

# Preliminary Investigation on the Epidemiology of Fairy Ring in Turfgrass

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## Objectives:

1. To develop a technique to facilitate the successful isolation of fairy ring-causing basidiomycete organisms from a turf/soil sample.
2. To develop a technique to induce the vegetative mycelium from fairy ring-causing basidiomycetes to produce a basidiocarp (i.e., fruiting body or mushroom) that could be used to accurately identify the organism.
3. To examine weather conditions associated with the appearance of fairy ring symptoms in turf.

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**Project Duration:** one year

**Total Funding:** \$3,000

Visual symptoms of fairy ring in turfgrasses are categorized as type I, type II, type III, and all three types can occur alone or in various combinations at the same site.

Type I is the most severe, characterized by necrotic or dead turf in circle or arc patterns and often accompanied by soil hydrophobicity and localized dry spot conditions. Type II symptoms are easily identified by the appearance of rings or arcs of stimulated, rapidly growing turf that is typically darker green in color than the surrounding turf. Type III symptoms are simply the appearance of the basidiocarps or "fruiting body" (i.e., mushrooms or puffballs) of the fungal causal agent. Fairy ring symptoms in turf are attributed to a basidiomycete fungal organism that interacts with the soil/rootzone biological, chemical, and physical environment thus indirectly causing turf damage or reduction in turf stand quality and function.

Fairy ring is often confirmed in turf if the fairy ring-causing basidiomycete is successfully isolated from the affected area and examined under a microscope. Most mushroom or toadstool-producing fairy ring fungi have distinct clamp connections formed along their hyphal strands. The puffball-forming fungi, however, do not typically form clamp connections.

In the field, the basidiocarp is the most accurate way to identify the species. According to the literature, over 60 species of fairy ring-causing basidiomycetes exist, and their range of susceptibility to fungicides labeled for fairy ring or cultural practices to suppress fairy ring symptoms has not been determined.

Specific extraction and isolation of basidiomycetes from the soil, soil rootzone, or thatch is difficult, tedious, and



Type 1 fairy ring symptoms on a creeping bentgrass (*Agrostis stolonifera*) green in West Deptford, NJ.

time consuming, and contamination from the many other fungi and bacteria in the soil is often the result. Most basidiomycete organisms collected from fairy ring-affected turf sites in the Mid-Atlantic region grew well on either potato dextrose agar or malt extract agar, especially when either growth media was amended with an antibiotic. Future research will investigate additional media amendments that may facilitate rapid extraction and growth of these fairy ring-causing basidiomycete fungi from turf/soil samples.

Currently, molecular techniques involving "DNA fingerprinting" are being investigated at North Carolina State University, as well as additional methods of soil extraction and isolation. In this investigation, the basidiomycetes grown in pure culture were transferred into a potting soil mix containing wood chips since these fungi are classified as wood-decaying fungi and therefore prefer a diet of lignin, which is also a major component of thatch.

The soil mix was subjected to a series of wet/dry cycles to induce fungal colonization of the soil mix and eventually to produce a basidiocarp or mushroom. Future research will examine methods to rapidly produce basidiocarps to make rapid and accurate identification of the fairy ring-

causing species.

Fairy ring symptoms on greens at Riverwind Golf Course (West Deptford, NJ) were visually monitored from May through September 2009 for the appearance of fairy ring symptoms. Weather information was obtained from the Philadelphia International Airport, located directly across the Delaware River from the golf course. Therefore, airport weather data was chosen to represent environmental conditions within this Mid-Atlantic region. Weather data obtained was air temperature (minimum, average, and maximum), relative humidity (minimum, average, and maximum), and natural rainfall (inches).

Five fairy ring outbreaks of type I symptoms were observed in June through August. Although the weather conditions were not strongly correlated with fairy ring outbreaks, an observed trend revealed the onset of type I fairy ring symptoms at this location corresponded to a maximum air temperature > 80° F with no precipitation (i.e., hot and dry conditions) after rainfall occurred (i.e., warm and wet conditions). Therefore, these "wet/dry" cycles may be the key to understanding fairy ring epidemics in turf.

## Summary Points

- Basidiomycete fungi attributed to fairy ring symptoms in turfgrasses are difficult to isolate from the soil and thatch of affected turf areas, although progress is being made in this area.

- Techniques are being tested to develop a reliable and rapid procedure to identify the species of the fairy ring-causing basidiomycete, and thus may lead to improved recommendations for control.

- With a wide and diverse number of basidiomycetes that cause fairy ring, symptoms can be observed any time of year. However, destructive or type I fairy ring symptoms are often seen during periods of hot/humid and dry weather.