SPORTS TURF MANAGER

... for safe, natural sports turf

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SPRING PLANTING PREP...

Every two years, the Sports Turf Association compiles a table of grass seed types available from major seed companies around the province. This year, we've also included a handy chart listing the most common characteristics of cool season turf grasses. Which will do best in shade, tolerate wear and have the lowest mowing frequency? See pages 17 and 18 for further details.

Controlling Turf Diseases

Daniel Tremblay

THE ROLE OF SILICA IN IMPROVING TURF'S NATURAL DEFENSES

Fungal diseases are a regular turf problem for golf course superintendents. And the problem is made even worse by often appearing during the summer season when the course is at its busiest. Control methods are presently few in number, basically boiling down to the use of fungicides. Studies presently underway at Laval University's Horticultural Research Centre, however, are working on alternatives to pesticide use.

In spite of all the money and effort invested over the last few years in research into the biological control of turf diseases, few new solutions are presently available that golf course superintendents could actually use. Improved turf care and the use of new disease-resistant cultivars can help prevent the appearance of diseases, but are not always sufficient.

During the summer, heat and humidity stimulate the growth of several fungi capable of attacking turf grasses. At the same time, golf turf is undergoing intense maintenance and suffers from several forms of severe stress. Among them, heat, drought, predatory insects, foot traffic from golfers, and frequent low mowings not only make turf more vulnerable to various infestations, but also wound the plants leaving the door wide open to pathogens. It is the combination of these factors that explains why diseases are so common during the summer months. → page 9

DANIEL TREMBLAY

Below: Plants were sown in University of Guelph greenhouses. Half were given fertilizer without silica while the other half received fertilizer with silica. Results obtained were conclusive. See page 9 for more...

Cover Story Continued... The Role of Silica in Controlling Turf Diseases

DANIEL TREMBLAY, MASTERS STUDENT AT LAVAL UNIVERSITY, DISCUSSES CURRENT TURF RESEARCH

Golf Turf is Unique

Fortunately, plants have the ability to defend themselves against harmful fungi. They are, in fact, usually extremely good at preventing fungal colonization. Among others, their defense arsenal includes thickened cell walls and the production of compounds that are toxic to harmful fungi. These means are usually highly efficient. However, golf turf, already highly stressed, is particularly vulnerable and therefore less efficient at preventing fungal infestation.

One avenue of research that is worth exploring is developing and improving the natural defenses of turf grasses. It would also be interesting to look into increasing the speed with which the plants deploy their defense arsenal and into improving the intensity of their defense response to aggressions. Over the last few years, various research teams have noted that adding silica to the mineral nutrition of certain plants decreases the incidence of several fungal diseases.

What is Silica?

Silica is a mineral element, much like carbon, nitrogen, and calcium. It is an element that is found in great quantities on the surface of our planet and is, in fact, the second most abundant element after oxygen. Concrete, sand and glass are silica polymers. But silica is insoluble and therefore cannot be absorbed by plant root systems. It is therefore important to add it in a soluble form so plants can absorb it. Since silica is not considered an element that is essential to plant nutrition, it is generally omitted from current fertilization programs. With more and more observations that silica has the potential to decrease the frequency of disease in several types of culture, it would seem worthwhile to include silica in regular plant fertilization situations.

For example, European growers of greenhouse cucumbers and roses who apply daily doses of silica report a decrease in mildew (*Sphaerotheca* sp.), a foliar fungal disease common in greenhouse production. Other beneficial effects have also been observed in the culture of certain other types of grass. Rice producers in the southern United States, for example, use silica as an amendment and are able to reduce the appearance of several diseases that decrease their harvest such as rice blast disease (*Pyricularia oryzae*). Other than disease resistance, leaves of plants fertilized with silica stand more upright, which improves light absorption and thus increases yields. Also silica accumulates in cell walls, allowing a general strengthening of plant tissues and, therefore, of the entire plant.

Researching Silica in Turf Culture

The goal of this research project, lead by Laval University in collaboration with the University of Guelph, is, in the first phase, to verify that silica actually is absorbed and translocated by turf grasses. The second phase attempts to determine the effect of silica on fungal turf diseases both in greenhouse experiments and in field tests, more precisely on golf course greens and fairways. Finally, the research should help make it possible to improve the knowledge of turf defense mechanisms and to understand the effects of silica on plant defense systems.

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The grass chosen for the project was bentgrass (*Agrostis palustris*), the species most commonly used in golf greens. The first phase consisted of verifying that bentgrass does absorb silica. To begin with, plants were sown in University of Guelph greenhouses. After a week of growth, half the plants were given a liquid fertilizer without silica while the other half received a liquid fertilizer with silica. The plants were fertilized three times a week.

The results obtained were conclusive. The plants receiving fertilizer enriched in silica contain a very large amount of that

Top: Tests are presently underway in experimental plots on the greens and fairways of two golf clubs in the Guelph region. **Above:** Experimental plot at the Guelph Turfgrass Institute of the University of Guelph. Photos by Tremblay.

element in their aerial parts compared to plants not receiving silica.

The goal of the second phase of the experiment, on which the research team is presently working, is to determine whether the absorbed silica has an effect on the incidence of fungal diseases such as dollar spot, caused by *Sclerotinia homoeocarpa*, and pythium blight (*Pythium* sp.). The results obtained up to now indicate that the addition of silica to turf fertilization delays the appearance of symptoms and, in some cases, decreases the incident of disease. Tests are presently underway in experimental plots at the University of Guelph and on the greens and fairways of two golf clubs in the Guelph region (Guelph Lake Golf and Country Club and Victoria Park Golf Course) in order to confirm the results obtained under controlled conditions.

The last phase of this experiment consists of studying how silica acts in turf disease resistance. The interest in the role of silica in decreasing the incidence of disease is recent. The first hypotheses considered that the strengthening of plant cell walls (limiting the penetration of the pathogen) was the only role silica played. However, over the last few years, another role is coming to light. Studies carried out at Laval University by the team of Dr. Richard Bélanger suggest an entirely different means of action: it appears silica stimulates the plant's own defense mechanisms and thus make it more capable of defending itself against the aggressions of pathogenic fungi.

When attacked by a pathogen, the response of plant cells seems to be far superior when they have undergone previous treatments with silica. It is these defense strategies that still have to be identified and quantified in order to better understand the inductive role of silica in plants. Similar studies have been carried out on cucumbers, but so far no other study has been done on turf grasses and silica. This research project is therefore innovative and should help point out the defense compounds of bentgrass during attacks by pathogens as well as verify the effect of silica on the production of these compounds.

When Will Results be Available?

Complete results should be known by next summer. Other than their contribution to the advancement of scientific knowledge, the results could provide an interesting tool to golf course superintendents. Eventually silica might well be integrated into turf maintenance programs as a means of reducing the use of pesticides, notably fungicides. ♦

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About the author. Daniel Tremblay is an agronomist and a student working on his Masters Degree in Plant Biology at Laval University. He wrote this article in collaboration with Dr. Julie Dionne, a professor specializing in turfgrass management at the University of Guelph, and Dr. Richard Bélanger, a professor and phytopathologist at Laval University's Horticultural Research Centre.