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Status of suceptible hosts of foliar fungi from North Central Tarai Forests of Uttar Pradesh (India)

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Abstract: The present report elucidates a rich and unique profile of Mycobial as well as Phytodiversity of research area surveyed with 126 Angiosperms host plants representing 102 genera & 44 families being parasitised by 142 foliar fungal species representing 62 fungal genera.

Key words: Foliicolous fungi, north central tarai forests

Introduction

The leaves provide a very suitable habitat for the growth and development of fungal pathogen by providing ample surface area and nutrient supply. Such leaf inhabiting fungi are known as foliicolous fungi and invaded area of the leaf appear as leaf spot or leaf lesions. Taxonomic studies of such fungal forms have been generally considered as only of academic interest but the taxonomic treatment of a fungal organism in the first requirement for any studies concerning its biology. Correct identification of a fungus absolutely free from ambiguities is vital for its employment in applied disciplines. In fact without being equipped for ascertaining the correct identity of a fungal pathogen all studies concerning its phytopathological aspects would be misleading. The weed and forest plants serve as reservoirs of leaf spot pathogens which on getting opportunity may spread to agriculture and horticulture plants.

India is one of the twelve mega biodiversity countries of the world, has two of the world's eighteen biodiversity hot spots located in the Western ghats and in the Eastern Himalayas. In north of North Tarai Forests, the Himalayas rise as a virtual wall beyond the snow line. Above the alluvial plain lies the Tarai strip, a seasonally marshy zone of sand and clay soils. The Tarai has higher rainfall than the plains, and the downward rushing rivers of the Himalays slow down and spread out in the flatter Tarai zone depositing fertile silt and reproductive means during the mansoon season and receding in the dry season. The Tarai, as a result has high water level and is characterized by moist sub tropical conditions and a luxuriant turn over of green vegetation all the year around. The climatological and topographical conditions favour the luxuriant growth and development of foliar fungi. This North Tarai region of U.P. is next only to Eastern and Western ghats, as one of the hottest spots for Biodiversity in general and the diversity of fungal organism inhabiting plant leaves in particular offers an ideal opportunity for the morphotaxonomic exploration of fungal organism in general and foliicolous fungi in particular. Keeping this in view the author served the North Central Tarai forests of U.P. which include East and West Sohelwa, Shrawasti, Bahraich forest range and Bahraich Wildlife Santury during April, 2010 - September, 2011.

Materials and Methods

During collection, infected leaf samples were taken in separate polythene bags. Suitable mounts of surface scrapping and hand cut sections were prepared from infected portions of the leaf sampls. Slides prepared in cotton blue lactophenol mixture were examined and camera lucida drawings were made which seems to be new. Morphotaxonomic determinations of taxa were done with the help of current litetature and resident expertise available. All the fungal taxon were identified after making microscopic preparations and later confirmed by Prof. Kamal, Emeritus Scientist (DST), DDU Gorakhpur University, Gorakhpur. The fungal Holotype specimen has been deposited in HCIO, IARI, New Delhi

Results and Discussion

The author surveyed periodically the forest from Sohelwa East to Katarniaghat Wildlife Sanctury during April, 2010 - September, 2011 so as to collect and document foliicolous fungi. The author collected 126 plant species representing 102 genera of 44 familes parasitized by 142 fungal species which belong to 62 fungal genera. The host plants and their parasites are enumerated below.

The perusal of the list reveals that 44 families can be divided in to 9 categories depending upon the number of host plants infected. The most susceptible family was found to be Fabaceae which represents 18 infected host plant species followed by Moraceae with 9 plants ; Myrtaceae and Verbenaceae with 7 plants ; Asteraceae and Euphorbiaceae with 6 plants ; Rutaceae, Apocyanaceae, Cucurbitaceae and Menispermaceae with 5 plants; Malvaceae and Solanaceae with 4 plants; Brassicaceae, Boragenaceae and Lauraceae with 3 plants; Amaranthaceae,

Table -1: The host plants and their parasites

Name of the Family	Host Plant	Foliicolous Fungal Species in habiting plant
Fabaceae	*Acacia bipar* Linn.	*Corynespora* sp. Giissow
	Acacia concinna Wall.	*Pseudocercospora acaciae* Kamal & Singh
	Albizia lebbek Benth.	*Corynespora albizicola* Sharma *et al*.
	Bauhinia purpurea Linn.	*Leptoxyphium* sp. Speg.
		Phoma sp. Desm.
		Phomopsis bauhiniae Bansa Alealdi
	Bauhinia racemosa Lamk.	*Pstalotia lambertiae* Petr.
	Bauhinia vahlii W. & A.	*Alternaria bauhiniae* Singh & Mall
		Cmorynespora sp. Giissow
	Bauhinia variegata Linn.	*Macrophomina phaseolina* (Tass) Goia
	Butea frondosa Koen. ex. Roxb.	*Leptoxyphium buteae* Speg.
	Cajanus cajan (L.) Millsp.	*Phoma cajan*i (Rangel) Khune & Kapoor
	Cassia fistula Linn.	*A. tenuis* Nees.
	C. occidentalis Linn.	*Pseudocercospora nigricans* Cooke
	Desmodim trifolium DC	*Oidia* sp. Link. ex Fr.
	Dolichos lablab Linn. Lyons	*Cercospora dolichi* Ellis & Ev.
		Pseudocercospora dolichi Ellis & Ev.,
		Phoma herberum West.
	Indopeptadienia oudhensis (Brandis) Brenan	*Cercospora oudhensis* Mall
	Inga dulcis Roxb. Kuytze	*Haplosporella baumontina* Ahmad
		Diatrype diseiformis Kar & Maity
	Medicago sativa Linn.	*Cerceospora* sp. Fres.
	Pisum sativum Linn.	*Helminthosporium* sp. Link.
	Pongamia pinnata Pierre	*Fusicladium pongamiae* Syd.
Moraceae	*Artocarpus heterophyllusm* Linn.	*Pseudocercospora artocarpi* (H.& P. Syd) Deighton
		Alternaria tenuissima Nees. ex Fr.
		Cladosporium artocari Kulhare and Singh
		Rhizoctonia solani Kuhn
	Ficus bengalensis Linn.	*Cercospora fici* Heald & Worf.
		Stenella ficina Syd.
	Ficus carica Linn.	*Alternaria alternata* (Fr.) Keissler
	Ficus glomerata Roxb.	*Uredo fici* Cast
	Ficus rumphii (Blume), Bijdr.	*Alternaria sp. Nees.*
		Oidium sp. Link ex. Fr.
		Colletotrichum dematium Pers ex. Fr.
		Phyllachora ficuum Niessa
		Botryodiplodia theobromae Pat.
		Sooty mold
	Ficus scabrella Roxb.	*Alternaria* sp. Nees.
	Musa paradisiaca Linn.	*Alternaria* sp. Nees.
	Streblus aspar Linn.	*Asterina* sp. Lev.
		Meliola sp. Fr.
		Pseudocercosporella strebli Singh
		Zyxiphora gorakhpurensis Sutton
Myrtaceae	*Eucalyptus lanceolatus* Hill Malpea.	*Stenella* sp. Syd.
	Eugenia jamboliana Linn.	*Meliola eugeniae*- jamboloidis Hansf.
		Penicillium expansum Link. ex. S.F. Gray
	Eugenia myrtifolia Linn.	*Meliola* sp. Fr.

	Psidium guajava Linn.	*Cladosporium tennussima* Cke,
		Mycovellosiella myrtacearium Rai & Kamal
		*Rhizoctonia solan*i Kuhn
	Syzygium cumuni (L.) Skeels	*Penicillium expansum* Link ex. S.F. Gray
	Syzygium eugenia Linn.	*Asterina eugeniae* Yates
	Syzygium sp. Linn.	*Alternaria* sp. Nees.
		Oidium sp. Link. ex. Fr.
Verbenaceae	*Clerodendrum indicum* Linn.	*Cercospora clerodendri* Miyake
		Fusarium concolor Reink,
	Clerodendrum inerme (L.) Gaertn	*Amerosporuim polynematoides* Speg.
	Clerodendrum viscosum Linn.	*Stenella* Sp. Syd.
		Corynespora clerodendri Giissow
	Clerodendrun sp. Linn.	*Corynespora clerodendri* Giissow
	Lantana camera Linn.	*Sirosporium lantanae Bubak* & Screb.
	Lantana indica Linn.	*Corynespora nana* Meenu & Kamal
	Tectona grandis Linn.	*Phomopsis variosporum* Sacc.
		Stenella tectonic Syd.
Asteraceae	*Ageratum conyzoides* Linn.	*Alternaria* sp. Nees
	Chrysanthamum roseum Linn.	*Pseudocercospora* sp. Speg.
	Eupatorium cannibinum Wahl.	*Alternaria* sp. Nees
		Corynespora sp. Giissow
		Leptoxyphium sp. Speg.
		Passalora sp. Fr. et. Mont.
	Parthenium hysterophorus Linn.	*A. zinniae* Ellis
		Mold attack
	Sphaeranthus indicus Linn.	*Cercospora sphaeranthi* Patil
		Cercospora neo- sphaeranthi Bhartiya Kumari & Singh
	Xanthium strumarium Linn.	*Cercospora xanthicola* Heald & Wolf
Euphorbiaceae	*Codiaeium variegatum* Bl.& Hort (Spiral leaf croton)	*A.alternata* (Fr.)Keissler
	Codiaeium variegatum Bl.& Hort (Small leaf croton)	*A.alternata* (Fr.) Keissler
	Codiaeium variegatum Bl.&Hort (Narrow leaf croton)	*A.alternata* (Fr.) Keissler
	Croton roxburghii Bat.	*Corynespora bahraichiana* Singh and Mall
	Euphorbia pulcherrima Willd ex. Klotz	*A. tenuissima* (Ness ex. Fr.) Wilt shire
		Phyllactinia sub- spiralis Lev.
	Mallotus philippensis Lamk Muell. Arg.	*Glomerella cingulata* (Stonem) Spauld
		Mycovellosiella malloti Bhalla *et al.*
		Pestalotiopsis palmarum (Cke.) Stey
		Phoma malloti Desm.
Rutaceae	*Aegle marmelos* Linn. Correa	*Phoma glomerata* (Cda) Wr.
		Colletotrichum capsici (Sydow) Butler & Bisby
	Citrus lemon (L.) Burm.f.	*A.alternata* (Fr.) Keissler
		Alternaria citri Nees.
		Curvularia tuberculata Jain
		Geotrichum candidum Link ex Pers.
	Citrus medica Linn.	*Coniella citri* Agarawal & Sharma
	Glycosmis pentaphylla (Correa.) Willd	*Alternaria* sp. Nees.
		Corynespora glycosmidis Abbasi *et al.*
		Corynespora sp. Giissow
		Phomopsis sp. Sacc.

	Murraya exotica Linn.	*Botryodiplodia theobromae* Pat.
		Colletotrichum exoticum Pavgi & Singh
		Leptoxyphium sp. Speg.
		Phoma herbarum West
Apocyanaceae	*Carrissa carandas* Linn.	*Corynespora carissae* Singh & Mall
		Pseudocercospora carissae Singh & Mall
		Sirosporium sp. Bubak & Sereb
	Carrissa congesta weight	*Discosia hiptages* Tilak
	Echinops sp. Linn.	*Puccinia pulvinata* Rabenn.
	Holarrhena antidysentrica wall.	*Colletotrichum dematium* (Pers.ex Fr.) Groove
		Periconia byssoides Pers. ex Mandal
		Glomerella cingulata (Stonem) Spauld & Shrenk
	Ichnocarpus frutiscens (L.) R.Br.	*Alternaria* sp. Nees.
		Alternaria ichnocarpicola Singh & Mall
		Corynespora ichnocarpii Singh & Mall
Cucurbitaceae	*Coccenia indica* W. & A.	*Oidium* sp. Link. ex. Fr.
	Cucurbita maxima Linn.	*Leveillula taurica* (Lev.) Arnaud
		Cercospora citrullina Cooke
	Lagenaria siceraria (Mol.) Standl.	*Cladosporium cucumerinum* Ellis & Arth.
		Curvularia verruculosa Ellis
	Lagenaria vulgaris Ser	*Glomerella cingulata* Sehrenk & Spauld
	Luffa acutangula (L.) Roxb.	*A. alternata* (Fr.) Keissler
		Mold attack
Menispermaceae	*Menispermum canadense* Linn.	*Sirosporium* sp. Bubak & Scrab
	Tilicora acuminata Hook. f.	*Acremonium moriforme* W Games
		Phoma sp. Desm
	Tinospora cordifolia Willd.	*Colletotrichum capsici* Butler & Bisby
	Tinospora malabarica Miers.	*Acrodictys* sp. Ellis
	Tinospora sp. Miers	*Pseudocerspora cocculi* (Syd.) Deight
Malvaceae	*Abutilon indicum* (Linn.) Sweet	*Phomopsis abutilonis* M.C. Rai
	Hibiscus mutabilis Linn.	*A. dianthi* Stev. & Hall
		Mold attack
	Hibiscus rosa- sinensis Linn.	*A. longipes* Ellis & Ev.
		Microxyphium fagi (Pers.) Hugnes
	Sida rhombifolia Linn.	*Oidium* sp. Link ex. Fr.
		Alternaria solani Nees.
Solanaceae	*Datura stramonium* Linn.	*Colletotrichum capsici* Sydow. Butler & Bisby
	Lycopersicom esculantum Linn.	*Alternaria kamalella* Singh & Mall
		Cladospourium tennussimum Cke.
	Solanum melongena Linn.	*Cladosporium oxysporum* Berk. &Curt.
	Solanum tuberosum Linn.	*Alternaria alternata* (Fr.) Keissler
		Cladosporium sphaerospermum Penz.
Brassicaceae	*Brassica campestris* Linn.	*Curvularia lunata* (Walker) Boild
	Brassica oleraceae var capi. Linn.	*Rhizoctnia solani* Kuhn
		Sclerotinia sclerotiarum (L.) Bacy
	Lunaria annua Linn .	*Alternaria* sp. Nees.
Boraginaceae	*Cordia dichotoma* Forst	*Phaeoramularia cordiae* Kumar & Kamal
	Cordia myxa Hk. F.	*Alternaria tenuis* Nees.

	Heliotropium indicum Linn.	*Leptoxyphium* sp. Speg.
Lauraceae	*Litsea chinensis* Lamk.	*Alternaria longipes* (Elis. & Ev.) Mason *Astrostomella* sp. Coelo. *Fuligomyces indica* Khan & Kamal *Phomlopsis litsea* Kamal & Singh
	Litsea glutinosa (Lour.) C.R. Robinson Litsea polyanthus Juss.	*Mystrosporiella litseae* Munjal & Kulshreshyha *Diatrypella citricola* Ellis & Ev.
Amaranthaceae	*Achyranthes aspera* Linn.	*Alternaria* sp. Nees. *Cercospora achyranthina* Thrim. & Chupp. *Stenella* sp. Syd.
	Spinacia olaraciea Linn.	*Rhizoctonia solani* Kuhn *Alternaria alternata* (Fr.) Keissler
Rubiaceae	*Adina cardifolia* Hook. f. *Haldina cordifolia* Hook. f.	*Pseudocercospora adinae* Singh & Kamal *Cercospora adinae* Srivastava *et al.*
Asclepiadaceae	*Calotropis gigantea* R.Br *Calotropis prosera* (Ait.) R.Br.	*A.alternata* (Fr.) Keissler *A.alternata* (Fr.) Keissler Passalora sp. Fr. et. Mont.
Tiliaceae	*Corchorus olitorius* Linn.	*Alternaria* sp. Nees. *Cercospora macutensis* Syd.
	Grewia elastica Linn.	*Stenella grewiae* Syd.
Ebenaceae	*Diospyros melanoxylon* Roxb.	*Sarcinella gorakhpurenis* Kamal & Singh *Pseudocercospora kelleri* (Earle) Deight
	Diospyros tomentosa Roxb.	*Diatrypella quercina* (Ces. & De Not) Sacc. *Cercospora* kaki Ellis & Ev. *Trichothecium roseum* Link. *Aecidum rhytismoideum* Berk. & Br.
Bignoneaceae	*Haplophragma adenophullum* (Wall.) P.Dop.	*Leptoxyphium* sp. Speg. *Oidium* sp. Link. ex. Fr. *Mycovellosiella haplophragmatis* Kamal & Singh *Passalora* sp. Fr. et. Mont
	Haplophragma sp. Speg.	*Pseudocercospora* sp. Speg.
Alangiaceae	*Alangium salvifolium* Linn.f.Wang	*Phyllosticta alangii* Hasija
Annonaceae	*Annona squamosa* Linn.	*Glomerella cingulata* Spauld & Shrenk *Botryodiplidia theobromae* Pat. Apud, Pat & Legerth,
Barringtoniaceae	*Barringtonia acutangula* Gaertn	*Acrodictys* sp. Ellis *Phomopsis barringtoniae* Kamal & Singh
Bacellaceae	*Basella alba* Linn.	*Macrophomina phaseolina* (Tassi) Goid *Selerotium rolfsii* Sacc.
Nyctagenaceae	*Boerhaavia diffusa* Linn.	*Pseudocercospora* sp. Speg.
Phyllanthaceae	*Bridelia retusa* Spreng	*Colletotrichum gloeosporioides* Penz. *Periconia byssoides* Pers. ex. Mandel
Lecythidaceae	*Careya arborea* Roxb.	*Zygosporium echnosporum* Mont.
Caricaceae	*Carica papaya* Linn.	*Sirosporium* sp. Bubak & Scrab

Araceae	*Colocasia esculenta* Linn.	*Colletotrichum dematium* (Pers. ex Fr.) Grove
Burseraceae	*Commiphora macrophylla* Linn.	*Pseudocercospora* sp. Speg.
Cycadaceae	*Cycas circinalis* Linn.	*Alternaria* sp. Nees. *Drechslera monoceros* Subram. & Jain *Sphaeropsis cycadis* Mundkur & Ahmad *Stenella* sp. Syd.
Ruscaceae	*Dracaena marginata* Lam.	*Alternaria* sp. Nees. *Asterina* sp. Lev *Stenella* sp. Syd.
Ulmaceae	*Holoptelia integrifolia* Planch	*Phoma exigua* Desm.
Convolvulaceae	*Ipomoea fistulosa* Linn.	*Stenella* sp. Syd.
Anacardiaceae	*Mangifera indica* Linn.	*Ascochyta mangiferae* Batista *Meliola rhois* Henn. *Periconia* sp. Tode. sp. *Sooty mold*
Labiateae	*Nepeta hindostana* (Roth.) Hains	*Cercospora neptae* Trehan
Oleaceae	*Nyctanthes arbortristis* Linn.	*Stenella* sp. Syd.
Lamiaceae	*Ocimum basilicum* Benth.	*Meliola* sp. Fr. *Mold* attack
Rosaceae	*Rosa indica* Linn.	*Acremonium* sp.Link ex. Fr.
Poaceae	*Saccharum* spontaneum Linn.	*Ramularia* sp. Sacc.
Dipterocarpaceae	*Shorea robusta* Gaertn. f. Fruet	*Ceratophorum helicosporum* Sacc. *Pseudocercospora rhoreae* (Thirum & Kotsuki) Deighton
Miliaceae	*Toona ciliata* Roem	*Alternaria alternata* (Fr.) Keissler
Rhmanace	*Zizyphus xylopyrus* (Retz.) Willd.	*Meliola ziziphi* Hosagouder *et al*.

Rubiaceae, Asclepiadaceae, Tiliaceae, Ebenaceae and Bignoneaceae with 2 plants ; Alangiaceae, Annonaceae, Barringtoniaceae, Basellaceae, Nyctagenaceae, Phyllanthaeceae, Lecythidaceae, Caricaceae, Araceae, Burseraceae, Cycadaceae, Ruscaceae, Ulmaceae, Convolvulaceae, Anacardiaceae, Labiateae, Oleaceae, Lamiaceae, Rosaceae, Poaceae, Dipterocarpaceae, Milaceae and Rhamnaceae with 1 infected host species only.

The literature (Bilgrami *et al*., 1979,1981, 1991 ; Ellis, 1971, 1976 ; Jamaluddin *et al.*, 2004 ; Sarbhoy *et al.*, 1986, 1996 ; Singh & Mall, 2007) reveals that all the fungal taxon has not been reported from North Central Tarai forest of U.P. Therefore, all are a new record for Indian mycoflora.

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