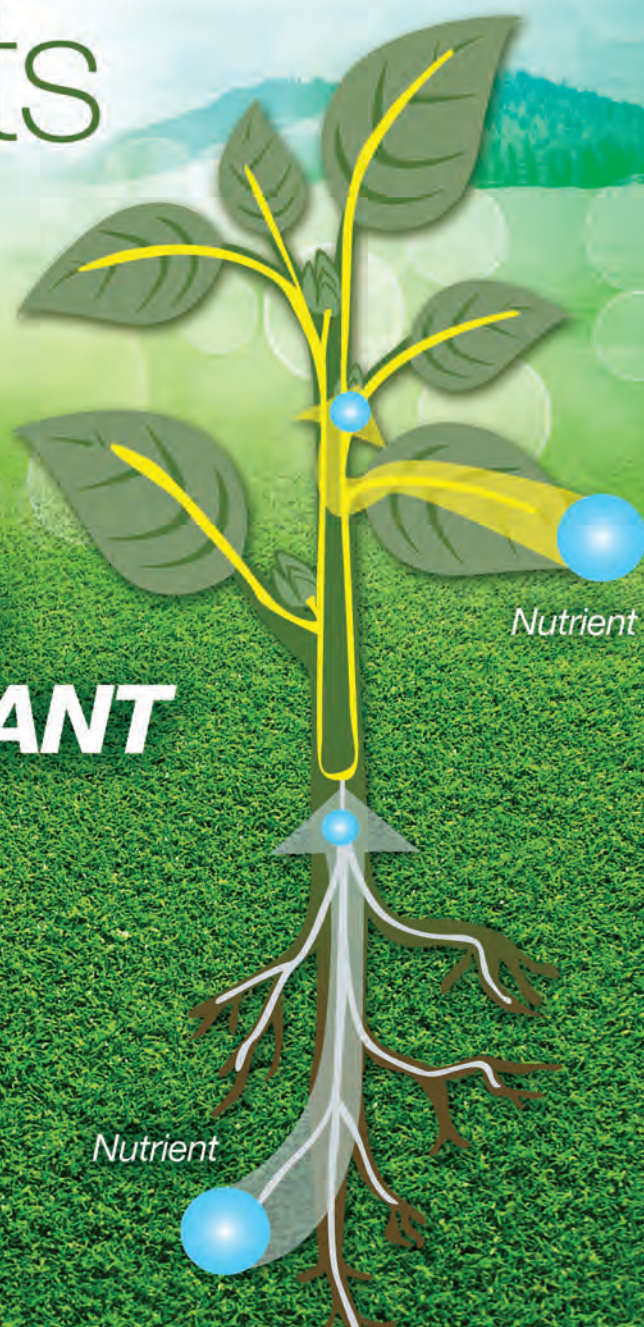




Polysaccharide Products

**AN EVOLUTION IN
SUSTAINABLE PLANT
MICRONUTRIENT
TECHNOLOGY**

www.sanctuaryproducts.com





Sanctuary Polysaccharide Products

An Evolution in Sustainable Plant Micronutrient Technology

Sanctuary polysaccharide is a new generation of micro nutrient products. It utilizes a proprietary technology using polysaccharides. A polysaccharide is a long chain of sugar molecules linked together. This chain lasts longer in the soil plus provides protection for the nutrient. This process enhances nutrient absorption and speeds translocation of these nutrients within a plant. Polysaccharide products have shown outstanding uptake results both through the shoot and root. Simply, these products build soil microbial populations plus biologically deliver nutrients to the plant.

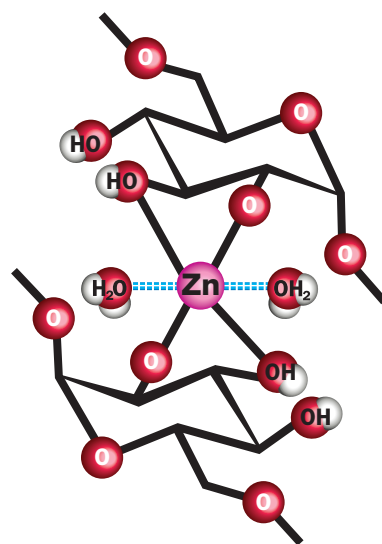
What are Polysaccharides?

A Polysaccharide is a by-product of the “carbon cycle,” where plants convert carbon dioxide, water and sun energy into carbohydrates. This process is commonly known as photosynthesis. Polysaccharides provide the energy for growth. They allow essential nutrients to be absorbed and effectively utilized and transported within the plant. This approach to nutrient management provides the timely delivery of essential nutrients during critical times in the plant’s life cycle.



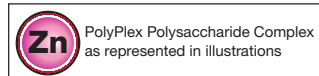
The Role of Nutrients

The roles of plants are well understood. Plants are the only means to take sunlight energy, water and nutrients to produce food in the form of proteins and carbohydrates. The limiting factor is absorption, uptake and translocation within the plant. The challenge is to increase the amount of available nutrients to the plant and get them to the growth points without harming the plant. The limiting factor has always been the soil, water availability and the environment. The Polysaccharide Technology overcomes many of these challenges.

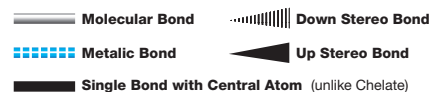
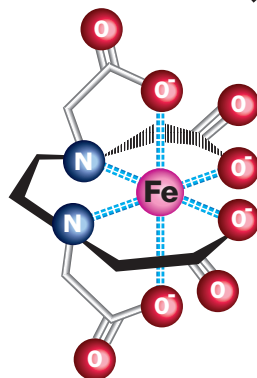


SANCTUARY POLYSACCHARIDE COMPLEX

Bonds with the metal ion to create a “neutral” charge that will freely pass through the stoma and guard cells. Polysaccharides are natural plant material and once inside the plant become energy and cell forming material once the metal ion is released when needed.



EDTA Nitrogen [N] bonds are double the strength of Oxygen [O] and Hydroxide [OH] bonds. Unlike polysaccharides EDTA does not break down within the plant preventing Zinc (Zn) from entering the plant’s vascular system.



EDTA COMPLEX (CHELATE)

EDTA is a chelate complex that has more and stronger bonds that can inhibit nutrient availability and tie up other metal ions within the plant. Unlike Polysaccharides, EDTA does not break down, and passes into the environment and the water table.

Sanctuary Polysaccharide nutrients provide the following key benefits:

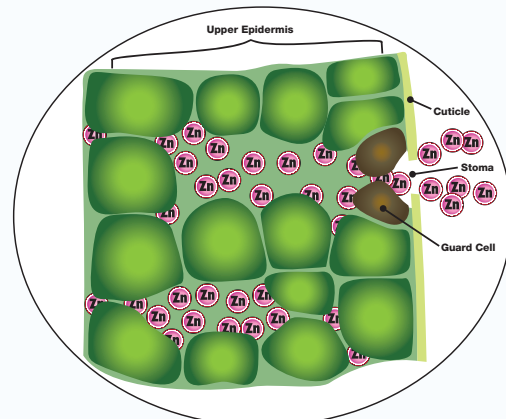
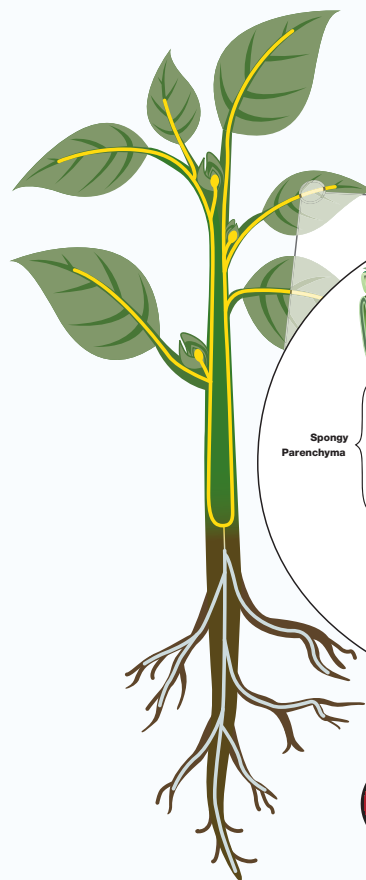
- Increases the availability of nutrients to plants
- Improves the mobility of nutrients in the soil and the plant
- Prevents mineral nutrients from forming insoluble precipitates
- Reduces phytotoxicity
- Limits micronutrient leaching
- Enhances nutrient and energy uptake

The Sanctuary PolyPlex Advantage

Polysaccharides have the advantage of being composed of the same materials that make up cell walls and the starches that provide energy to plants ensuring biochemical compatibility. This provides these polysaccharide nutrients the ability to move rapidly within the plant's metabolic pathways.

This nutrient is then translocated within the plant to where the nutrient is required. Polysaccharide nutrients can be absorbed by the root and translocated in the xylem. Or, they can be foliar absorbed and translocated in the phloem. This dual method of versatility reduces rates of application while providing timely delivery of the nutrient. This offers a cost effective method of application. Plus, this reduces the environmental liability of over application of these nutrients.

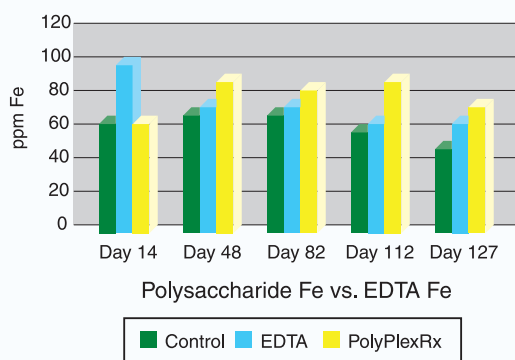
The zero charge polysaccharide complex surrounds the molecules so that the nutrient can pass into the plant through the stoma, where it is translocated as needed by the plant. Nutrients move from the stoma through the guard cells finding their way into the xylem through a combination of transpiration and osmosis, literally pumping carbohydrates, water, gases and nutrients throughout the plant.



PolyPlex molecules not shown to scale. Molecule is less than 1/1000 the stomatal opening. Comparable to hooting a basketball into a hoop two football fields in diameter.

PolyPlex Research

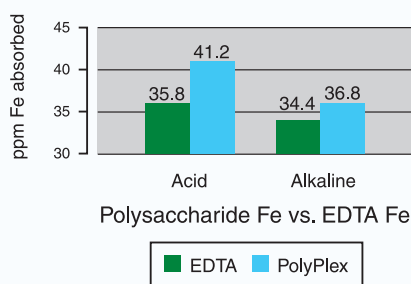
Residual Release



Sanctuary Polysaccharide offers improved uptake, absorptions and translocation of Iron in both acid and alkaline soil types as compared to EDTA Iron. This offers more consistent and predicible results in all soil types regardless of the pH, which can be a limiting factor for micronutrients.

(University of Florida)

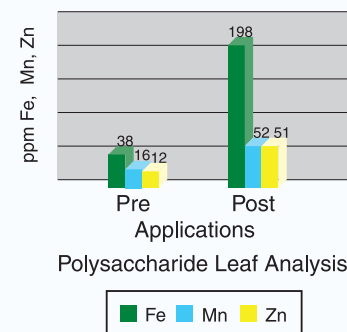
Ph Availability



Sanctuary Polysaccharide delivered significant concentration of Iron, Manganese and Zinc. The nutrients were absorbed efficiently and the deficiencies were corrected without any phytotoxic symptoms.

(Florida Coop Grower Study)

Foliar Absorption



Sanctuary Polysaccharide delivers a sustained and consistent supply of iron to the plant. Polysaccharide Iron displayed a safe absorption potential by not overloading the plant with too much iron upon the initial application. The EDTA Iron was released rapidly resulting in plant phytotoxicity.

(University of Bologna, Italy)

Safety and Compatibility

Sanctuary polysaccharide helps eliminate many aspects of phytotoxicity by mimicking **“Mother Nature”**. These lower application rates compared to sulfates and other metallic ions, offer less phytotoxicity because there is less **“active”** material to damage plants. Sanctuary polysaccharide has been used with a wide range of products including other plant nutrients, fungicides, growth regulation products and other pest control products. As product formulations change, it is always a good practice to **“Jar Test”** mixes prior to adding them to the spray tank.

Next Generation Solutions

The polysaccharide nutrient product is the next generation of biologically complexed micro nutrients. This technology improves uptake, reduces applied nutrient levels while increasing plant health. Plus, this product is a rich energy compound that can support the addition of bacteria or **“Probiotics.”** The Sanctuary polysaccharide provides the food energy source to support colonization of these bacteria. As we move forward, Probiotics products will be the next generation of bio-control products to manage pest problems, improve plant health and reduce environmental related stress problems.

These products are available in single or blends of essential macro and micro nutrients. These nutrients include potassium, magnesium, calcium, iron, copper, manganese, and zinc. The range and scope of the results depends on the nutrients selected and the soil related deficiencies. These products have shown results in enhancing plant health, which reduces wear, stress and disease related issues in turf. Plus, these products have shown improved quality in ornamental plants and flowers.

Sanctuary Polysaccharide Products

- **Iron** – this is a no stain iron product that delivers outstanding residual color at 16 to 32 oz/A. When using growth regulator products the combination of Sanctuary Iron & Vitality reduces turf discoloration.
- **Potassium** – this low salt potassium product is rapidly available to the turf for stress tolerance at 16 to 32 oz/A. This is an excellent product to improve putting green speed and wear tolerance.
- **Micro Turf** – this all-purpose product delivers iron, zinc, manganese and copper for overall turf and ornamental health at 16 to 32 oz/A. This is available in both a liquid or wettable powder (WP) product.
- **Synergy** – this stress management product delivers iron, zinc, and manganese for overall stress, wear and disease management at 16 to 32 oz/A. This is available in liquid or wettable powder (WP) product.
- **Vigor** – this product delivers manganese and magnesium for overall turf color at 16 to 32 oz/A. When combined with Sanctuary iron at the low rate this combination improves overall residual turf color.
- **Vitality** – this foliar absorbed calcium product promotes outstanding stress and wear tolerance during extreme heat. This product can reduce the impact of poor water quality containing sodium. In addition this product enhances turf color during cool weather conditions at 16 to 32 oz/A.

Conclusions

The Sanctuary PolyPlex offers numerous key advantages over other nutrient chelation methods that:

- **Improves Micro Nutrient Availability**
- **Provides Program Flexibility**
- **Applied Foliar or Drench**
- **No Phytotoxicity to Plant & Turf**
- **Delivers Consistent Results**
- **Delivers Plant Energy for Growth**

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