



WHAT IS BACTIVATE SHIELD?

Bactivate Shield is a Microbial Soil Conditioner composed of 2 specific beneficial microorganisms (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. The abilities of plants treated with Bactivate Shield to resist pathogenic activity that is typically associated with broad acre farming (cereal crops, grasses, fruit and vegetable crops and so on) will be evident with prolonged use.

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.

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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 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.

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.

THE RIGHT BACTERIA FOR PROTECTION AGAINST ROOT PATHOGENIC FUNGI

The right bacteria in the right soil conditions can do more than just break down organic matter, build the soil structure, and fix nitrogen and release phosphorus and potassium from the soils. However, the key is having the right micro-organisms which are present in Bactivate Shield.

UNDERSTANDING THE SOIL RHIZOSPHERE SYSTEM (PATHOGENIC VERSUS BENEFICIAL MICROORGANISMS)

The term "rhizosphere" describes the zone of soil surrounding the root with intense bacterial activity. The interactions between plant roots and the rhizosphere are beneficial to plant production through a number of mechanisms:

1. Increases in availability of soil phosphorous,
2. N-fixation, and
3. Production of compounds that can inhibit the growth of plant pathogenic fungi.

Sustainable plant production can then be maximized by incorporating Bactivate Shield into the soil and balancing all the above beneficial effects. Pathogenic and beneficial microorganisms are all found in agricultural soils throughout the world. Some pathogenic microorganisms induce damping-off, root rot or vascular wilt of crops of economic importance, whereas others are unable to induce disease in a given plant species (Salerno et al. 2004). It has been already shown that beneficial microbes protect plants against pathogenic ones. Both pathogenic and beneficial microbes are able to colonize plant roots. However, beneficial microorganisms do not induce host tissue damage; in opposition, they establish a compatible interaction with the plant (Salerno et al. 2004). The differences in pathogenicity do appear to be linked to differences in polysaccharide degradation capacities between the two microorganisms once they have colonized the roots (Salerno et al. 2000).

Differences between pathogenic and beneficial microbes may reside at the cellular level of root interaction. Plant tissue becomes rapidly disorganized in roots colonized by pathogenic strains whereas root tissues do not show signs of damage with progression of beneficial species (Salerno et al. 2000).

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 SHIELD BACTERIA OUTLINED

Paenibacillus Polymyxa SQR 21 a ubiquitous bacterium commonly found in soils

Trichoderma Viride SQR T37 is a fungus

Paenibacillus Polymyxa SQR 21 and *Trichoderma Viride SQR T37* colonize the rhizosphere, competing with some pathogenic fungi such as *Rhizoctonia*, *Fusarium*, *Aspergillus*, and others, and by this means reducing the incidence of plant diseases caused by these pathogenic organisms. It has been shown that *Paenibacillus Polymyxa SQR 21* and *Trichoderma Viride SQR T37* reduced the colonization of *Fusarium verticillioides* in maize plant roots. (Qirong Shen.et al. 2003)