Severe Blight Diseases of Turfgrass Induced by Fungi Species in the Sudan

Ahmed Hashim Ahmed¹, Elnair Akasha Mohammed²

¹Department of Crop Protection, Faculty of Agriculture, University of Khartoum, Khartoum Sudan
²Department of Crop Protection, Kenana Sugar Research and development, Kenana, Sudan

Email address
ahmed.hashim1943@gmail.com (A. H. Ahmed), akashaelnair186@gmail.com (E. A. Mohammed)

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Abstract

The present study was conducted in Khartoum State in fifteen locations to investigate turf grass diseases. Turf grasses (lawns) are cultivated in private and public gardens and courts are getting special importance in Khartoum State in recent years. However, blight disease- like symptoms have been observed in different gardens in Khartoum State. Therefore, the present research was conducted to study the blight disease of turfgrass in Khartoum State. The results revealed the infection of turfgrass fields surveyed with four fungi; namely, Fusarium nivale, Drechslera spicifera, Rizoctonia solani and Curvularia lunata. The identity of these fungi was confirmed by Blotter tests and culture in PDA. The association of these fungi with turfgrass blight disease was confirmed by pathogenicity tests, which revealed identical symptoms of tufrgrass blight with those associated with the disease in the private and public gardens and courts. The results of the present work are in agreement with the work reported by Lebean (1960), Smiley et al., (1992), and Nancy (1997), who showed the importance of applying Koch’s postulate to confirm the identification of the fungi causing blight diseases of Bermuda grasses.

Keywords
Bermuda Grass, Blight Diseases, Fungi Species, Management

1. Introduction

Bermuda grass (Cynodon dactylon) is considered the main coverage for green land on courts, hill slopes, athletic and lawns entertainments for common and home gardens. Bermuda grasses are established vegetatively by planting the springs or the plugs. In areas of low rainfall it is commonly grown along irrigation ditches and stream beds [6]. The methods of planting are successful if the site is properly prepared before planting. Proper soil Preparation before planting is important to allow air and water to penetrate and promote root grows [9].

There are many pathogens that cause Bermuda diseases worldwide like fungi, bacteria, viruses, nematodes and parasitic flowering plants. Austin, [2] and [14] mentioned that certain cultivars of Kentucky blue grass, perennial rye grass, tall fescue, bent grass and fine fescue are susceptible such that it is very difficult to predict when the symptoms will be most severe. All Drechslera spp. diseases tend to form leaf lesions as the first symptom of the disease. The lesions caused by the different Drechslera species are different on each host plant. Leaf lesions on Kentucky bluegrass first appear as small, water soaked areas that soon become reddish brown to purplish black, often surrounded by a yellow zone fading into adjacent healthy green tissue. [13]. Fusarium patch appears as small orange, brown or light brown patches, each extending in a circular pattern outward to form scars up to 50 mm in diameter. When favorable growing conditions are present these patches may have white fluffy strands (mycelium) within and around the scar which look similar to candy floss, these patches may also join together to form larger areas of scaring and damage [4]. Fading-out which appears to be an appropriate name for the turf disease caused by Curvularia spp, which are closely related to Helminthosporium Diseases like Symptoms which are very common in the Sudan [8]. The first record of Bermuda grass blight in the Sudan was reported from a home garden in East Khartoum State infected by Rhizoctonia sp. [1] as shown in Figure 1 and 2. The present investigations were carried out in Khartoum State to survey and identify the causal
organisms of the blight diseases of the Bermuda grasses and describe possible management strategies.

![Figure 1. Symptoms of blight disease in Bermuda grass.](image1)

![Figure 2. Sever symptoms of blight disease in Bermuda grass.](image2)

2. Materials and Methods

A survey of turf diseases occurring in Khartoum State was conducted, in fifteen locations divided into three groups namely Omdurman (Giad garden, Alnakhir garden, development of academic center, University of Al Quran Alkariam and shabab Omdurman center), Khartoum (Elsont center, University of Khartoum "center", Ozon garden, private garden and private garden) and Khartoum North (Abowd bark, ALsalam open garden, Ministry of education, Abu baker garden and DF garden). In each location visual inspection and several photographs were taken from the diseased plants as apparently healthy ones. Five samples composing of 10 Cm plugs of turfgrass were taken from each location, these samples were kept in plastic bags and stored in the refferigater at 5 °C for further lab work on isolation and identification.

2.1. Isolation of the Pathogens from the Leaves

Leaf cuts 3 to 4 cm long were surface sterilized by 10% chlorox solution for 1 to 2 minutes, washed four times by sterilized distilled water to remove chlorox solution and left to dry. Then each sample was divided into two subsamples. Six segment from the subsample were incubated in each Petri-dishes containing PDA. Similar segments were incubated in plotter test. Both segments were incubated at 28 ±2°C temperature and inspected daily for fungi growth.

2.2. Isolation of Pathogens from the Roots

Similarly, the roots of the previously sample turfgrasses were divided into two subsamples washed in running water surface sterilized for 1–2 minutes and, then washed four times to remove chlorox solution and left to dry on sterilized filter paper. The root cuts were then `15 incubated Petri-dishes containing PDA other in plotter test at 28 to 30°C temperature for 7 days inspection daily for fungi growth.

2.3. Isolation from the Soil

Soil samples from the previously collected turfgrass locations were mixed together and one gram of the soil sample was taken and added to 10ml sterilized distilled water (SDW) and diluted as follows; 1- 1ml of dilution one was added to 9ml of SDW to give 100 diluted 2- 1ml of dilution two was added to 9ml of SDW to give 1000 diluted One drop of dilution three was added to Petri-dishes containing PDA and incubated at 28 to 30°C temperature and examined daily for fungi growth.

2.4. Identification of the Fungi

The identification of the fungi species was based on the method described by [3] in his book, "Fusarium laboratory Guide for the identification of the major species" and that of [15] in his book, "The diagnosis of plant diseases, field and laboratory manual emphasizing the most practical methods for rapid identification". Then the identification was further confirmed by the help of Dr. Sohair and Miss Awatif in the plant pathology lab, of the plant Protection Department of ministry of Agriculture, Khartoum North.

2.5. Pathogenicity Test

Pathogenicity tests were conducted according to Koch’s postulate to confirm the pathogenicity of the fungi species isolated namely; Fusarium, Drechslera and curvularia spp. as the causal agents of turfgrass blight disease. The grasses used were one month old with no blight disease symptoms observed, each fungus was isolated from infected grasses grown on PDA for 14 days; conidia were removed from the surface of the colonies by distilled water. Spores suspension was adjusted by Hemicytometer to 13x10^5 conidia/mL. The spore suspension was sprayed to each plant. Control grasses were sprayed with sterilized distilled water. The disease incidence is measured by counting the number of plants infected related to the total number of plants inspected (% infection). The disease severity was counted by the method described by [5] using a key of 0-5 where 0=no symptoms, 1=leaf tip dieback of 0 to 5mm, 2=leaf tip dieback more than 5mm, 3= chlorotic leaf lesions plus leaf tip dieback, 4= 50% tillers with leaf sheath lesions and 5= more than 50% with dead leaves. The experiment was conducted in complete randomized design (CRD) with four replications. Variations between treatments were determined by subjecting data to the analysis of variance system (ANOVA) using Statistical Analysis System (SAS). Least significant Difference LSD test was used to determine differences between means at a probability of P> 0.05.
3. Results

The results revealed the mix infections of turf grass surveyed with four fungi species, namely *Fusarium nivale*, *Drechslera spicifera*, *Curvularia lunata* and *Rhizoctonia solani* (for example Figure 5, 6, 7, 8, 9, and 10). The Pathogenicity tests of the isolated fungi have shown typical Symptoms as those shown on the old grasses. Bermuda blight was inspected daily in the locations included in the study. The infected grasses appear as brown yellow from distance (Figure 3). Close observation as round, water-soaked spots that soon turn yellow or orange reddish patches that coalesce to cover large areas of dead plants (Figure 4). The Pathogenicity tests have shown that inoculation of healthy grasses with the individual pathogens resulted in symptoms different from the blight symptoms resulting from complex natural infection the inoculation of fungi species showed significant incidence occurring in the Bermuda grass 20 days after inoculation (Figure 11). *Fusarium nivale* infection first appeared as around water-soaked spots that soon turn into yellow or orange brown patches that enlarge and become blight yellow. Such symptoms were not observed in healthy uninoculated plants. Inoculated grasses with *Curvularia lunata* developed leaf spots lesions typical to those occurring naturally in the field. Most leaf and sheath lesions appear on the tops of affected plants. The inoculation of *Drechslera spicifera* on healthy Bermuda grass resulted in the appearance of small Purplish spots that gradually increase in size resulting in large blight spots with Purplish brown borders. The results of the disease incidence show that the blight disease incidence was very high in Omdurman location followed by Khartoum North and Central Khartoum as shown in Table 1.

### Table 1. Means of different fungus species (*Fusarium*, *Drechslera* and *Curvularia*) incidence on Bermuda grass at various periods.

<table>
<thead>
<tr>
<th>Fungus strain</th>
<th>Days 5</th>
<th>Days 10</th>
<th>Days 15</th>
<th>Days 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fusarium</td>
<td>0.30a</td>
<td>0.47a</td>
<td>0.47a</td>
<td>0.56a</td>
</tr>
<tr>
<td>Drechslera</td>
<td>0.24b</td>
<td>0.30b</td>
<td>0.35b</td>
<td>0.41b</td>
</tr>
<tr>
<td>Curvularia</td>
<td>0.22b</td>
<td>0.31b</td>
<td>0.37c</td>
<td>0.44b</td>
</tr>
<tr>
<td>Mean</td>
<td>0.25</td>
<td>0.36</td>
<td>0.40</td>
<td>0.47</td>
</tr>
<tr>
<td>LSD</td>
<td>0.179</td>
<td>0.148</td>
<td>0.09</td>
<td>0.078</td>
</tr>
</tbody>
</table>

Means followed with same letter in the same column are not significantly Different at p= 0.05 according to LSD.
4. Discussion

The present work has reported for the first time in the Sudan, Bermuda blight diseases induced by *Fusarium nivale*, *Drechslera spicifera*, *Curvularia lunata* and *Rhizoctonia solani*. The results of the present work is in agreement with the work reported by [10, 12 and 16], who showed the importance of applying Koch’s postulate to confirm the identification of the fungi causing blight diseases of Bermuda grasses. Similar to the present work [11] reported similar symptoms on Bermuda grass inoculated with *Drechslera spicifera*. The present work has clearly indicated the requirement needed for the establishments of new Bermuda grass. Such requirements include proper land preparation, healthy of newly seeded Lawns free from disease – like Symptoms and frequent watering for newly seeded Lawns. The present work has shown, for the first time, the association of *Fusarium nivale*, *Drechslera spicifera*, *Rhizoctonia solani* and *Curvularia lunata* with blight disease in turfgrass in the Sudan. The present work indicated that fungal infection should be considered as one of the factors causing desertification and agree with those of [7] who reported that the biological factors such as pests and diseases are part of the constrains that lead to desertification of the rain-fed farming areas in the Sudan.

5. Conclusion

Blight disease symptoms in Bermuda grasses are very common in different private, public gardens, courts and other green common areas in Khartoum State in the Sudan. Several investigations revealed the occurrence of four fungi species namely; Curvularia, Drechslera, Fusarium and *Rhizoctonia* spp. are responsible for the blight diseases as single or mix infections leading to desertification of severely infected areas. Requirements for growing healthy Bermuda grasses have been described.

References


