SCREENING OF BACTERIA FOR BIOLOGICAL CONTROL OF BROWN PATCH AND PYTHIUM BLIGHT DISEASES OF TURFGRASS

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Introduction
Brown patch disease and Pythium blight disease caused by Rhizoctonia solani and Pythium aphanidermatum, respectively, are the two major soil-borne turfgrass diseases occurring world-wide. Currently the most widely used control measure is fungicidal treatment on infected turfgrasses. However, the frequent and prolonged use of fungicides have become problematic due to adverse effect on non-target organisms as well as creating fungicide resistant population of the pathogen. Biological control is an alternative and potentially attractive strategy of reducing fungicide input to highly managed turfgrasses. This study was therefore conducted to determine the biological control potential of bacterial isolates obtained from turfgrass grown areas against brown patch and Pythium blight diseases of turfgrasses.

Materials and Methods
Bacterial isolates were obtained from thatch and soil of Cynodon dactylon cv. Tifdwarf, taken from greens, fairways and tees, by removing 10-cm diameter cores from symptomatic areas to a depth of 6 - 10 cm with the aid of a cup cutter. Bacterial isolates were screened for their ability to suppress the growth of R. solani and P. aphanidermatum. The dual-culture technique was used where 5-mm mycelia plug obtained from the leading edge of a 5-day old culture of each fungal pathogen was taken and placed at the centre of the plate. Individual bacterial isolate was then streaked at 4 opposite locations 2.5 cm from the mycelial plug. PDA was used in this study since both microorganisms can grow well on this medium. The radial growth of inhibition fungus was measured daily. Bacterial isolates showing antagonistic activity against R. solani or P. aphanidermatum were identified based on their morphological characteristics.

Results and Discussion
Isolation of bacteria from thatch and soil of C. dactylon cv. Tifdwarf resulted in total bacterial count ranging from 0.97 - 2.5 x 10^3 cfug of sample, which can be grouped into 10 different colony types. Out of the 10 colony types, only five isolates were found to have antagonistic activity against R. solani or P. aphanidermatum when tested using the dual culture techniques. All of these bacteria were isolated from the thatch. The bacterial isolates were identified as Bacillus megaterium, Burkholderia cepacia, Chromobacterium violaceum, Pseudomonas aeruginosa and Serratia marcescens.

B. megaterium, B. cepacia and P aeruginosa were found to inhibit the growth of both R. solani and P. aphanidermatum while S. marcescens and C violaceum were found to inhibit the growth of only P. aphanidermatum. However, when the radial growth of both pathogens was compared, it was noted that the growth inhibition of P. aphanidermatum by B. cepacia and P aeruginosa was lower than the growth inhibition of R. solani. B. megaterium had been reported to be a potential biological control agent against R. solani on soybeans as well as Phomopsis sp., Pestalotia sp. and Alternaria alternata on Litchi (Korsten et al 1993). Optimisation studies done by Korstan on the postharvest pathogens revealed that the postharvest decay was more effectively reduced with B. megaterium applied as a fine spray compared with dip application. Even though B. cepacia (Pseudomonas cepacia) is the causal agent of the onion sour skin disease, it had been reported to inhibit the growth of many fungal pathogens including Sclerotium rolfsii and Fusarium oxysporum f. sp. raphani (Sanchez et al, 1994). It has also been reported to be a good biological control agent against Rhizoctonia stem rot disease of Euphorbia pulcherima caused by R. solani (Cartwright and Benson, 1995). P. aeruginosa had been reported to be able to reduce the infection of R. solani and Macrophomina phaseolina on chickpeas. This bacterium inhibited the growth of the pathogen through the production of salicylic acid and siderophores production. S. marcescens had been reported to be antagonistic to Phytophthora capsici in vitro, able to reduce damping off of cultivated cucumber seedling and suppressed summer patch symptom development on Poa pratensis caused by Magnaporthe poae (Kobashi et al. 1995).

Conclusions
Five isolates were found to have antagonistic activity against R. solani and/or P. aphanidermatum. All of these bacteria were isolated from the thatch. The bacterial isolates were identified as Bacillus megaterium, Burkholderia cepacia, Chromobacterium violaceum, Pseudomonas aeruginosa and Serratia marcescens. B. megaterium, B. cepacia and P aeruginosa were found to inhibit the growth of both R. solani and P. aphanidermatum while S. marcescens and C violaceum were found to inhibit the growth of only P. aphanidermatum.

References

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