Compost Tea versus Packaged Biologicals

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Commercially Available Biology

Products containing beneficial microorganisms are becoming available in the marketplace. Some are in a dry form, and others are in a liquid form; some have living organisms, whereas others have dormant, "sleeping" organisms. There are products containing active microorganisms that must be used immediately and have no shelf life. Other products have active microorganisms contained in special, breathable packaging for a long shelf life. Several products have dormant microorganisms that have been stabilized so that they do not cause their container to burst. If organisms are active and growing, they release carbon dioxide and other gases, which can cause the container to explode. Thus, to increase shelf life, the organisms must not be actively growing if the container is closed and sealed.

Balance of Beneficial Biology Is Essential

Beneficial microorganisms are necessary for successful organic plant-growing systems; in general, bacteria, fungi, protozoa, and nematodes are the minimum required. These organisms need to be properly balanced relative to what plant is desired to protect the plant from diseases and pests, to retain and cycle nutrients, and to build soil and soilless media structure to allow oxygen and water to move through the root system correctly. If two or three of the groups are missing, then the system will be out of balance, and conditions will select for nonbeneficial microbes to grow and potentially harm plants.

Diversity and Minimum Amounts of Biology Necessary

Minimum amounts of beneficial microorganisms must be present at all times for optimal organic plant-growing conditions, for example, minimum levels of bacteria, fungi, protozoa, and nematodes. Diversity must be maintained within each group, as well, because different species of these organisms wake up and become dormant under different environmental conditions. For plant protection, at least 70 percent of the microbes present must be beneficial organisms to outcompete nonbeneficial organisms for food and space. Beneficial organisms must be awake, not dormant or asleep, for protection and nutrient retention and cycling to be maintained.

Limited Amount of Known Species Cultured

Scientists can only grow something less than 0.01 percent of the species of bacteria and fungi in the laboratory. Most of the species that cannot be grown in the lab are unnamed, even though we know they exist through the use of nucleic acid assessment methods, which do not require organisms to grow in lab conditions to detect them.

Even though scientists don't know how to grow most of the beneficial species of bacteria and fungi, those that we do know how to grow can be produced in high numbers and then put to sleep to allow packaging and shipping. If they weren't asleep, or dormant, the sealed container would burst.

Unfortunately, the types of materials used to achieve dormancy, such as drying, strong acids like phosphoric acid, strong bases like potassium hydroxide, or high-concentration salts or sugars, result in the loss of nearly 50 percent or more of the species present. Many bacteria and fungi do not make dormant stages tough enough to protect the organisms from drying, strong acids, strong bases, or high concentrations of salt or sugar.

However, a recent breakthrough in packaging material allows oxygen to diffuse into even sealed containers, making the containers breathable so that dormancy is no longer a necessity. Without the need to strong-arm the organisms into a dormant condition, the species of bacteria and fungi are not lost, and when these active organisms are placed in an environment with food, air, and water, the organisms are ready to go right to work.

Dormancy Limits Plant Protection

When dormant microbes are applied to leaves, they will not adhere to the leaf surfaces because to stick to leaf surfaces, the organisms have to be awake and producing the glues to stick themselves. Organisms must be active to produce glues and make threads so that they can adhere to plant surfaces. Therefore the

packaging material must allow the organisms to stay active if there is any hope for a product that sits on the shelf to actually be able to immediately adhere to leaf or root surfaces.

One to Ten Species Is Not Present in High Enough Levels in Packaged Biologicals

Diversity is essential for organisms to achieve year-round disease suppression, demonstrate seasonal-long nutrient cycling, or work together to build soil structure. Products with only a few species of bacteria, from one to possibly a maximum claimed of eighty species, could add beneficial species, but those species have limited conditions where they will be active. Through the three billion years that bacteria and fungi have existed on this planet, each species has been selected to grow in very limited conditions. Since each species is active only for a relatively short time each year, to protect the plant in all conditions, species diversity must be extremely high. Literally thousands of species must be present, and many of them active at any particular time, to protect and help the plant. Because each set of environmental-plant conditions requires a unique set of active bacterial and/or fungal species, many needed beneficial species are missing in dormant, packaged biological products.

Recommendations

Three forms of biology are available in the marketplace: (1) limited species inocula; (2) compost, worm castings, and vermicompost; and (3) actively aerated compost tea. Applying a single bacterial species to control a specific problem often does not succeed because environmental conditions and plant requirements may not favor the growth or survival of that particular single species. It is recommended that growers test leaf surfaces and root systems to learn whether the addition of any type of dormant spore is necessary before adding any inoculum. In general, the use of high-quality compost, worm castings, vermicompost, or actively aerated compost tea is recommended to add the minimum amounts and diversity of biology necessary for maintaining healthy growing systems.

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