SHORT COMMUNICATION

Brown patch disease of Zoysia turfgrass (*Zoysia matrella* (L.) Merr.) caused by *Rhizoctonia solani* Kühn

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Brown patch disease of Zoysia turfgrass (*Zoysia matrella* (L.) Merr.) caused by *Rhizoctonia solani* Kühn

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Smaller, yellowish brown areas of diseased grass [*Zoysia matrella* (L.) Merr.] were observed scattered in a home garden lawn in Kandy District (Central Province) of Sri Lanka.There was also a ring of brown grass and whitish aerial mycelium grown inbetween foliage and runners, boarding a greenish area. The ring, referred to as 'smoky ring', could be recognized from a distance during early morning hours of certain dry days. The upper half of the affected leaves was reddish brown and necrotic and separated from the greenish lower portion by a thin, dark brown and wavy band. From the symptoms, the pattern of symptom development in the field and the identity of the pathogen, the disease was diagnosed as the brown patch. The causal organism, isolated on PDA, was identified as *Rhizoctonia solani* Kuhn. A similar condition was also observed later in a turf in Digana area in the same District. Whitish sporophores of an epiphytic slime mould (Order Physarales) were observed on the surface of grass leaves which did not appear to have a role in the disease. Though the brown patch caused by *R. solani* is a common disease in turfgrass all over the world, this appears to be the first report in Sri Lanka.

Key words : Rhizoctonia brown patch, \'smoky ring\', *Zoysia matrella* (L.) Merr.

INTRODUCTION

Numerous fungal pathogens cause diseases in turfgrass and among them infections by *Rhizoctonia* are quite common. *Rhizoctonia* species cause different diseases in turf grass, brown patch, also referred to as Rhizoctonia blight, yellow patch and large patch. There are several important differences between brown patch and large patch. The brown patch affects all species of coldseason turf grass and is incited by *Rhizoctonia solani* Kuhn (teleomorph *Thanatephorus cucumeris* (A. B. Frank) Donk) (Mocioni *et al*. 2003). This is the most widespread of all turf grass diseases occurring throughout the world and the most prevalent on zoysia grass when the night temperature is above 20^{0}C and day temperatures are above 26 – 27^{0}C (UGA Extension publications B 1233, 2015). The symptoms of brown patch can vary depending on the grass cultivar, climatic and atmospheric conditions, and soil management of the turfgrass (Bloom and Couch, 1960). Bentgrasses (*Agrostis* spp.), ryegrass (*Lolium* spp.) and tall fescues (*Festuca arundinaceae*) are most susceptible to *Rhizoctonia* infection. The yellow patch caused by *Rhizoctonia cerealis* is also referred to as cool season brown patch (Burpee, 1980). The disease produces small to medium sized patches, usually with yellow margins.

The large patch is caused by different strains *R. solani*. In large patch, circular areas of diseased turf are observed, ranging in diameter from less than 3 ft. up to 25 ft. (Green *et al.* 1994). Leaves of recently infected turf, located at the periphery of the patch, may appear orange in colour. Some patches may be perennial, recurring in the same location and expanding in diameter year after year. In contrast to brown patch, water-soaked, reddish-brown or black lesions are found on the infected

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leaf sheaths. Foliar dieback from the leaftip toward the base occurs as a direct result of leaf sheath infections.

The manuscript reports the diagnosis of Brown patch disease caused by *Rhizoctonia solani* in Zoysia grass in a home garden lawn in the Kandy District (Central Province) of Sri Lanka and the confirmation of the pathogen.

MATERIALS AND METHODS

Patches of diseased Zoysia grass (*Zoysia matrella* (L.) Merr.) of an unknown variety, were observed in a home garden at Dodanwala, Kandy District, Central Province of Sri Lanka in June 2015 (elevation 488.6 m, day temperature 24 – 28^{0}C~ total rainfall 154.7 mm in June 2015). The field symptoms of affected grass at different stages of disease and the pattern of symptom development were recorded and photographed. Portions of whitish, areal mycelium, when available, were directly transferred using a sterile needle on to PDA plates in the field. Diseased grass at different stages of disease were uprooted and taken to the Plant Pathology laboratory Department of Botany, University of Peradeniya, Sri Lanka for detailed examination. Segments (5 × 5 mm^2) of tissues cut from the periphery of infected areas of the leaf and the sheath were surface sterilized in 1% sodium hypochlorite (20% Clorox) for 1-3 min followed by rinsing twice in sterile distilled water (SDW). Leaf segments were placed on sterilized filter paper to remove excess liquid and aseptically transferred onto PDA plates (4 pieces per plate), supplemented with 50 μ g/ml tetracycline to suppress bacterial growth. The plates were incubated at room temperature (28-30^{0}C) for 5-7 days. The fungus that grew out from leaf segments/mycelium was subcultured by transferring discs (6 mm diameter) of mycelium onto fresh PDA plates and was allowed to grow at room temperature for about 2-3 weeks. The fungus was identified using the colony, hyphal and sclerotia morphology (Martin, 1987). A voucher culture was deposited in the culture collection of the Department of Botany, University of Peradeniya, Deposit Number UPBT 122015.

RESULTS AND DISCUSSION

Symptoms

Smaller, about 3 – 10 cm diameter, yellowish and irregular patches of diseased grass were observed in the turf. About 6 – 10 diseased patches were scattered within a square m^2 area. There was also about 40 cm diameter and 7 cm wide ring of brown grass bordering an area of greenish area which could be observed from a distance (Fig. 1a). Whitish aerial mycelium, intermingled with the affected and dew-covered foliage and runners, was observed during early morning hours of certain dry days (Fig. 1b). The aerial mycelium disappeared some time later when the sun started to become stronger. This is generally referred to as the 'smoky ring'. The foliage of affected grass showed symptoms at different stages of disease development. Most of the affected leaves showed reddish, tan or brown colour upper half of the leaf blade with a dark brown and wavy margin bordering the healthy lower portion of the leaf. A few affected leaves had irregular, grey or reddish brown areas in the middle of the leaf blade bordered by two dark brown bands. Here the upper and lower portions of the leaf remained green. There were leaves in between which had turned brown or straw colour entirely and appeared dead (Fig. 1c). In a few leaves, the browning had continued in to the leaf sheath (Fig. 1c). Occasionally, reddish brown discoloration was also observed along a stolon covering 2-3 nodes. In certain isolated patches, the grasses were dark brown and appeared dead and several of such patches in close proximity had coalesced to form larger irregular areas. These areas appeared to have had poor drainage.

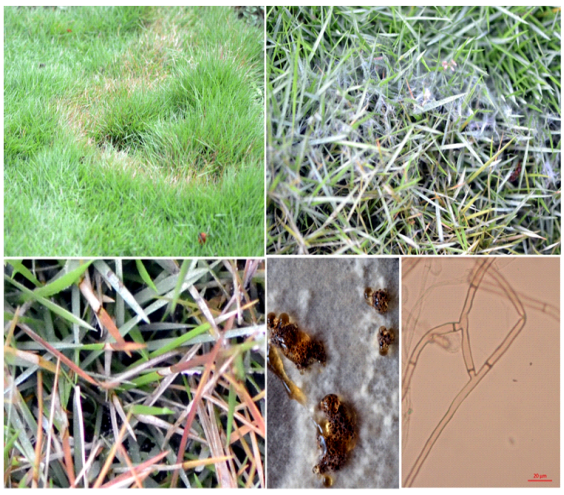

Fig. 1 : Ring of brown, dead grass ('smoky ring') surrounding healthy turf (a), white mycelia growth between leaves and runners (b), reddish brown upper portion of foliage with dark boarders and (c), sclerotia of *R. solani* formed on PDA (d) and characteristic branching at 90^0 and constriction at the point of branching (e) of *R. solani* mycelium

Pathogen

The fungus, isolated from diseased leaves and the aerial mycelium, produced whitish colonies initially on PDA with fast growing, sparse mycelium covering the whole plate and turned light brown after a few days. Irregular, dark sclerotia with compact masses of mycelium were visible (Fig. 1d) after 23 weeks. Microscopic examination showed the hyphae producing a characteristic branching pattern at 90^0 (Fig.1e) and a slight constriction at the junction of branching slightly shortening the width of the hyphae below the septum (Fig. 1e). There were no spores of any kind produced on PDA. The fungus was identified as *Rhizoctonia solani* which is classified under the Phylum Basidiomycota, Class Agaricomycetes, Order Cantharellales and Family Ceratobasidiaceae.

Slime mould growth

Numerous, smaller and white colour sporangia, often united in a row, of a slime mould (Order: Physarales) were also found associated with leaf of both healthy and *Rhizoctonia* affected grasses. Older pustules had turned black colour. Their presence did not result in any visible damage to or colour change of the host leaf beneath the pustules.

The pathogen isolated from diseased leaves and the aerial mycelium was identified as *R. solani* using morphological characteristics. The presence of 'smoky ring' with whitish aerial mycelium in the turf canopy bordering the healthy grass and the symptoms produced in affected leaves revealed the disease to be the brown patch caused by *R. solani*. The smoke ring is an indication of active fungal growth on the turf foliage and is an initial sign of brown patch development. To the best of our knowledge, this is the first report of the brown patch disease caused by *R. solani* in Sri Lanka. A somewhat similar condition, without a 'smoky ring', was also observed in a turf in Digana area in the same District in June 2016.

R. solani is a soil inhabitant that survives on decaying organic matter or in soil but uses living plants if available. Infection occurs when environmental conditions become favourable for pathogen buildup and host plants become susceptible. Brown patch is a problem in home or commercial lawns but in most situations the disease may not kill plants. When the conditions are conducive, however, the fungus is capable of infecting and killing most cultivated turf grass species. The disease can be very damaging to young grass seedlings. During long periods of hot, wet and humid conditions, brown patch can develop fast so that a large area can occur within 24-48 h (Bloom and Couch, 1960). Turfgrass usually recovers from light attacks with the change in environmental conditions such as temperature or moisture. After the leaves die in the blighted area, new leaves can emerge from the surviving crowns (Green *et al*. 1994).

High nitrogen fertilizer applications have been associated with increased turf susceptibility to Rhizoctonia brown patch in cool-season turfgrasses (Smiley *et al*. 1992). The disease in seaside bentgrass (*Agrostis palustris [Agrostis stolonifera* var. *palustris]*) was most severe at high N levels and decreased with decreasing N levels (Bloom and Couch, 1960). Rhizoctonia brown patch in tall fescue (*Festuca arundinacea* Schreb.) was more severe when the turf was mowed at 2.5 cm than at 6.4 cm (Watkins *et al*, 1990).

Application of moderate levels of N fertilizer (Bloom and Couch, 1960), irrigation very early morning, reduction of shade and increase of air flow to dry turf more quickly may be beneficial for management of brown patch in Zoysia grass (Green *et al,* 1994). Preventive and curative fungicide applications are needed for managing the disease on commercially cultivated turfgrass such as golf course greens, tees and fairways.

Application of appropriate fungicide/s would enable regrowth from surviving crowns, stolons and rhizomes. Tebuconazole, applied in three different formulations, was very effective against the brown patch pathogen, *R. solani* (Mocioni *et al*, 2003).

Growth of a slime mould observed on the leaves of healthy and *R. solani* affected grass studied was epiphytic and did not appear to play a role in the brown patch disease. Slime molds grow on plants but do not infect grass leaf or cause any direct damage. They can sometimes cause mild yellowing of the leaves due to their shading effect. Slime mould spores in the soil and thatch germinate during warm, wet weather (Centre for Turf grass Environmental Research and Education, NCSU 2016).

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