



Plant Health Care Inc.

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Technical Bulletin

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The Value of Humate

All of the ingredients of PHC products are active ingredients. We do not use fillers. While all of you should be well aware of the value of the biological components of our products (i.e., mycorrhizal fungi and rhizosphere bacteria), many of you may not fully comprehend the value of some of the other ingredients.

HUMATE AND HUMIC ACIDS

Humate is a mineral that is mined from the earth. It is an early stage in the development of coal from organic matter. Humate is rich in humic and fulvic acids, which are active components of soil humus (hence the name "humate"). These organic acids not only increase the organic content of the soil, but they also increase the cation exchange capacity (CEC) of soil. The CEC is a measure of the ability of soil to hold and release positively charged mineral ions (cations) in the rhizosphere (plant rooting zone). Humic acids have many negatively charged sites along the length of the molecule. These sites attract positively charged mineral ions like iron, magnesium, manganese, calcium, zinc and other micronutrients. The humic acids hold these ions in place, preventing them from leaching out of the soil. However, the holding force is relatively weak, so that plant roots can actively detach and absorb these nutrient ions using an electrochemical trick called "cation exchange". In cation exchange, the root cells release the desired cation minerals by trading hydrogen ions (H⁺) for them. Humic acids make this exchange work smoothly. So humic acids improve the mineral nutrition value of the soil by preventing valuable minerals from leaching out. At the same time, humic acids readily support the exchange of these cations to roots. This is what is meant by "increasing the cation exchange capacity of soil". Improving the CEC improves the mineral nutritional value of the soil for plants.

As a natural organic material, humate is biodegradable. It is digested slowly by various soil microbes, including saprophytic bacteria and fungi. Since it attracts and holds various mineral ions, humate serves as both a mineral food source as well an organic food source. As such, humate will contribute to the biodiversity of the soil.

Most of our products contain humate in one form or another. Insoluble products contain granular humate, which is about 65% humic acid. Our soluble products contain a soluble version of humate called "PHC Humex™". Humex™ is a proprietary soluble extract of humate, which is unique in being soluble over the entire pH range, both acid and alkaline. This allows Humex™ to hold mineral cations in solution regardless of the pH. Other brands of soluble humate cannot do this.

Humic acids

- Increase the organic content of the soil
- Increase the nutritional value of the soil by:
 - Increasing the cation exchange capacity (CEC) of the soil
 - Reducing the leaching (washing out) of valuable mineral nutrients (cations)
- Serve as an organic and mineral food source for microbes, thereby increasing biological diversity of the soil.