Improving turf stress resistance to disease and drought by improving the plant defense activators

Dr. Tom Hsiang and Dr.Paul Goodwin, University of Guelph   2016

Project Scope:

This project tests different defense activators on a variety of turfgrass cultivars in field studies to determine their effect on prevalent plant diseases such as dollar spot or fusarium patch and to modify the concentrations and timing needed for successful application. This will be accomplished through extensive field studies that would replicate actual use of a defense activator to induce resistance to plant pathogens. In addition, lab tests will examine the efficacy of different activators on different bentgrass cultivars for reduction of drought, cold and heat stress. From the results of the field and lab studies, the researchers will use data collected to modify concentrations and application times and then test these recommendations again on different cultivars to see whether diseases such as fusarium patch and cool season stresses can be sufficiently managed by defense activator agents. The results will provide recommendations for turfgrass managers on the choice of bentgrass cultivars and on improved turf disease and turf stress management practices.

   This research is generating new information about the use of plant defense activators by translating successful lab results to field conditions; conditions similar to those experienced by people managing turfgrass. Defense activators can do more than just improve the disease resistance of turf plants; they can also increase the stress resistance against pressures such as drought or heat. However, the response varies by particular cultivar. If we can figure out which products can activate the best disease resistance or stress tolerance in which cultivars, then this will help turf managers to decide when, where and which products to use for sustainable turfgrass management. The efficacy of these products needs to be documented prior to registration for general use.

   Major Results include the lab testing of over two dozen bentgrass cultivars which show differential activation of resistance and these tests were complete May 2015. In addition, the commonly used bentgrass cultivars Penn A4, T1, MacKenzie and Penncross were tested for disease resistance activation against dollar spot disease in the field in summer 2014 and 2015, and there are differences among the four activators tested, and between cultivars. In fall 2014, field plots were established at the Guelph Turfgrass Institute. There are 15 m by 24 m plots of each of the following cultivars: A4, T1, MacKenzie, V8, Penncross, L93, Focus, Tyee, 007, and Alpha. Most of these cultivars were from our recommendations based on previous lab test results for activator responsiveness. These field plots have been used and are being use in spring, summer and fall 2015 for field testing, and in subsequent years.

We have continued to screen different activators on different cultivars in the lab. We have found that certain rates of particular activators (such as silicilic acid and phosphite) do provide an efficacious effect for control of dollar spot. We repeated these tests and then tested them in the field in 2016. The repeated lab tests confirmed earlier findings of efficacy. We then tested 12 different treatments in the field. For late summer when dollar spot disease pressure was high, weekly applications of the products gave results ranging from 1.5% to 10.5% area diseased compared to 17.5% for the inoculated control. These results demonstrate that most "home remedies" may have some suppressive effect, but not at the level to satisfactorily control the disease.