

Root Health

When it pertains to plant cultivation, sometimes it's more of an art form rather than a science. One concept behind plant growth that is an essential component to learn about growing is the knowledge related to root health. Some would argue the roots of a plant are the most important part of a plant and yet, is easily one of the most damaged parts of a plant if not maintained. Roots help the plants stay anchored to the ground as well as allow uptake of water and nutrients that are needed to help growth. Therefore, having good healthy root zone is essential and beneficial for plant quality and quantity. There are several factors that should be considered to maintain a healthy root zone at optimum condition.

Having a healthy root zone is determined by a number of factors such as root oxygenation, root competition, root temperature, salinity, pathogens, microbial relationships and more. Oxygenation of the root zone, either with an air stone in a deep water culture hydroponics system, or a loose medium such as perlite in soil, will allow root health to improve and dramatically increase the speed of growth. Deprivation of oxygen will cause the roots to suffocate and not complete the aerobic respiration process.

As for root competition, some scientific studies have discovered that plants tend to produce more mass when growing next to a neighboring plant versus a plant growing alone. In some cases, companion planting of cover crops like a clover, the root zone will explode with life. The cover crop will have nitrogen fixing bacteria in the root zone contributing to the uptake of nitrogen by nearby plants that share this root zone.

Root temperature strongly affects shoot growth. It tends to play a more important role than the surrounding air temperature of a plant. If a plant is exposed to less than 30 minutes of root zone heat, the crop can be affected in many negative ways. Therefore, ensuring that the root temp remains temperate is essential. Cool root zone in nutrient solutions actually hold more dissolved oxygen for better oxygenation. Cooling the roots has other positive effects that play into the production of plant growth hormones as well.

Soil salinity can also be a serious issue regarding root health. Areas where salinity is extremely high tend to cause the root cells to lose moisture and die.

Lastly, microbial relationships can influence plant health and growth significantly. Basically, specific micro-organisms can be attracted to a plant by secretions released by root systems. This secretion is called root exudates. These exudates consist of amino acids, sugars, fatty acids, carbohydrates and proteins. They act as signals that form a symbiosis with microbes such as beneficial bacteria and mycorrhizae.

Mycorrhizae is a fungi that creates a symbiosis, or mutual relationship, with the plant's roots. The plant allows the fungus to take the minimal amount of nutrients it needs to grow. As a return favor to the plant, the fungus becomes an extension of the root system, assisting in an even faster rate of nutrient absorption and uptake. Root exudates can even sense attack by pathogenic microbes and release phytoalexins as defense mechanisms. These phytoalexins are antimicrobial and antioxidant in nature, offering added immunity to pests and diseases.

When it comes to plant growth, root physiology is an aspect of plants every grower must consider when creating and orchestrating a system, soil or hydroponics.