SweeterSoils

Bactivate

WHAT IS BACTIVATE?

Bactivate is a Microbial Soil Conditioner composed of 5 specific bacillus species (listed below) that enhance plant growth and protection. This document highlights the role of beneficial micro-organisms in stimulating plant growth and protection and their use as bio-fertilisers and biological control agents to benefit unproductive and stressed environments.

WHAT IS A MICROBIAL SOIL CONDITIONER?

A Microbial Soil Conditioner is a culture of beneficial micro-organisms (special bacteria and/or fungi) formulated with a suitable carrier material that helps soils improve their nutrient status and encourages proper plant growth and protection. These beneficial microorganisms can:

1. Increase phosphorous uptake
2. Make atmospheric nitrogen available and readily accessible to roots
3. Promote the growth of roots by releasing plant regulation substances, and
4. Protect the roots from pathogenic micro-organisms and create a healthy environment for outstanding plant growth and performance.

A Microbial Soil Conditioner acts as a natural biocataliser by assuring quick colonization of the rhizosphere (root zone) with beneficial micro-organisms that will re-establish a healthy soil and allow plants to thrive. A healthy rhizosphere dominated by beneficial micro-organisms is the perfect natural environment for plant growth. Farmers can create real economic benefits by applying this biotechnology to their own farm soils. By identifying exactly which organisms and correct application rates, you can maximize beneficial outcomes while limiting adverse effects of normal farming practices over both the short and long term.

WHAT ARE BENEFICIAL MICRO-ORGANISMS (BACTERIA & FUNGI)?

There are a large group of naturally occurring organisms which are responsible for nutrient recycling (for one, through decomposing plant residues) and other soil building and maintaining activities. Mixed culture of beneficial microorganisms such as photosynthetic bacteria (Rhodopseudomonas sp) lactic acid bacteria (lactobacillus sp.), yeast (saccharomyces sp.) and fermenting fungi can positively improve the soil fertility as well as plant productivity that can help improve the effects of

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common management practices such as crop rotations, incorporation of organic materials, conservation tillage, crop residue recycling, and bio-control of pests. Micro-organisms be used as soil inoculants to improve soil quality, and as a direct consequence the health and the growth performance of crops. Existing ratios of micro-organisms are often unknown or not well identified and the beneficial effects of these micro-organisms often go unrecognised. With sustained use, the cumulative effects of Bactivate improve year by year.

Agriculture's frequent practices such as tillage and site preparation can reduce the population of beneficial micro-organisms, which are one of the most important components of the soil as they carry out many important processes vital for soil fertility and health. Their re-introduction using a Microbial Soil Conditioner in areas where they have been reduced will put life back into the soil, greatly improving soil quality, and therefore improving plant's health and growth vigour.

HOW DO BENEFICIAL MICRO-ORGANISMS IMPROVE PLANT GROWTH?

Rhizobacteria promotes plant growth directly and/or indirectly by:

- Producing plant regulators
- Facilitating nutrient uptake
- Accelerating mineralization
- Reducing plant stress
- Providing nitrogen fixation
- Promoting other beneficial micro-organisms such as 'mycorrhizal fungi'
- Suppressing plant diseases, and
- Functioning as nematicides and insecticides

Five specific Bacillus species have been formulated into ***Bactivate*** and by way of a soil additive help plants increase their growth and yield performance. Bactivate's beneficial bacteria are really only observable when they grow in colonies on nutrient agar, under specific light conditions or with electronic microscopes. Bacteria have the ability to form a resting spore, which allow them to survive extreme periods of heat, cold and desiccation.

HOW DO BENEFICIAL MICROBES PROTECT PLANTS AGAINST PLANT ROOT PATHOGENS?

Three factors contribute to the protective functions of beneficial microbes:
Competition for nutrients in soil and rhizosphere
Competition for infection sites and root colonization, and/or
Induced systemic resistance (Salerno et al. 2000).
Induced resistance is defined as an enhancement of the plant's defensive capacity against a broad spectrum of pathogens and pests. It is acquired after appropriate stimulation such as the introduction of a beneficial micro-organism into the rhizosphere (root zone). Elevated resistance to pathogen infection due to an induced agent is called induced systemic resistance or systemic acquired resistance. Many micro-organisms have the ability to induce systemic resistance against pests and diseases. Two Bacillus species (subtilis and thuringiensis) in ***Bactivate*** are proven to suppress pests and diseases.

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WHY WE SHOULDN'T CONTINUE TO OVER USE CHEMICALS AND CHEMICAL FERTILISERS?

The overuse of chemicals and chemical fertilisers is contributing to the decline in production and the degradation of our soils. Unfortunately, these practices aren't sustainable, and the continued practice of this will open up our soils to lower yields and soil diseases. We are already seeing diseases creeping into Australia that we haven't seen before, such as Panama disease and other Fusarium oxysporum mutations. This can be directly linked to the overuse of chemicals and fertilisers in our soils. Graeme Harvey's book "We Want Real Food" points out the fact that the overuse of chemical fertilisers and chemicals is also a problem for cattle farmers as their meat (protein) suffers because the livestock are undernourished and overstressed, even the milking cows produce less and poorer quality milk. It also points out that these man made fertilizers deplete the soil of biologicals and leach out minerals and actually prevent their own use in the plant actually absorbing the other minerals it needs.
By adding in specific, antagonistic bacteria, we can start to rebuild the entire soil biota. Bactivate is one of the only products that can prove the bacteria survive once they hit the soil, and we also know the exact function these Bacillus will provide. By knowing this and utilising this advanced technology, we are able to reduce the amount of chemicals and chemical fertilisers you use, while improving the soil quality and yield.

BACTIVATE BACTERIA OUTLINED

Bacillus thuringiensis has a strong ability to decompose organic nitrogen components in the soil. It is widely known for its defensive and offensive capacities against soil and plant pathogens. Bacillus thuringiensis will create a crystalline structure which many pests feed upon.
Once ingested the crystalline structure will cause paralysis of the pest's digestive tract causing starvation and eventual death.

Bacillus megatherium has a strong ability to decompose lecithin, calcium phosphate and phosphor tricalcium. The bacteria changes animal and plant remains in the soil into phosphorus salt and thoseminerals readily available for fast uptake for plants to use for healthy growing. Phosphorus is one ofthe three major or primary nutrients for plants that were originally rich in the soil. However, mostagricultural soils have a lack of phosphorus nutrients because the element is mostly in the organic state which is hardly dissolved and remains as an inorganic substance. Coupled with this is the practice of using phosphate fertilisers in large amounts in search of high yields. This leads to more phosphorus compounds sitting undissolved in the soil. The bacillus bacteria in ***Bactivate*** with its phosphorus decomposing effect promote the dissolvability of the inorganic elements that are often already sitting in the soils after prolonged fertilisation which can readily be absorbed by plants.Bacillus megatherium therefore is of great assistance to improve the utilisation of the phosphoruselement in the soil for increased and healthy plant growth.

Bacillus mucilaginosus is a silicate bacteria which has been accepted and researched earlier and more by former Soviet and Chinese scientists. Silicate bacteria are special in the soil as they decompose any potassium minerals, release potassium and boast azotification. The bacteria metabolize and cause the production of organic acids, amino acids, amylose and hormones for plant utilisation. Meanwhile, the reproduction of the bacteria also suppresses pathogenic cells. The level of potassium can be raised by 33-34%. At present, silicate fertilisers are applied on more than 30 crops in over 20 provinces and districts in China. The bacteria demonstrate the effect for improving the

quick-acting phosphate and potassium in soil, thus raising yield and quality as one of the most important elements in microbial fertilisers.

Bacillus subtilis is known for its capacity to multiply quickly in the soil. It also shares ability common to the other bacteria in Bactivate in that they have the ability to form a tough, protective endospore, allowing the organisms to tolerate extreme environmental conditions. It has a strong capacity to produce proteinase, diastase and pectase. It is the major bacillus that decomposes animal and plant remains into available nitrogen in the soil. These bacteria live within specialized nodules on the root systems of plants, where they process atmospheric nitrogen into a form available for the plants to use. Thus bacillus subtillis frees up soil nutrients in both soil and air for plant use. I is also known as an antagonistic organism against plant pathogens combining with Bacillus thuriengensis to suppress plant pests and pathogens.

Bacillus licheniformis is a facultative anaerobe bacteria which proliferates in soil. It is capable of decomposing protein and lignin to provide nutrition for plants in forms such as amino acids. It can effectively decompose organic matter in the soil and thereby provides nutrition for the growth of plants.

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