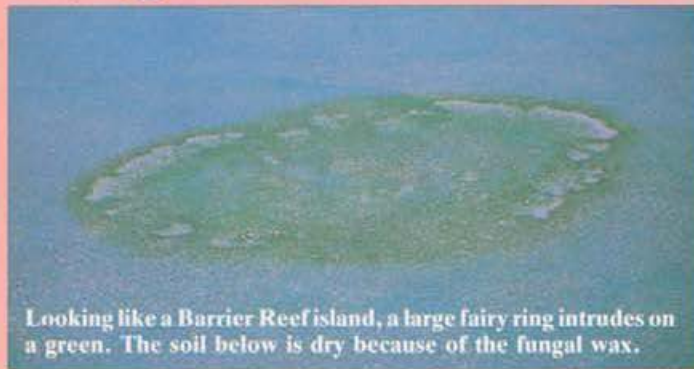


Rings on the lawn



If you happen to like a good lawn, either as a gardener or as a tennis- or bowls-player, then the appearance of mushrooms or puff balls (the fruiting bodies of soil fungi) can be a mild nuisance. But what's worse for a lawn is a 'fairy ring'.

These charmingly named circles of apparently extra-vigorous growth — coupled often with a ring of dead grass — are destructive manifestations of a fairly large fungal network, or mycelium, underground. In moist conditions the fungus will fruit near the margin of the ring, and the mushrooms will help signal the species that's responsible.

Although many fungi can cause fairy rings, one of the worst — well known in the Northern Hemisphere — has just been identified as a culprit in South Australia by Mr Jack Harris, who recently retired from the CSIRO Division of Soils.

Mr Harris, an expert on soil fungi and their interactions with plants, has confirmed that *Marasmius oreades* is the cause of many persistent fairy rings in the cooler parts of the country. Furthermore, he has also found out why this particular species is such a problem. To understand his explanation, we have to know what goes on at the base of a lawn.

As any type of turf grass grows, a thatch or mat builds up beneath it. This consists of the tough, fibrous, and

partially lignified remains of the grass, after the protein and carbohydrate portions have decomposed. (Lignin is the material of wood.) Thatch is hard to break down because lignin and cellulose — its other main constituent — are complex polymers that relatively few micro-organisms can use as a food source.

However, *M. oreades* can. 'Nothing wrong with that', you may think, as decomposition is very necessary to return nutrients to soil and so ensure continued growth.

The only problem is that in soil areas with too much thatch only *M. oreades* and a few other fungi and bacteria can survive. Other species die out, so the microbial soil flora dwindle to just the few thatch-decomposers. The importance of this will become apparent later.

M. oreades grows as a sheet of mycelium spreading outwards in an ever-widening circle. At first, its decomposition of thatch releases nutrients, especially

nitrogen, into the soil and stimulates the growth of nearby turf-grass; hence the extra-green flush on the rim of the ring that marks the growing edge of the fungus.

However, the mycelium of *M. oreades* is particularly waxy, and therefore water-repellent. As it accumulates, the remaining thatch and most of the soil beneath turn into a water-repellent sheet. Rainfall, or water from even the best sprinkler system, fail to penetrate into the ground. As the soil dries out, the turf in that region withers; but the fungus' mycelium can continue to grow in these conditions.

Compounding the problem, the activities of the fungus release toxins that further damage the embattled grass by inhibiting root growth. Mr Harris has not yet identified the toxins, but believes they are products of the breakdown of the thatch.

Watering the brown circle won't help solve the problem. Instead, Mr Harris suggests encouraging the soil flora to return to a balance, so providing plenty of competition for *M. oreades*. It won't be completely eradicated, but other soil microflora will hold its growth in check. And, of course, if the gardener prevents the fibrous thatch building up into a large mat there will be less sustenance for *M. oreades* in the first place.

Now, although plenty of fungicides effective against

this species exist, the difficulty in using them is the waxiness of the mycelium. Just as the water won't penetrate, neither will the fungicide.

Mr Harris suggests a couple of simple control methods for the fungus. They both involve encouraging the soil bacteria. One old idea, which has some scientific credibility, is to give the lawn sugar! The fact is that microbes starved for energy because they can't digest thatch — the only substance around — will suddenly thrive if sugar becomes available as a food source. Their growth may keep the fairy ring fungus in check.

The sugar method is probably a little risky because over-exuberant bacterial growth may leave toxic by-products that can harm the grass. Instead, Mr Harris is experimenting with worm casts, which are rich in organic material.

On affected bowling greens, he makes cores near *M. oreades* rings and puts crumbled worm casts down. The rings remain, but they don't grow as vigorously because the organic material encourages microbial growth, preventing the establishment of a monoculture of the unwanted fungus.

With competition, the threads of the mycelium will be far less densely packed in the soil. That means less wax, and therefore better water penetration.

With these treatments and careful thatch control, the fortunes of the fungus will eventually wane. Although it is likely to remain in the soil, Mr Harris has found that it won't do any damage to greens unless its mycelium grows larger than about 1 metre. Anyone for tennis?

Roger Beckmann



The fruiting bodies of *M. oreades*.

Marasmius oreades, the fairy ring fungus. J.R. Harris, *Turfcraft Australia*, 1988, Sept.-Oct., 9, 28-31.