Research Journal of Chemical and Environmental Sciences
Res J. Chem. Environ. Sci. Vol 7 [2] April 2019: 72-74
Online ISSN 2321-1040
CODEN: RJCEA2 [USA]

Website: www.aelsindia.com/rjces.htm

RJCES

ORIGINAL ARTICLE

Identification of *Ustilago cynodont is* associated with Smut disease in Bermuda grass (*Cynodon dactylon*) in Kashmir

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ABSTRACT

Bermuda grass (Cynodon dactylon) is an important warm-season perennial turf and forage grass. The productivity of the grass depends on the variety/cultivar and various climatic factors. The grass is prone to various diseases, among them; smut is one of the important diseases causing severe effects on its productivity and cultivation. The present study was undertaken to identify the causal agent of smut associated with smut disease in Bermuda grass. The disease incidence in the lawns was more and had affected the inflorescence of the grass. The study identified Ustilago cynodont is associated with this disease in grass. Future prospects of the disease are, confirmation through molecular approaches, impact on the performance of growth, survival, and competitiveness of the clonal rhizomatous perennial grass and management using organic approaches.

Key words: Smut, Bermuda grass, grassland management, Ustilago cynodontis

Received 25.12.2018 Accepted 28.02.2019

INTRODUCTION

Grass family (Poaceae) is one among the largest and most import plant family which is playing a pivotal role for the nutrition and health of the human beings as well as the livestock, besides serving other potential ecosystem services like in watershed management, recreational purposes and others. Bermudagrass (*Cynodon dactylon*) is an important warm-season perennial turf and forage grass that is typically grown in warm, tropical and subtropical climates [1]. The grass is quiet often abundantly seen as a weed in uncultivated areas, along the bunds and roadsides and other such places. However, it is a good source of fodder for the livestock also and is cultivated [1]. It is propagated by grass tufts and rooted runners. During winter, the Bermuda grass turns dormant. This is a non-exacting and early successional grass species, observed to grow in open areas having disturbances from grazing animals frequently, or from fire, flood and other calamites [3]. The species prefers heavy clay soil than the light sandy soils of dry regions, but it has potential to tolerate a wide range of soil types even with less fertility. Productivity of the Bermuda grass varies with cultivar used, season and the soil fertility, with dry matter yield of 5-15 t/ha. It is highly palatable by cattle [6]. Bermuda grass is susceptible to diseases like anthracnose, rust, smut, white leaf etc, but smut is one among the prominent diseases causing severe effects. In smut disease, the reproductive organs are replaced by the dark spores of the carbon colour and appear like ash when crushed and cause the devastating effects on the plant part or the crops [2].The infection results in complete modification of awn bearing spikelets to sori with teliospores and reduction in dry matter production and growth rate of stolons by changing the allocation of resources between roots and shoot. It becomes apparent only when plants form seed heads that are colonized by the smut fungus. Since the inflorescence of infected grass is completely modified into sori bearing teliospores, no viable seeds are produced [7]. Many native grasses and other plants are also affected, and the number of hosts for smuts approaches nearly 4000 species [5]. Smut fungi are the members of the class Basidiomycetes of the order ustilaginales.All these fungi are the biotrophicin nature and about 50 genera and around 1000 species of the smut fungi have been reported [1]. Six species of Ustilagino mycetes have been described from Cynodon, namely *Sorosporium cynodontis* Ling, *Tilletia cynodontis* Vanky, *Ustilago cynodontis* (Henn.) Henn.,*U. dregeana*Tul and C. Tul., *U. hitchcockiana* Zundel and *U. paraguariensis* Speg. Keeping in view the

importance of the disease, a preliminary study was conducted on smut effecting Bermuda grass in Kashmir valley to record the incidence of the disease and identification of pathogen associated with this disease.

MATERIAL AND METHODS

Source of Infected plant material

During the month of August 2018, infected Bermuda grass plants were found in and around the campuses of ICAR-CITH, and ICAR-IGFRI-RS Srinagar J&K in discontinuous stretches both in lawns and experimental fields.

Incidence and Sample Collection

The incidence was recorded according to the formula as below. Total 6 infected samples, 3 from each location were collected in small paper bags for microscopic studies.

$$\textbf{Percent disease Incidence} = \frac{\textbf{Number of Runners infected}}{\textbf{Total Number of Runners Examined}} \times \textbf{100}$$

Microscopy

Spores collected from the inflorescences of all collected samples were examined under compound microscope. Spores were scraped off the infected plant material and mounted in a drop of Lacto-phenol [8]. The slides were allowed to dry at room temperature for 4-5 days until the mounting medium thoroughly hardened. They were then microscopically examined, and spores were measured using micrometry. The average size of the spores of each reference sample was determined based on the measurements of six spores of each sample. The pathogen was identified by comparing the pathogen characters with authentic literature of Shivas and Venky [9].

RESULTS AND DISCUSSIONS

Symptomatology and Incidence of Disease

The infected plants occurred in patches alongside healthy plants and several disease foci were observed along a 100-m transect of non-contiguous Bermuda grass. The disease was severe wherever it was present and inflorescence was distorted, failed to fully emerge and was covered with black-brown spores (Fig 1a). Sori involving the inflorescence was cylindrical, tapering at apex, partially concealed by the leaf sheaths, covered by a thin, delicate, greyish peridium that disintegrates early revealing a dark, semi agglutinated mass of spore balls surrounding several fine columellae. The inflorescence was intact in healthy plant with no black colored spores(Fig 1b).Average Incidence recorded was16-28% from both the locations under study. The maximum incidence of 27.36% was observed at experimental fields ofICAR-IGFRI as most of the grasses remain unsprayed with fungicides as compared to ICAR-CITH fields and lawns.

Fig 1: a. Distorted, less emerged smutted inflorescence of *C. dactylon*covered with black-brown spores; b- Healthy inflorescence

Identification of pathogen

Teliospores collected from the smutted inflorescences observed under light microscope were globose to sub-globose, smooth-walled and echinate, ranging from 5.4 to 6.5 µm x 4.8 to 6.5 µm (Fig 2). The spore characters were matched with authentic literature, which revealed that the pathogen associated with the disease, is *Ustilago cynodontis*. Relatively dry and warm climatic conditions favour growth and development of both plant as well as pathogen. Infection caused a reduction in overall dry matter production and the growth rate of stolons, changed the allocation of resources between roots and shoots and affects the survival of plants; the growth of infected stolons is disproportionally affected. [7].The grass shares a common ecological niche with several crops like sugarcane, wheat, rice etc; hence there is every possibility of *U. cynodontis* switching over to these crops as a pathogen [4].

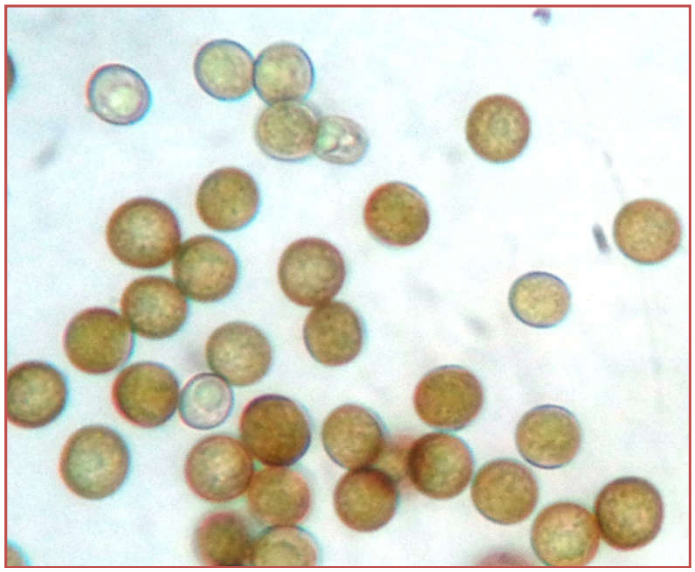

Fig 2: Smooth walled, globoseteliospores under light microscope (100X)

ACKNOWLEDGEMENTS

Authors are highly thankful to ICAR-CITH for conducting microscopic studies in Plant pathology Laboratory

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CITE THIS ARTICLE

K A Khan, S Ahmad, S S Bhat, N H Mir, S Un Nabi, M A Sheikh. Identification of *Ustilago cynodont is* associated with Smut disease in Bermuda grass (*Cynodon dactylon*) in Kashmir. Res. J. Chem. Env. Sci. Vol 7 [2] April 2019. 72-74