-phosphate granules, which are included in all Ecogrowth granular fertiliser blends, are coated with EcoAdvance® premium biology.

Soil biology, in particular the microbial component, plays an indispensable role in soil function. Biologically active soils are the cornerstone of healthy, resilient and sustainable agricultural production systems. When functioning effectively, soil microbe–plant root interactions positively influence plant health and productivity. Microbial activity in the rhizosphere surrounding plant roots stimulates soil-building processes and enhances nutrient availability.

Ecogrowth's EcoAdvance® premium biology is our proprietary granular fertiliser inoculum, containing carefully selected beneficial soil microbes and complementary bio-stimulants (Table 1). This powerful microbial primer works by kick-starting soil microbial activity and helping to establish a connection between plant roots and the soil microbiome (Figure 1). As the soil is fed with EcoAdvance® - activated mineral fertiliser, microorganism-based processes are supported that have many soil and plant benefits, including natural mineral cycling, enhanced nutrient release and delivery, improved soil structure and moisture retention, and increased overall plant health and resilience.



fertiliser for life

Table 1: Functional ingredients of EcoAdvance® premium biology.

EcoAdvance® premium biology Component	Function*
<i>Bacillus spp.</i>	Plant growth-promoting rhizobacteria to solubilize rock-mineral Phosphorus, fix atmospheric Nitrogen, and promote root growth.
<i>Trichoderma spp.</i>	Plant growth-promoting fungi to solubilize soil minerals, suppress plant pathogens and promote root growth.
<i>Glomus spp.</i>	Vesicular arbuscular mycorrhizae (VAM) fungi to extend the effective range of plant roots and create a web of nutrient and water exchange throughout the soil.
<i>Complimentary biostimulants</i>	Nutrients and phytohormones to stimulate soil microbe and plant root growth.

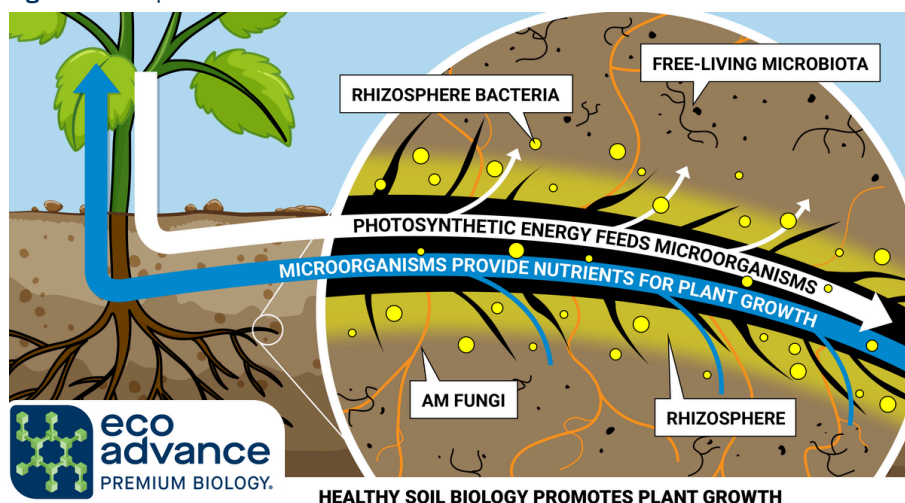
*Functions described are not exhaustive.



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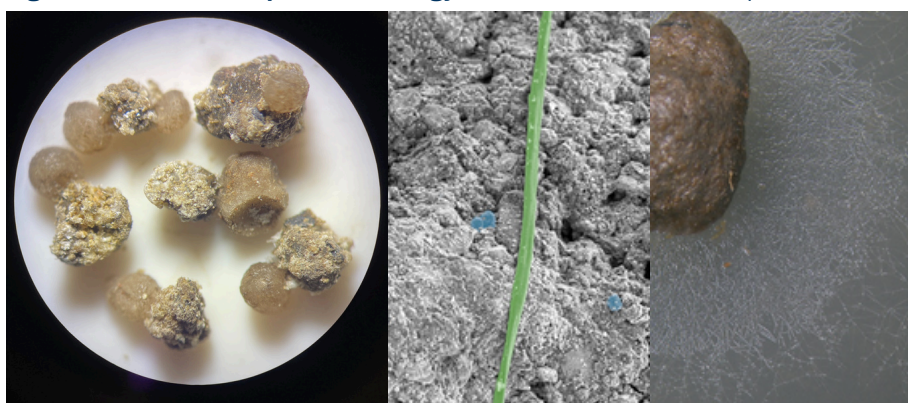
Figure 1 Legend: Plants acquire mineral nutrition and water via their roots. Microbial activity is essential for soil-plant nutrient exchange; microbes create a link between soil nutrients and water and the plant root. When functioning correctly, soil microbe-plant root interactions allow plants to receive the nutrients they need from the soil on demand. Plant beneficial soil microorganisms exist both in the rhizosphere, the area immediately surrounding the root, and in the wider soil volume. Microorganisms directly connected to the plant root, such as vesicular arbuscular mycorrhizae, associate with free-living soil microorganisms to create a web of nutrient and water exchange. Soil microorganisms must be fed to proliferate and perform their various functions, such as plant nutrient supply. In addition to soil organic carbon, soil microorganisms feed off root exudates derived from plant photosynthesis. Plants purposefully channel photosynthetic energy into root exudates to attract and support beneficial soil microorganisms that are tailored by the plant species growing. Plants support soil microbes when they are needed to solubilize soil nutrients and access a wider soil nutrient bank. In turn, soil microbes promote soil function and health driven by microbial activity.

Figure 1: The plant root-soil microbe connection.



EcoAdvance® premium biology contains viable microbial spores (Figure 2) that are shelf-stable and activated by water when coated granular fertiliser is introduced to soil, even more so with available nitrogen. The composition of Ecogrowth rock-phosphate granules promotes microbial growth directly on the granule surface, serving as a 'seed' of EcoAdvance® premium biology growth that spreads into surrounding soil, carrying rock-mineral nutrients with it.

Figure 2: EcoAdvance® premium biology contains viable microbial spores.



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Figure 2 legend: Left image: Magnified image of Natural (SF12) granules inoculated with EcoAdvance® premium biology and covered in *Bacillus* spp. growth. SF12 granules were incubated in humid conditions, after which a crust of *Bacillus* spp. growth spread across the SF12 granule surface and physically joined to adjacent Carbon Coated Urea (CCU) granules, the latter providing a nitrogen source for microbial growth. Middle image: Scanning electron microscopy images of rock-phosphate granules with false-coloured EcoAdvance® premium biology microorganisms (bacteria, blue, and fungi, green) growing across the surface. Right image: Magnified image of Soft Rock-Phosphate granules inoculated EcoAdvance® premium biology and placed onto nutrient-rich solid media, showing *Trichoderma* spp. growth on the agar surface.

The microbiome of rhizosphere soil is the result of many factors and is influenced greatly by the soil environment and plant species growing. EcoAdvance® premium biology is not intended to micromanage the soil microbiome or dictate the microbial species that ultimately prevail in a functional, productive soil. Rather, EcoAdvance® premium biology acts as a catalyst of a system wherein soil nutrients are accessed by the plant via soil biology (Figure 1). Importantly, EcoAdvance® premium biology makes P in our rock-phosphate granules bioavailable to the plant, even within a single growing season, and promotes VAM colonisation of root cells, which connects the plant with soil biology (Figure 3). Thus, Ecogrowth granular fertiliser coated with EcoAdvance® premium biology holistically unlocks microbial function in the soil, leading to improved plant nutrient access and soil health.

Figure 3: EcoAdvance® premium biology unlocks P in rock-phosphate fertiliser and promotes VAM root colonisation.

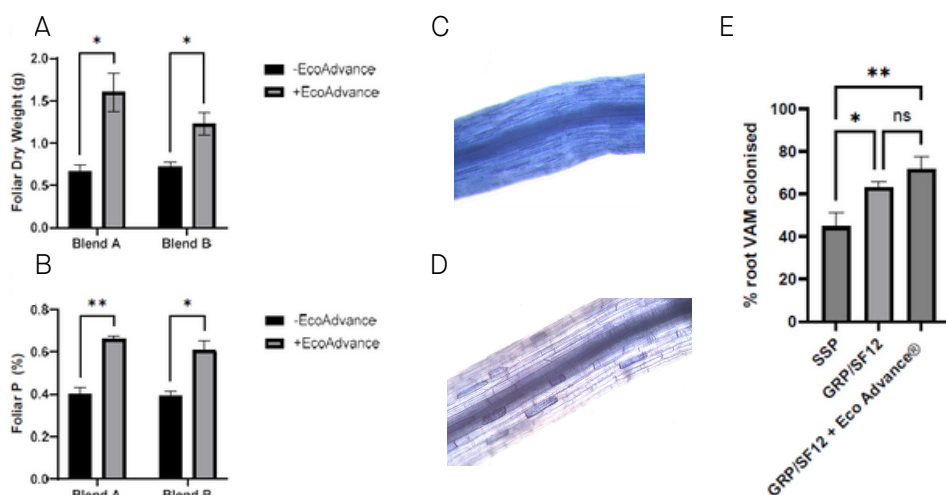


Figure 3 Legend: Left: Barley was grown for 5 weeks in pots containing soil supplemented with two Ecogrowth rock-phosphate granular fertilisers. (A) Greater plant growth (dry weight above-ground tissue) occurred with EcoAdvance® premium biology coating of rock-phosphate granules (+EcoAdvance®) than without (-EcoAdvance®). (B) Differences in plant growth correlated with leaf tissue % P content, indicating that EcoAdvance® premium biology facilitates the plant availability of P nutrition in Ecogrowth rock-phosphate granules. Data are means \pm SE, * $P < 0.05$, ** $P < 0.01$ (unpaired t-test with Welch correction). Right: Assay of root colonisation by vesicular-arbuscular mycorrhizae (VAM) in soil supplied with different nutrient forms. (C) Trypan blue-stained root section showing no VAM colonisation. (D) VAM colonisation of roots with cells full of darker-stained VAM hyphae. (E) Leek plants were grown for 6 weeks in soil treated with different fertilisers. Percentages of Trypan blue-stained roots that were VAM colonised were determined by the gridline intersection method. Greater root VAM colonisation occurred with rock-phosphate granules (GRP/SF12) compared to a chemically soluble source of P (SSP), and even further root VAM colonisation occurred with EcoAdvance® premium biology - inoculated rock-phosphate granules. Data are means \pm SE, * $P < 0.05$, ** $P < 0.01$, ns: not significant (ANOVA).