Beneficial Soil Microbes May Increase Soil Health in Vineyards

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Abstract:

Farmers operating a vineyard and winery in Southern New Jersey adopted a unique cultivation system for weed control and eliminated all herbicides in the vineyard. As a result their observations showed increased vine health, increased grape fruit quality and anecdotally reported improved wine quality. The growers also observed, an increase in earthworm populations in field soils, improved soil health and better overall plant health. They attributed soil and plant improvements to an increase in beneficial soil microbes. Soil fungi and bacterium are both part of the soil environment. Farming practices can either harm or accentuate populations of soil microbes. Farming practices that reduce or eliminate all fungi and bacterium in soil may make plants more susceptible to soil pathogens and other diseases. Beneficial microbes have many functions to aid in plant growth and help maintain a beneficial soil environment. Soil fungi and soil bacterium not only act as decomposers, but also influence water dynamics, act as nutrient stabilizers, and can be plant disease suppressors; all of which are functions essential to keeping plants healthy. Of course, there are harmful fungi and bacterium, but typically all fungi and bacterium are reduced or eliminated with some production practices, and without much after though of what is happening in the soil environment. Beneficial soil fungi and beneficial bacterium currently have not become widely cultured for crop production in agricultural soils. Farmers using mainly synthetic chemicals for crop production and pest control have not yet broadly realized the impacts on soil microbes or the ability of beneficial soil microbes to naturally control some plant pests. More research is needed to determine if adoption of alternative weed control strategies, void of synthetic herbicides, can improve soil and plant health by encouraging microbial populations to flourish in crop soils.

Summary:

The goal of utilizing more natural farming practices in which bacteria and fungi are encouraged to flourish in the soil may help plants. Bacteria and fungi are very important to plants because they work in a symbiotic manner to support and protect plants and improve soil health. Fungi also have the ability to use carbon from the plant and in exchange help the plant uptake soluble nutrients from the soil. Beneficial soil fungi and bacterium also promote plant growth by helping the plant synthesize enzymes to break down disease organisms and by promoting the production of antibodies by plants. Thus, plant defenses are activated when beneficial fungi are present in the soil environment.

Soil Fungi have been found to be more abundant than soil bacterium, but of utmost importance is they both are able to have a symbiotic relationship with plants. These relationships promote overall benefits to all organisms and are most successful when both beneficial and pathogenic organisms are undisturbed, to continually recycle the natural process of microbe competition in soil. There is proof of this statement, especially with the two most prevalent organisms in the entire world, plants and fungi have a symbiotic relationship together in their own respective environments.

To promote biodiverse and healthy soils, some farmers are adopting sustainable practices for weed control to improve beneficial microorganism populations in soil. In the case of wine grapes, growers who have eliminated herbicides from the weed management program have indicated improved wine taste and healthier plants. More research is needed to quantify this hypothesis.

Tillage under the canopy is used to reduce weed populations rather than directed herbicide applications.

The combination of between-row mowing and under-canopy tillage is used to enhance soil health and increase soil biodiversity in this vineyard.

Drip irrigation delivers water and fertilizer to plants to further increase plant health in a sustainable production system.