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Silicon, Silicon Everywhere, But Nary a..

Silicon a Potentially Important Element for Disease Management in St. Augustinegrass

Silicon is the second-most abundant element after oxygen in the earth's crust, and most soils contain considerable quantities of the element. However, repeated cropping can reduce the levels of plant-available silicon to the point that supplemental silicon fertilization is required for maximum production, and some soils contain little plant-available silicon in their native state.

Low-silicon soils are typically highly weathered, leached, acidic and low in base saturation. Highly organic soils that contain little mineral matter may contain little silicon. Soils comprised mainly of quartz sand (SiO2) also may be very low in plant-available silicon. These low silicon conditions are probably prevalent on many sod farms and golf course greens throughout Florida.

Plant nutritionist and plant physiologists generally consider improving the management of 13 essential elements. These include six macroelements (N, P, K, S, Ca, and Mg) and seven microelements (Fe, Mn, Zn, B, Mo, Cl and Cu). These elements are considered essential because deficiency in any one of them adversely affects physiological plant function, resulting in abnormal growth and/or an incomplete life cycle.

However, silicon is considered a plant nutrient "anomaly" because it is presumably not essential for plant growth and development. Interestingly, soluble silicon has enhanced the growth and development of several plant species including rice, sugarcane, most other cereals and several dicotyledons such as cucumber and tomatoes.

Higher plants vary in their capacity to accumulate silicon. Wetland gramineae (rice) absorb silicon as Si(OH)4 on a dry matter basis ranging from 4.6% to 6.9%, dryland gramineae (sugarcane and cereals)

Bitterblue St. Augustinegrass with silicon, left, shows little evidence of gray leaf spot whereas the plant at right, without silicon, shows symptoms of gray leaf spot.

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between 0.5% to 1.5% and dicotyledons less than 0.2%. So, accumulation of silicon by plants maybe in large amounts that are several fold higher than those o other essential macro- or micro-nutrients. For example, silicon accumulation may be twice that of N in rice.

Silicon amendments also have proved effective in controlling both soilborne and foliar fungal diseases in cucumber, rice, sugarcane and several other plant species.

In rice, silicon has been demonstrated to control several fungal diseases as effectively as a fungicide. In addition, partiall resistant rice cultivars amended with silicon had their resistance augmented to the same level as those considered completely resistant to rice blast caused *Pyricularia grisea.*

Gray leaf spot of St. Augustinegrass, also caused by *Pyricularia grisea*, can be difficult problem during the spring,

summer and early fall months for sod producers, especially when transporting sod to the marketplace and after laying sod on a homeowner's lawn. Currently, fungicides are considered the best method available for managing this disease.

Silicon could offer another disease management option to sod producers that would be deemed more environmentally friendly. Because this element had proven effective for controlling rice blast, this study investigated the effect of silicon on gray leaf spot development in St. Augustinegrass. The experiment included St. Augustinegrass cultivars Bitterblue and Floratam, that were amended with silicon (Calcium Silicate Corporation, Inc., Columbia, Tenn.) and included a non-amended control.

Plants were periodically misted to provide optimum leaf wetness that promoted natural infection by *P. grisea* in the greenhouse (Figure 1). Disease severity was rated over a four-week period by estimating the percentage gray leaf spot on individual leaflets. Silicon dramatically reduced the percentage of gray leaf spot infection for Bitterblue (49.3 vs. 10.5) and Floratam (42.7 vs. 9.6) (Figure 2). Plant silicon content in Si-amended treatments increased more than twofold over the controls for both cultivars.

Thus, silicon appears to be a good method for managing gray leaf spot in St. Augustinegrass. Based on this preliminary infection, silicon sources and their management practices should be developed for integrated disease management. However, several questions need to be answered before this can become a common practice for sod producers :

- What is the optimum silicon rate for plant accumulation?
- Which is the best method of application?
- Do differences in silicon accumulation exist among cultivars?
- Are there residual effects?
- Can silicon control gray leaf spot development as effectively as a fungicide?
- If so, can rates and number of applications be reduced and are other diseases affected too?

Inaugural Silicon in Ag Conference

The first international conference in agriculture will be held Sept. 26-30 at the Lago Ma Resort and Club in Fort Lauderdale. The importance of silicon for plant health and so productivity is increasingly recognized by scientists throughout the world. Organized b the University of Florida's Everglades Research and Education Center, scientific paper will be presented on all topics involving the role of silicon in plant and soil science including

- transport and function of silicon in plants,
- deposition of silicon in plants,
- effect of silicon on different plant species,
- silicon and disease management,
- mechanisms of disease resistance,
- silicon sources for agriculture, and
- relationship of silicon to soil physical and chemical properties.

Paper presentations will be made by 21 scientists from 12 countries, and will be com piled in the book, Silicon in Agriculture, to be published by Elsevier Science. Poste presentations still are being accepted. In addition to formal presentations, activities ar being planned to provide ample opportunity for personal contact among the participants Additional information, including the registration form is located at

www.ifas.ufl.edu/~conferweb/silicon.htm

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