



## PRODUCT INFORMATION BULLETIN

SARGE is a UVB protectant that also acts as a green dye marker. SARGE is formulated with a proprietary water soluble humic acid complex to improve the ability of both cool season and warm season turfgrass to withstand the stresses of heat, electromagnetic radiation, drought, and other types of environmental or cultural pressures.

### PROBLEMS ASSOCIATED WITH ELECTROMAGNETIC RADIATION

*The sun emits ultraviolet radiation in the UVA, UVB, and UVC bands. 98.7% of the ultraviolet radiation that reaches the Earth's surface is within the UVA bandwidth. UVB (shortwave) is a specific portion of the sun's energy that is only partially absorbed by the ozone layer and can damage biological organisms.*

**UVB Damage to Plants.** Physiological and developmental processes of plants are affected by UVB radiation. Plants have a limited ability to adapt to increased levels of UVB. Excessive heat and ultraviolet light in the UVB (electromagnetic radiation) region of the spectrum can damage plant photo-systems, inhibit photosynthesis and weaken plant structure.

Photosynthetic light absorption and energy use must be kept in balance to prevent formation of reactive oxygen species. In the case of drought for example, it causes stomatal closure, which limits the diffusion of carbon dioxide to chloroplasts and thereby causes a decrease in CO<sub>2</sub> assimilation in favor of photorespiration that produces large amounts of hydrogen peroxide.

Indirect changes caused by UVB (such as changes in plant form, how nutrients are distributed within the plant, timing of developmental phases and secondary metabolism) may be equally, or sometimes more, important than damaging effects of UVB. These changes can have important implications for plant competitive balance, plant diseases, disruption in timing of developmental phases and secondary metabolism.

The severity of the damage can range from a decline in carbohydrates, reduced energy production and natural plant defense, to cell collapse and plant death.

### SARGE TECHNOLOGY

#### *UVB Ray Protectant*

The SARGE formulation contains a UVB ray protectant that absorbs and converts damaging levels of UVB rays to electromagnetic wavelengths that are harmless to plants. By alleviating UVB induced photo-inhibition, plants are capable of:

- Increasing their production of photosynthates (carbohydrate sugars)
- Elevating carbohydrate reserves
- Improving photosynthetic efficiency by reducing the amount of energy produced through photorespiration
- Building stronger root systems

#### *Water Soluble Humic Acid Complex*

Stress due to elevated temperatures is a major factor behind yield and quality losses on many crops. Humic acids have been scientifically shown to reduce the negative effects of heat and moisture stress and improve stress tolerance.

Humic substances found in SARGE come from Leonardite, and provide rich carbon sources of organic matter. The principal active components of humic substances are two groups of complex carbon based organic acids, Humic acid and Fulvic acid.

These natural organic carbon compounds have extremely high ion exchange capacity and possess the ability to chelate inorganic trace elements (making the nutrients more readily available to the plants) and enhance nitrogen absorption.



When applied together with fertilizers, humic substances can increase the efficacy of the companion materials. Furthermore, water holding capacity of soils is increased considerably.

Many investigators have also observed a positive effect of humic substances on the growth of various groups of micro-organisms. Beneficial bacteria and fungi reproduction created in the presence of humic biologically enhance plant growth. The microbial activity produced by these bacteria and fungi are excellent root stimulators. Increased root development can aid in heat and drought stress periods.

SARGE is formulated with a unique water soluble humic acid that provides the following stress relieving functions and chemical benefits:

- Retains water soluble inorganic fertilizers in the root zones and releases them to plants upon demand
- Improves water retention
- Promotes the conversion of number of elements into forms available to plants.
- Extremely high ion-exchange capacity.
- Increases buffering properties of soil.
- Rich in organic and mineral substances essential to plant growth.
- Elevates the percentage of total nitrogen in the soil.
- Increases root and top growth on a fresh and dry weight basis.
- Improves plant root uptake of Nitrogen, Phosphorus, Potash, Iron, Magnesium, Copper, Zinc and Calcium from the soil.
- Enhances plant foliar nutrient absorption and translocation

## BENEFITS OF SARGE TECHNOLOGY

SARGE is a multi-functional spray adjuvant with humates that provides the turfgrass manager with a set of highly effective, complimentary performance properties that go beyond traditional spray indicator adjuvant technologies.

- **Highly visible, dark green spray indicator that also provides protection to plants from damaging UVB rays**
- **Promotes accurate and uniform application of pesticides and liquid fertilizers**
- **Improves tolerance of turfgrass to environmental stresses**
- **Enhances the capability of turfgrass to withstand disease pressure**
- **Turfgrass recovers better following stress periods**
- **Improves rootzone conditions that lead to healthier and more vigorous plants**
- **Safe to turf and the environment**

## USE DIRECTIONS

### DIRECTIONS FOR GENERAL TURF USE

GREENS, TEES, FAIRWAYS, LAWNS AND SPORTS TURF

Mix SARGE at the following rates: 20 to 22 ounces per 100 to 125 gallons of water (600-660 ml. per 400 to 500 gallons of water).

Apply SARGE in a 2 gallon spray solution per 1000 sq. ft (8 liter spray solution per 100 sq. meters).

Do not irrigate for 24 hours after application.

**NUMERATOR**  
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