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Two New *Cladosporium* Species from Murshidabad District, West Bengal, India

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ABSTRACT

Introduction: *Cladosporium* is a member of dematiaceous hyphomycetes which is characterized and easily recognised by its unique structure of the conidiogenous loci and conidial hila. Despite being imperfect in forms, they are the most versatile organisms in nature. While working on dematiaceous hyphomycetes from Murshidabad district, two specimens of *Cladosporium* had been collected which on critical examination characterised as two new species.

Methods: The infected leaves with distinct symptoms were collected and dried to make herbarium specimens. The microscope slides were prepared in lacto-phenol cotton blue mixtures of the recognised species. The fungi, treated here were studied in their natural habitat on the leaves of *Clitoria terrnatea* and *Hibiscus mutabilis*.

Results and Discussion: Two new species of *Cladosporium* viz. *Cladosporium clitoriae* Haldar and *Cladosporium murshidabadense* Haldar on *Clitoria ternatea* Land *Hibiscus mutabilis* L. respectively had been collected, figured and described in the present communication with notes on their phylogeny and ecology.

Key Words: Anamorphic, Hyphomycetes, Taxonomy, sp.nov

INTRODUCTION

The genus *Cladosporium*, a well documented fungus and was established by Link in the year 1815 with *Cladosporium herbarum* (Pers: Fr.) Link *ex* S.F. Gray is the type species. It had been named as "Klados" means a branch, hence branched spore chains. The taxonomic position of the genus *Cladosporium* is almost accepted as being a member of the form family *Cladosporiaceae* under the order *Hyphomycetes* of the form class *Deuteromycetes.* The genus *Cladosporium* is well characterized and easily recognised by its unique structure of the conidiogenous loci and conidial hila which classified as coronate, i.e., composed of a central convex dome surrounded by a raised periclinal rim. Cladosporoid are common and worldwide distribution and it is one of the largest, most heterogeneous genera of hyphomycetes, comprising more than 772 names i.e., valid, invalid, legitimate and illegitimate species, varieties, formae as well as herbarium names[1]. Reasons for this vast number of taxa probably reside in the imprecise, wide circumscription of this genus in literature, the strong morphological variability of most species and the occurrence of some species on a wide range of substrates. The members of *Cladosporium* is a dematiaceous fungi occurring on all kinds of living and dead leaves and stems of herbaceous and woody plants, as secondary invaders on necrotic leaf lesions caused by other fungi, are frequently isolated from air, soil, food stuffs, paint, textiles and other organic matters.

Reviews keys of Cladosporoid taxa on living plants were provided by a large number of worker from India and abroad. Some of them are : Amanelah, Beharvandi & Zafari[2], Avasthi, Gautam &Bhadauria[3] Bensch *et al*[4] ., Braun &Hill[5], Braun & Crous[6], Crous[7], Crous *et al*,[8]. Crous [9] ,Das[10],David &David[11],Dugan *et al*.[12],Ellis[13], Ellis[14], Heuchert, Braun &Schubert[15], He & Zhanh[16],Jang *et al*[17],Kirk[18], Mułenko, Schubert & Kozlowska [19,] Partridge & Morgan-Jones [20], Schubert *et al*,[21] Schubert & Braun[22],Seifert ,Nickerson & Corlet[23] Schubert & Braun[24], Wirsel SGR & Runge-Frobose[25], Thomma, Van Esse & Crous[26] , Schubert *et al* [27] , Braun & Schubert[28], Zhang *et al*[29], Sharma *et al*[30], Sandoval-Denis *et al*[31], Subramania[32], Kamal[33] and Haldar[34].

During working on the foliicolous fungi of Murshidabad district in the year 2016 of West Bengal the author had collected two members of Hyphomycetes growing on the living leaves of *Clitoria ternatea* L. (Fabaceae)and *Hibiscus mutabilis*

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L.(Malvaceae). which on critical examination found to be two new species of the genus *Cladosporium*. Hence, these two species. *Cladosporium clitoriae* Haldar sp.nov. and *Cladosporium murshidabadense* Haldar sp.nov. have been created as new taxa (Myco Bank[35]).

The district of Murshidabad is located in the central part of the state of West Bengal under Presidency Division, lies between 23°43/ to24°52/ N latitude and 87°49/ to 88°44/ E longitude and occupies an area of 5341sq km. The district is separated from the Maldah district by the river Ganga on its north. The eastern boundary of the district is formed by Bangladesh. It is bounded by the districts of Burdwan and Nadia on the south, the Birbhum district and the state of Jharkhand located in the western side. The river Bhagirathi flowing across the district divides it into almost two equal parts. The western part is known as Rarh which is substantially continuation of sub-vindhyan region. The soil of this district is primarily alluvial. The tract east to river is known as Bagri and is covered with recent alluvium consisting sandy clay. The elevation of the district is from 10m to 50m above MSL. Ganga and its tributaries such as Bhagirathi, Jalangi and Bhairab are the important rivers of the district. The district is oppressively having hot summer, short winter, high humidity and good rainfall during monsoon season. The average annual rainfall of the district is 1400 mm.

MATERIALS AND METHODS

Specimens with typical disease symptoms of Cladosporoid fungi on living leaves were collected during field trips. The infected leaves were detached intact from the host plants and they were kept in polythene bags and processed by following standard techniques Castaneda[85]. Photographs of the infected spots on the host leaves were captured by Sony DSC-HX200, camera and for the examination of fungal structure and spore morphology, the microscope slides were prepared in lacto-phenol cotton blue mixtures of the recognised species. Morphotaxonomic study of the associated fungi was done through the low and high magnification 100x400 of the compound microscope, (Olympus-CX21i FS1 Research Microscope) by using USB INSTA CMOS camera. The microphotographs were stored in electronic format JPEG. Holotypes being deposited at AMH, Agharkar Research Institute (ARI), Pune (MS), India and isotypes retained in the Departmental herbarium (KNC)for future reference.

RESULTS

Cladosporium clitoriae Haldar sp.nov.(Fig.1)

Myco Bank MB 829285

Incidence in winter, infection foliicolous inciting whitish, necrotic, spots amphigenous distinct on upper surface, numerous, subcircular to irregular, sometimes surrounded by grey margin, lesions occasionally developing shot-hole appearance, 1.5-2.5 in diam. *caespituli* epiphyllous, brown, mycelium immersed, superficial, smooth. *stroma* amphigenous,well developed, arising from the epidermal hairs of the host tissue, composed of thick walled isodiametric type of cells, light brown: *conidiophores* solitary to fasciculate, with 2-8 divergent stalks in a fascicle arising from the base of the stroma and rarely through the stomata, straight to curved, pale brown, septate, simple to branched, sometimes nodose with terminal and intercalary swelling, thick walled, smooth with distinct scars, after succession of conidia, apex sub acute to obtuse, average length 277.56-627.92 µm and breadth-29.16µm.*conidia* solitary to catenate up to 3 in a chain, pale olivaceous, usually straight, rarely curved, cylindrical, ellipsoidal, thin walled, smooth to verruculose, up to 4 septate, often with distinct protuberant scar at both ends, average length 53.49-212.89 µm and breadth 29.16 µm.

Etymology: Referring to the genus of the host.

Habitat in folis vivis *Clitoria ternatea* L.(Fabaceae),Ring Road, Berhampore, Murshidabad, West Bengal, India, AMH 9847(Holotypus), KNC 142 (Isotypus). D.Haldar, 06.11.1016.

Cladosporium murshidabadense sp.nov.(Fig.2)

MycoBank MB 829286

Incidence in rainy season, spots formed on lamina, amphigenous, semi circular to circular, dark brown centre surrounded by blackish margin, sometimes no definite spots, only greyish discoloration without any boundary,0.5—10 mm in diam,; *caespituli* amphigenous ,vein limited, unevenly distributed over the spots, black; *stroma* present(23.60-297.87 µm),occasionally only a few brownish spherical to gobular hyphal cells, substomatal; *conidiophores* amphigenous, solitary to fasciculate, in fascicles 2-7 stalks emerging the stomatal opening, straight to flexus, brown to pale brownish, simple or branched, thick walled, smooth, very often nodose, plurisepted (1-9 septa),septa distinct, often geniculate, often terminal vesicular swelling with distinct spore scar lying at the apex or by the side wall of the conidiophores,(average length 559.33-1124.60 µm) and breadth(40.79-48.02 µm);*conidia* solitary to catenate, cylindrical, ellipsoidal, lemon shaped, oblong, pale brown, smooth, thick walled 0-3 septate, hilum distinct aat one end or both ends, average length,(53.26-137.97 µm) and average breadth (25.81-54.88 µm).

Specimen studied: On *Hibiscus mutabilis* L. (Malvaceae), Kossim Bazar, Berhampore, Murshidabad, West Bengal, India, AMH-9748(Holotypus), KNC 317(Isotypus), D. Haldar, 2 June, 2016.

Etymology: Referring to the genus of the host.

No species of *Cladosporium* has yet been recorded and described on the hosts *Clitoria ternatea* L.(Fabaceae) and *Hibiscus mutabilis* L.(Malvaceae) and there is no record of this genus so far on other members of the family Fabaceae and Malvaceae respectively. So, the present fungus is described and illustrated here as a new taxon.

DISCUSSION

The fungi *Cladosporium clitoriae* Haldar and *Cladosporium murshidabadense* Haldar has been found to occur profusely during winter months to spring and early summer. The host plants *Clitoria ternatea* L. and *Hibiscus mutabilis* L. both are economically important. The roots of *Clitoria ternatea* L. is used as powerful cathartic and diuretic. Flowers yield a blue dye. Seeds contain a fixed oil. Both seeds and root-bark contain tannin. Purgative and leaves used as fodder. On the other hand *Hiiscus mutabilis* L. bark yields a strong fibre of inferior quality. Leaves used for cough, menorrhagia, dysuria and wounds caused by burns and scalds. Flowers given in pectoral and pulmonary complaints[36].

CONCLUSION

Two new species of *Cladosporium viz Cladosporium clitoriae* Haldar and *Cladosporium murshidabadense* Haldar growing on two ornamental plants namely *Clitoria ternatea* L. and *Hibiscus mutabilis* L. They cause severe leaf infection of the host plants resulted which the growth of the plants become stunted. A pathologist should develop the control measures of the disease.

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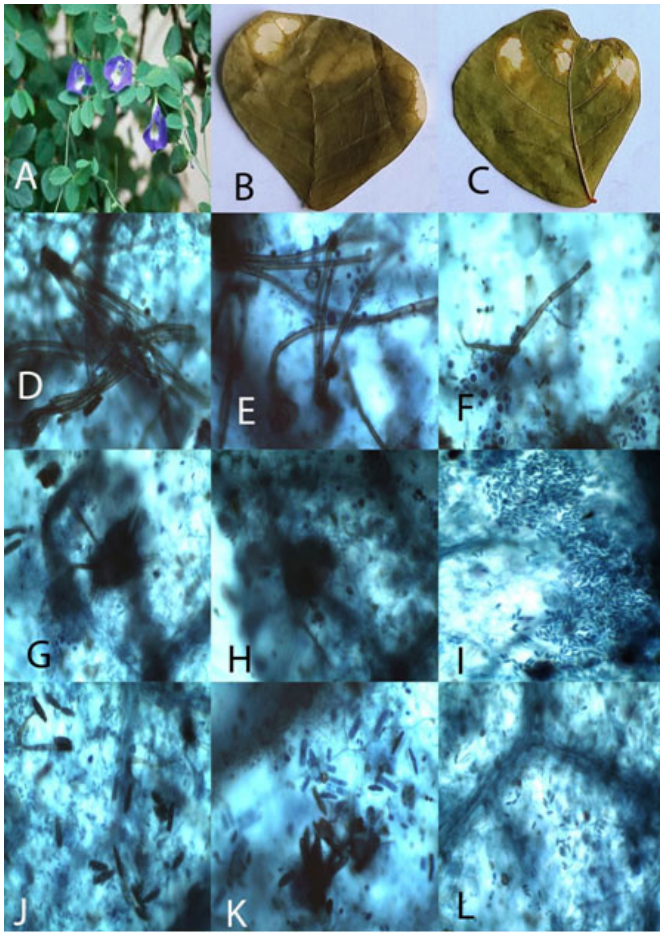

Figure 1: *Cladosporium clitoriae* on *Clitoria terternatea.* A-Host plant.B-C: Leaf spots.D-F:Conidiophores.G-H :Strpma:I-L:Conidia: Scale bars=20 mm.

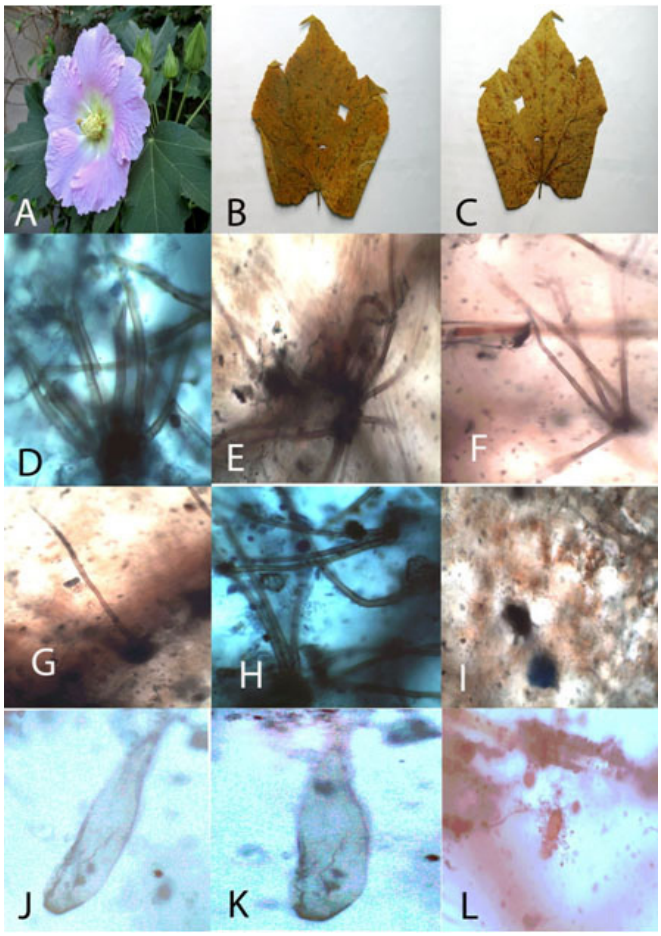

Figure 2: *Cladosporium murshidabadense* on *Hibiscus mutabilis.* A-Host plant. B-C: Leaf spots.D-H:Conidiophores.G-H: Strpma:I.J-L:Conidia: Scale bars=20 mm.