MitoGrow™

Aqua 3-IA
Web White Paper 2023

Aqua 3-IA is an auxin plus biostimulants used to promote root growth and development in most species of trees, shrubs, perennials, and annuals. Aqua 3-IA encourages and improves overall nutrient and water uptake, thereby enhancing vigor and growth as well as tolerance to biotic and abiotic stresses. It is a suspendable dry powder containing a proprietary combination of the growth hormone, Indol-3-butryic acid (IBA); vitamins B1, B3, & B6; kinetin; Bacillus amyloliquefaciens; seventeen varieties mycorrhizae; seaweed extract (Ascophyllum nodosum); and carbohydrates.




How it Works

In healthy plants, the shoot growth and root growth are balanced resulting in growth that is limited only by the availability of light, water, nutrients, and the plant's ability to absorb them. Unfortunately, environmental stressors, root damage, pest damage, age, and disease can upset the shoot to root balance. If new root growth lags behind shoot growth, and a sudden change in the environment occurs, such as a drought, the plant can rapidly decline and die in as little as a few days. In established trees the decline my take several years.

The patented combination of plant hormones and biostimulants in Aqua 3-IA defends the plant against stressors by creating a healthy root biome with mutualistic relationships between the plant, bacteria, and mycorrhizae. The hormones and microbe relationships also activate the plant's innate immunity preparing it for a variety biotic and abiotic assaults before they occur.

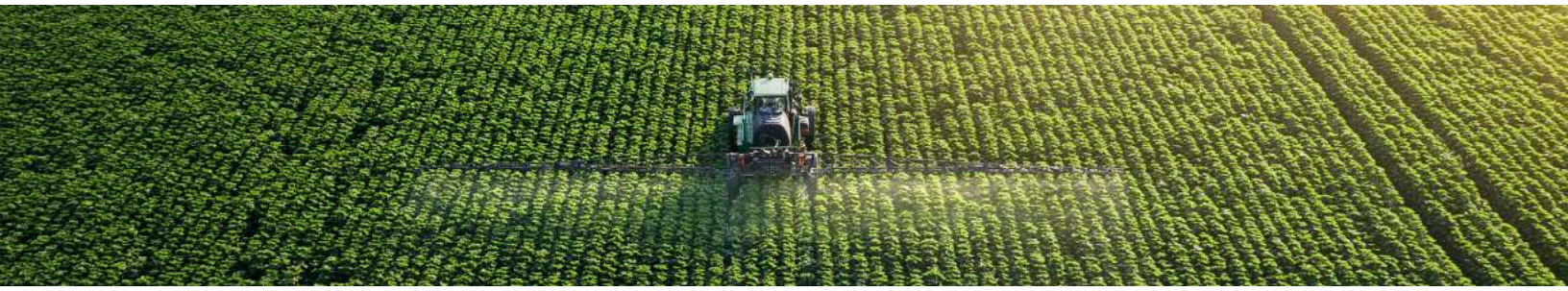
Indole-3-Butyric Acid (IBA)

↑ Increases root growth
↑ Increases root hair development
↑ Activates plant immune system
↑ Increases resistance to abiotic stress
↑ Increases crop yield
↑ Stimulates flower development
↑ Promotes fruit development
↓ Reduces transplant shock

IBA is an auxin, and auxins are a subset of plant hormones responsible for the morphogenesis of plants. They are generally produced in one part of the plant and are transported to other parts of the plant where the auxin concentration affects the tissue type and development. IBA and its sister compound IAA, Indol-3 Acetic Acid, are produced in the apical buds of the plant and travel to the roots where they stimulate new root development. These new roots then acquire additional water and nutrients from the soil to support new growth throughout the plant. In healthy plants the shoot growth and root growth remain balanced resulting in plants that grow at the natural rate for their particular species. IBA is more biologically active than IAA and because Aqua 3-IA uses the naturally occurring acid form of IBA, rather than the salt form found in most products, it is more persistent in the root zone due to the acid's lower solubility in water.

When the natural balance between IBA production in the buds and root growth stimulation becomes out of step with each other, the result is a negative feedback loop leading to a steady decline and eventual death of the plant. Application of the Aqua 3-IA formula has been shown to override the declining auxin cycle and restore the root growth rate so that it can support a healthy growth rate for the entire plant.

There are many agricultural products that contain IBA, but Aqua 3-IA is unique in the concentration of IBA it provides for use on transplanted or established plants. Only products specifically formulated for rooting of cuttings have higher concentration of IBA.



Much More Than an Auxin

Maximizing the initial root stimulating effects of the treatment is an important distinction of Aqua 3-IA versus other products containing IBA or IAA alone or in combination. The addition of B vitamins and kinetin synergistically increases the metabolic boost to the plants. The addition of B vitamins to our product exempts Aqua 3-IA from EPA regulation while providing additional benefits to the plant. Recent research has shown that Vitamin B1 can be an activator of systemic acquired disease resistance in plants. Vitamin B1 has been shown to increase root development in the lab and when combined with Vitamins B3 and B6, those root growth benefits have increased by a factor of sixteen.

Vitamin B1

↑ Increases root development
↑ Increases shoot growth
↑ Increases resistance to abiotic stress
↑ Increases resistance to biotic stress
↓ Reduces transplant shock

Vitamin B3

↑ Regulates seed development
↑ Increases resistance to salinity
↑ Increases resistance to DNA damage
↑ Stimulates cell metabolism

Vitamin B6

↑ Increases resistance to UV-B damage
↑ Increases resistance to biotic stress
↓ Reduces cell death due to ROS (reactive oxygen species)

Kinetin is found in seaweed extract (Ascophyllum nodosum). It works synergistically with auxins to stimulate root growth and has a number of other beneficial effects on plants.

Kinetin

↑ Increases rate of cell division
↑ Increases seed germination rate
↑ Increases shoot growth
↑ Increases resistance to salinity
↑ Increases resistance to high temperature
↓ Reduces cell death

Sustained Benefits

Aqua-3-IA contains microbes that colonize the roots and the soil. These organisms provide long-term benefits to the plants. Bacillus amyloliquefaciens (BA) promotes plant growth and protects plants from pathogens. BA produces IBA, IAA, and other plant hormones in the root zone where they are absorbed and continue the effects initiated by the other components in Aqua 3-IA. BA activates innate disease resistance in plant tissue. The presence of Bacillus amyloliquefaciens on the plant roots facilitates mycorrhizal colonization.

Bacillus amyloliquefaciens

↑ Increases beneficial root biome
↑ Produces plant hormones
↑ Increases resistance to abiotic stress
↑ Increases nutrient uptake
↑ Releases proteins, fatty acids, & enzymes
↑ Facilitates mycorrhizal root colonization
↑ Induces systemic resistance in plants
↓ Reduces root zone pathogens

Rapidly developing roots are primed for associating with mycorrhizae. These beneficial fungi work with plant roots to extract more water and nutrients from the soil than the plant roots can alone. Mycorrhizae also actively compete against soil pathogens creating a root zone biome that helps sustain continued healthy root development. Aqua 3-IA contains living propagules from seventeen species of mycorrhizae. Mycorrhizae do more than acquire extra nutrients for plants and sustain a healthy root zone. Studies show that once symbiosis is established, these beneficial fungi highly upregulate plant genes involved in the biosynthesis of IAA, the uptake and metabolism of nitrogen, and the uptake of phosphorus. The increased production of IAA helps sustain the effects of the initial application of IBA.

Mycorrhizae

↑ Increases macro nutrient absorption
↑ Increases micro nutrient absorption
↑ Increases water absorption
↑ Enhanced root growth
↑ Increases resistance to abiotic stress
↑ Increases resistance to biotic stress
↑ Induces systemic resistance in plants
↓ Reduces root zone pathogens

Aqua 3-IA is formulated with carbohydrate as the component carrier rather that water. The resulting dry formulation has a significantly longer shelf life with improved shipping characteristics. Additionally, the carbohydrates simulate natural plant root exudates that signal the microorganisms to germinate and begin association with the plant roots.

Carbohydrate carrier

↑ Simulates root exudates
↑ Recruits beneficial bacteria and fungi
↑ Moderates plant–rhizomicrobiome interactions
↑ Improves soil moisture retention