OBJECTIVES OF THE PRESENT INVESTIGATION

The state of Nagaland is rich in the occurrence of leaf inhabiting fungi like meliolaceous and asterinaceous pyrenomycetes and dematiaceous hyphomycetes. A review of literature reveals that these groups have not been worked out by any worker in Nagaland hitherto and as such there is ample scope to work on these fascinating groups. During a survey of leaf inhabiting fungi of Nagaland, the author confirmed the area of investigation around the genera *Meliola, Irenopsis, Appendiculella, Asteridiella, Asterina, Tripospermum, Clasterosporium, Atractilina, Helicomina, Veronaea, Stenella, Corynespora* and *Alternaria.* Since exploration of fungal flora of any area is fundamental to any fundamental and applied research. The present study of leaf inhabiting fungi belonging to the above genera is very essential and useful. The present study would be helpful to a fungal taxonomist to arrange the fungi properly in different groups.

The main objectives of this research work is

(i) To identify the known and unknown pathogens which cause diseases on the economically important plants. Productivity of the affected host plants is reduced. So identification of the pathogens is very important and pathologists can solve this problem by controlling the diseases.

(ii) To study the extent of damage of host plants.

(iii) To study the seasonal variation / distribution of the pathogen on different host. It is important to understand the predisposing factors of the onsetting disease which is necessary for disease forecasting and management.
COLLECTION AND PRESERVATION OF SPECIMENS

The fungi treated here were studied in their natural habitat. Data presented in this work were collected from the study of the materials, both fresh and preserved, comprising the infected leaves of angiospermic (both dicotyledonous and monocotyledonous) host plants infected by different species of dematiaceous hyphomycetes, meliolaceous and asterinaceous pyrenomycetes.

With a view to study the leaf inhabiting fungi in their natural habitat and to collect them for detailed study in the laboratory, frequent field trips were undertaken at certain intervals of time almost throughout the year (particularly during the winter months) in different localities under varied climatic conditions during the period 2000-2004. The area of field study and collections include the districts of Dimapur, Kohima, Zunheboto, Mokokchung, Mon, Wokha, Tuensang, Kiphire, Peren and Longleng. In the district of Dimapur, the present work has paid attention to the different areas like Vaterinary Colony, Diphu Road, Medziphema, Patkai Hill, Chumukedima, Ao-Kashiram, Half-Nagarjun, Tinali, St. John School Campus and Rail Colony.

Special attention was given to the forest and foot hill areas like Intanki Forest (1400-1850m) in the district or Peren; Sakraba Village (1500-1900m) in the district of Phek; forest areas of Longla Village, Midland Colony and Tiyi Mountain (1300-1750m) in the district of Wokha; N.S.T. Colony (900-1400m) in the district of Mon; forest areas of Rettomi Village (1800-2800m) in the district of Junheboto, forest areas of Alichen and Chanki Village (1290-1925m) in the district of Mokokchung; Chichema Village and New Minister Hill (1600-3100m) in the district of Kohima.

Before collecting materials for preservation, general conditions of the collected specimens were recorded. In the present investigation attention was also paid to the behaviour of the different dematiaceous hyphomycetes, meliolaceous and asterinaceous
pyrenomycetes on the living leaves of different groups of host plants. During field observations, special attention was paid to the collection of infected host materials or leaves. The infected host tissues of living leaves were examined closely both with the help of 10x-20x magnifying glass and also with unaided eye. Field notes were taken about the behaviour of the fungi on host tissues under natural conditions. The infected leaves of different ages were detached intact from the host plant and they were kept in the polythene bags, closing the mouth by rubber ring.
MATERIALS AND METHODS

The fungi, treated here were studied in their natural habitat (i.e. spots, sooty appearance, blight, pustules etc. on the leaf of angiosperms) collected throughout the plains as well as from the hills of Nagaland. Study of external features of preserved materials was performed both with the help of dissecting microscope at 10x-20x and with unaided eye. Data collected were on the virulence of incidence, shape, size, nature and dimension of infected host tissues or simply discolouration of the infected areas or any other peculiarities as the case may be were recorded.

For detailed study of fungi, preparations were made for microscopic examination from the preserved as well as fresh materials. By trial and error, it has been found that the most suitable method for studying the pathogen was to make the infected host tissue semi-transparent with least disturbance. Depending on the size of the leaf and the nature of infection the entire or a portion of the infected host tissue along with the adjoining healthy tissue was detached carefully with a sharp scalpel. It was then mounted on a glass slide in a drop or two of lactophenol and covered with a cover glass and warmed on a flame so as to make the host tissue transparent (Linder, 1929). The preparation was then allowed to cool down, properly sealed with paraffin wax and relevant information was noted on the prepared slide with glass marking pencil. The preparation was ready for examination. Considering the extent of infection on both the surfaces of the leaf lamina as well as the maturity of the fungus, a number of such preparations were made. Stained preparations were also made with lactophenol accompanied with drop of cotton blue to study the details of transparent parts of the fungal specimens (Mandeval 1936). Where the leaf lamina was thick and coriaceous and symptoms were dense blotchy and dark coloured and the structures of fungus were not clearly distinguishable, preparations were made with lactophenol cotton blue taking scraping from the infected area, both upper and lower surfaces with a scalpel.
In specimens belonging to the families Meliolaceae and Asterinaceae at first, a good mycelial colony were selected, one drop of lactophenol was placed upon the colony. After a little while the mycelial colony was carefully removed with the help of a needle from the leaf surface and mounted on a glass slide in a drop of lactophenol. The preparation was then covered with a cover glass and ringed with paraffin and was ready for examination. The superficial mycelium of the colony was also removed from the host surface by warming a piece of leaf with mycelial colony in lactophenol (cotton blue was also occasionally used in the study of septation of ascospores and mycelia).

In all the cases preparations were examined under both low and high powers of compound microscope. The colour of different structures of the fungi and all the measurements were recorded from water mount preparations in natural light. All microscopic examinations were made with Olympus research type compound microscope (Japan) of varying magnification range. Camera lucida drawings were made with the aid of standard camera lucida attachments.

The identified specimens were verified and confirmed with the help of specialists of International Mycological Institute (IMI), CABI Bioscience UK Centre, Bakeham Lane, Egham, Surrey, UK; Indian Agricultural Research Institute (IARI), New Delhi, India; Mycology and plant pathology research laboratory, Presidency College Calcutta (PCC), West Bengal, India; Agharkar Research Institute (ARI), Pune, India and Mycology and Plant Pathology Research Laboratory, Presidency College, Kolkata, West Bengal, India. All the fungal specimens described and illustrated in the present work are deposited in the P.G. Department of Botany, Presidency College, Kolkata as Presidency College Collection (PCC), IMI, IARI and ARI.
MORPHOLOGY AND TERMINOLOGY

Among leaf-inhabiting fungi, the members of the families Meliolaceae and Asterinaceae possess fructification of varied forms which are associated with mycelium. Depending on their structural peculiarities and structure borne in them, the fructifications have been designated by various workers in a different manner. In the present work terminologies have been used in respective order, families and genera; a brief account of which is outlined below. Besides the characters of fructifications, certain structures borne in and on the fructifications and others on hyphae of some members of the fungi have also been utilised for the taxonomic studies of the fungi belonging to the families Meliolaceae and Asterinaceae.

The different species of dematiaceous hyphomycetes treated in the present work have been collected from Angiospermic (Dicotyledonous and Monocotyledonous) plants. They cause infection particularly on leaves, very rarely on petioles, stems and inflorescences. These fungi produce characteristic symptoms over the leaves: spots, blotch, blight, pustules, faint discolouration and sometimes lesions accompanied with shot-hole. During the growth of these fungi on or in the leaf tissue they develop hyphae, stromata, conidiophores and conidia.

Hyphae: Hyphae of dematiaceous hyphomycetous fungi are of two kinds, primary and secondary. The primary hyphae are immersed in the host tissue which forms stroma and the secondary or superficial hyphae spreading on the surface of the substratum, some times produces conidiophores both terminally and laterally. The hyphae are hyaline to dark brown, septate, freely branched, smooth, or slightly verruculose, thin or thickwalled, almost uniform in width, with slight attenuation at the tip.
In meliolaceous and asterinaceous fungi, the hyphae are septate, simple or branched, thin or thick-walled, hyaline to dark coloured, smooth or bearing some special structures-like hyphopodia and setae.

**Hyphopodia:** The hyphopodia may be one-celled (phialides) to two-celled (appressoria). Their distribution, shape and size are extremely important in distinguishing between species and varieties. This may be straight or bent, obtuse or acute at the tip.

**Mycelial-setae:** The presence of setae on mycelia is a taxonomic character of certain genera eg. *Meliola.*

**Perithecia:** These are spherical or cup-shaped ascocarps with a short or long beak. Each perithecium is provided with a pore or a slit at the tip through which acospores are re released. The ostiole is formed schizogenously and is lined with fine hyphae-periphyses. The perithecium bears unitunicate asci which are arranged in a layer forming hymenium and are intermingled with slender, sterile hyphal threads – paraphyses which are free at the tips. The perithecia may be associated with a well developed stroma-*stromatic perithecia; or with some mycelial growth, the subiculum; or may be free from any kind of stroma or mycelial growth-*non-stromatic perithecia in the families Asterinaceae and Meliolaceae. The perithecia may be glabrous or may be present with various types of hairs, appendages or setae which have taxonomic importance. The perithecia may be developed singly or in groups and are superficial, erumpent or deeply embedded in the substratum. A perithecium regardless whether it is associated with a stroma or not, has a true wall of its own.

**Thyriothecia:** These are shield shaped flattened type of ascocarps. It is always superficial and characteristic of Asterinaceae. It always contains bitunicate asci.
Ostiole: It is a mouth or opening, more superficially the schizogenously formed canal in the tip of a true peritheciun, lined with periphyses.

Paraphyses: These are sterile hypal threads which remain intermingled with unitunicate asci, having the free ends converging towards the ostioles. They may be filiform or slender, septate or aseptate and may be absent or gelatinized at maturity.

Paraphysoids: These are thread like elements of the remains of the intertheccial stroma having cellular structure and being without free ends; but continuing into the pseudoparenchymatous tissue. The paraphysoids remain associated with bitunicate asci.

Appendages: The fruit bodies of some members of Pyrenomycetes are appendaged, eg. Appendiculella, Irenopsis. The appendages may be simple or branched, septate or aseptate, usually coloured. The presence or absence and the nature of appendages are taxonomic characters for the delimation of the genera and species of the Pyrenomycetes eg. Appendiculella and Irenopsis sps.

Perithecial setae: Other than hairs and appendages, the perithecial wall may bear certain stiff, pointed to hooked outgrowths - Perithecial setae, eg. Irenopsis sp. and very few cases in Meliola sp.

Asci: These are a sac like structures in which the ascospores are formed endogenously by karyogamy and meiosis. Asci of the Pyrenomycetes are of various shapes: globose, oblong, elliptical, clavate and cylindrical. They may be short or long stalked. The ascis wall may be composed of single layer or of 2-layers i.e. unitunicate or bitunicate. The mature asci are usually 8-spored, but sometimes may be 2, 3, 4 and many spored.
The wall of unitunicate asci may be uniform in thickness but more often with conspicuously thickened at the apex. The unitunicate asci and thin-walled and the ascospores are discharged through an apical pore which remain otherwise closed by a plug. The ascus wall or any part of it turns blue with Melzer’s reagent. The ascus wall may be persistent or evanescent. The unitunicate asci are usually long-stalked.

The bitunicate asci consist of a rigid outer and an extensible inner wall. At maturity the outer wall ruptures at the apex and inner wall expands to form a long cylindrical sac and the ascospores escape through the pore at the apex. The ascus wall or any part of it does not turn blue with Melzer’s reagent. The ascus wall is not uniform in thickness and is usually thickened at the apex.

Ascospores: They vary greatly in size, shape and colour. They are transversely septate and smooth walled without any ornamentation. The wall may be thin or uniformly thick-walled. The spores may be hyaline to coloured, eguttulate to guttulate, with or without appendages.

Caespituli: Caespituli or fruiting developed within the spot as punctiform which may be distributed evenly or unevenly within the spot. It may or may not be vein limited. It may be amphigenous, epiphyllous or hypophyllous. Caespituli may be velutinous, effuse, cottony and velvety in appearance.

Stromata: Stromata may be present or absent; sometimes after a period of growth, the localised mycelium accumulates resulting in the formation of a mass of mycelial structure below the stomatal cavity, which is known as mycelial mat. By further growth, this mycelial mat produces stromata. Extent of development of stroma varies greatly from a few to many celled, compact tuberculate, pseudoparenchymatous structures which may extend on the surface of the host tissue. Mostly stromata are made up of loosely to fairly compact
interwoven hyphae which may be thin-walled, pale to mid olivaceous brown and made of from superficial to elongated cells. The stromata may be globular to subglobular, sometimes orbicular or elongated. The conidiophores emerge from the stromata either through stomata or by rupturing the host epidermis.

**Conidiophores:** The conidiophores arise single or in fascicles from the stromata or directly from superficial hyphae. They are cylindrical or dilated, sinuous, smooth-walled, aseptate to septate, thin or thick-walled, pale olivaceous to dark brown may or may not be geniculate.

The conidiophores are macronematous (when they are morphologically different from purely vegetative hyphae). They may be branched or unbranched, sometimes branching is restricted to the apical region; the unbranched lower portion is then referred to as the stipe and the upper branched part as the head.

Conidiophores may be mononematous (solitary to caespitose) or synnematous when numerous threads or filaments are tightly adpressed or fused along most of their length and spread out only at the apex.

Growth in length of conidiophores and their branches is usually restricted to the apical region, that is acroauxic type. It may cease altogether with the production of terminal conidium or chain of conidia.

The conidiophores comprising synnema are often branched at the tip, with the conidia arising from the conidiogenous cells at the tips of the numerous branched conidiophores. In some synnemata the "stalk like" portion is longer in comparison with the branched top and the entire structure resembles a long handled feather or duster.

**Conidiogenous cells:** The cell which produces a conidium is called conidiogenous cell. Conidiogenesis is understood by the majority of mycologists as the siute of physiological and morphological process by which conidia are produced. Conidiogenous cells may be
integrated or they may be on branches of the conidiophores where they are either terminal or intercalary. Conidiogenous cells may be denticulate, cicatrized, sometimes abstraction of conidia results in the formation of spore scars. The scars are either with thickened or unthickened rim.

**Conidia**: The variation in nature, form, shape, size, colour, septations, wall-thickness of the conidia of hyphomycetous fungi is very wide. Conidia may be hemisporous, amerosporous, didymosporous, phargmesporous, dictyosporous, scolecosporous type. They may be solitary to catenate, hyaline to bright or dark brown coloured, usually smooth or slightly verruculose. Conidia may be spherical, ellipsoidal, fusiform, obclavate, pyriform, obpyriform, ovoid, lemon-shaped, acicular, obclavato-cylindric, cylindrical or clavate in shape. They may be nonseptate or many-septate. The mode of septation may be only transverse or both transverse and longitudinal and oblique. Conidia may be straight or mildly to strongly curved, then to thick walled, surfaces smooth or finely verruculose or verrucose or sometimes warty. Hilum present at the base of the conidia may be distinct. (i.e. thickened) or indistinct (i.e. unthickened) Germinatin of conidia takes place by producing the germtubes.
SUGGESTED KEY TO THE INCLUDED GENERA

Suggested key to the included genera of Meliolaceous and Asterinaceous Pyrenomycetes

A. Meliolaceous pyrenomycetes
   Spores more than two celled
   B. Mycelial setae present.............................. Meliola

BB. Mycelial setae absent
   C. Perithecia with setae................................ Irenopsis
   CC. Perithecia with “larviform appendages”................ Appendiculella
   CCC. Perithecia with neither setae nor appendages ........... Asteridiella

AA. Asterinaceous pyrenomycetes
   Thyriotheca present
   Asci bitunicate
   Ascospores 2 celled ......................... Asterina

Suggested key to the included genera of Dematiaceous Hyphomycetes

Codiophores acroauxic
   A. Conidiogenous cells holoblastic
   Conidiogenous cells integrated
   B. Conidiophores semi-macronematous
      Mycelium superficial, sometimes torulose
      Stroma none
Hyphopodia absent

Conidiogenous cells cylindrical or doliiform

Conidia branched

Conidia with stalk cells and 4 divergent arms

\[\ldots\ldots\ Tripospermum\]

BB. Conidiophores macronematous

a. Conidia acrogenous

Conidiophores mononematous

Conidiogenous cells determinate or percurrent

Conidia simple, smooth, rugose or verrucose

Mycelium superficial with hyphopodia

\[\ldots\ldots\ Clasterosporium\]

aa. Conidia acropleurogenous

b. Conidiophores synnematous

Conidiogenous cells denticulate

Denticles broad conical

Conidia smooth or verruculose

Conidia simple fusiform or obclavate

\[\ldots\ldots\ Atractilina\]

bb. Conidiophores not synnematous

c. Conidiogenous cells denticulate

Denticles cylindrical or conical

Conidia simple

Conidia circinate or curved

\[\ldots\ldots\ Helicomina\]
cc. Conidiogenous cells not denticulate

d. Stroma none
Conidiophores mostly rather slender
Conidial scars small, inconspicuous
Conidia simple, smooth or minutely verruculose

............. *Veronaea.*

dd. Stroma present, usually well developed

e. Conidiophores not slender
Conidiophores frequently with a thickened band along one side, becoming incurved
Conidial scars always thickened & conspicuous
Conidia smooth to verrucose

............. *Cercosporidium*

ec. Conidiophores mostly caespitose

f. Mycelium mostly immersed
Conidiophores without thickened band
Conidia long, often subulate or narrowly obclavate or cylindric, multisepate

............. *Cercospora*

ff. Mycelium mostly superficial, verruculose
Conidiophores unbranched or not much branched
Conidia in simple or branched acropetal
chains
Conidia smooth, rugulose or verrucose
aseptate or transversely sepa

............ Stenella

AA. Conidiogenous cells enteroblastic
Conidiogenous cells tretic
Conidiophores macronematous and mononematous
Conidia not helicoid, catenate or solitary

gg. Conidiophores unbranched
Conidiogenous cells monotretic
Conidia with numerous transverse septa, pseudosepta

.......... Corynespora

gg. Conidiophores simple or irregularly & loosely branched
Conidiogenous cells polytretic
Conidiogenous cells sympodial
Conidia frequently with longitudinal and oblique as well as transverse septa
Conidia frequently catenate, mostly obclavate and rostrate

.......... Alternaria
DESCRIPTION OF TAXA

PYRENOMYCETOUS GROUP (MELIOLACEAE AND ASTERINACEAE)


Mycelium superficial, brown septate, branched, hyphopodiate. Perithecia borne on the mycelia, globose, non-ostiolate. Mycelial setae present but lacks perithecial appendages and setae. Asci 2-4 spored, evanescent; ascospores brown, 3-4 septate (Hosagoudar, 1996).

Type species: *Meliola trichostroma* (Kunze) Toro.

The genus *Meliola* was founded by Fries in 1825, and was emended by Bornet in 1851. Until 1918 it was the only genus recognised in the group Meliolineae. Theissen & Sydow (1917) first divided the genus *Meliola* by erecting the new genus *Irene* and placed all the species having no mycelial setae, which previously belonged to *Meliola*. The genus *Irene* was further subdivided into the genera *Appendiculella*, *Irenopsis*, and *Irene* by different authors. The genus *Irene* Theiss. & Syd. was later placed in *Asteridiella* McAlpine. Ciferri later in a series of paper preferred to regard all the above genera as mere sub-genera of *Meliola* Fr. and he (1954) gave a long list of new combinations for species described under the genera discussed above. Hansford (1961) opposed Ciferri's view and
stated that these "new combinations" of Ciferri are entirely unnecessary and superfluous "name making". All the subsequent workers recognised the genera: *Appendiculella*, *Irenopsis*.

For many years *Meliola amphitricha* Fr., 1823, based on *Sphaeria amphitricha* Fr., as regarded as the type species of *Meliola*. There was great controversy regarding the type specimen *Meliola*, because all early accounts of this species, belonging to a group in which more than 100 species are now recognised as distinct. So Gaillard (1892), Stevens (1927) and Hansford (1961) proposed to reject this specific epithet. Toro (1952) discussed the problems of the type species of *Meliola* and concluded that the lectotype should be *Meliola trichostroma* (Kunze) Toro. Hansford accepted this.
Suggested Key to the included species of *Meliola* of Nagaland

3141.4211- Colonies epiphyllous, thin; hyphae straight, substraight to flexuous; appressoria alternate to unilateral; head cells subglobose, ovate to cylindrical, angular to slightly lobate; phialides separate; mycelial setae 1-2 dichotomously branched, tip acute; ascospores cylindrical to subellipsoidal.

3141.4221- Colonies amphigenous, thin to subdense; hyphae substraight to slightly crooked; appressoria alternate; head cells globose, ovate, entire to slightly angular; phialides separate; mycelial setae dichotomously branched, branchlets reflexed, acute to obtuse at the tip; ascospores cylindrical to subellipsoidal.

................... *Meliola capillipediae*

31 1/3 1.3222- Colonies epiphyllous, velvety; hyphae straight to substraight; appressoria alternate; head cells globose, subglobose to ovate, entire, angular to irregularly lobate; phialides separate; mycelial setae simple, acute to slightly dentate; ascospores cylindrical to subellipsoidal.

................... *M. aglaiae-eduliae*

31 1/3 3.3223- Colonies epiphyllous, thin; hyphae straight to sub-straight; appressoria opposite (60%), alternate and unilateral; head cells ovate to cylindrical, entire; phialides mixed with appressoria; mycelial setae simple, acute to slightly dentate or truncate; ascospores oblong to subellipsoidal.

................... *M. erioglossi var. epiphyllae*
Colonies epiphyllous, thin to subdense, slightly velvety; hyphae straight to slightly undulate; appressoria alternate and about 40% opposite; head cells globose, subglobose to ovate, entire; phialides mixed with appressoria; mycelial setae acute to variously dentate at the tip; ascospores cylindrical to slightly ellipsoidal.

\[ M. \text{lasianthi} \]

Colonies epiphyllous, dense, velvety; hyphae substraight, flexuous to slightly crooked; appressoria alternate; head cells globose to subglobose, entire; phialides separate; mycelial setae simple, hamate to circinate above, obtuse; ascospores cylindrical, deeply constricted.

\[ M. \text{circinatum} \]

Colonies epiphyllous thin to subdense; hyphae straight; appressoria alternate, about 40% opposite; head cells globose, ovate, entire; phialides separate; mycelial setae simple, acute at the tip; ascospores cylindrical.

\[ M. \text{tectonae} \]

Colonies amphigenous, thin; hyphae straight to slightly crooked; appressoria opposite, about 3% alternate; head cells globose, ovate to cylindrical, rounded to subtruncate; phialides mixed with appressoria; mycelial setae simple, acute at the tip; ascospores ellipsoidal, middle cell larger than the remaining.

\[ M. \text{lonicerae} \]

Colonies epiphyllous, dense, velvety; hyphae substraight to undulate; appressoria alternate, about 15% opposite; head cells ovate, globose or cylindrical, entire to slightly angular or subtruncate; phialides mixed with
appressoria; mycelial setae simple, acute, subacute to truncate; ascospores cylindrical.

..........M. mastitiae

Colonies epiphyllous, thin; hyphae straight to substraight; appressoria opposite, about 20% alternate; head cells ovate, oblong, slightly attenuated or angular; phialides mixed with appressoria; mycelial setae simple, acute; ascospores oblong to ellipsoidal.

..........M. picrasmae var. nagolandis

Colonies amphigenous, subdense; hyphae straight to flexuous; appressoria alternate, about 15% opposite; head cells globose, ovate, tapered & broadly rounded; phialides mixed with appressoria; mycelial setae simple, acute to obtuse; ascospores oblong to subellipsoid.

..........M. cylindropoda var. indica

Colonies epiphyllous, very thin; hyphae straight to slightly flexuous; appressoria alternate; head cells subglobose to cylindrical, attenuated and rounded apex; phialides separate; mycelial setae simple, acute to obtuse at the tip; ascospores cylindrical to ellipsoidal, 3-4 septate.

..........Meliola gymnemae

Colonies hypophyllous, suddense, crustose; hyphae crooked; appressoria alternate to unilateral; head cells ovate, globose, entire, angular to sublobate; phialides mixed with appressoria; mycelial setae simple, acute at the tip; ascospores cylindrical.

..........M. cyathocali
Colonies epiphyllous, thin to subdense; hyphae straight to undulate; appressoria alternate to unilateral; head cells ovate to globose, angular to lobate; phialides mixed with appressoria; mycelial setae simple, acute; ascospores cylindrical to subellipsoid.

..............M. anisomali

Colonies epiphyllous, subdense to dense; hyphae straight, substraight to flexuous; appressoria alternate to unilateral; head cells globose, ovate to clavate, entire to sublobate; phialides separate; mycelial setae simple, acute to obtuse at the tip; ascospores cylindrical to slightly ellipsoidal.

..............M. mucunae-imbricatae

Colonies amphigenous, thin to subdense; hyphae straight to substraight; appressoria alternate, rarely irregular; head cells globose, oval, entire; phialides separate; mycelial setae simple, subacute to obtuse; ascospores oblong to cylindrical.

..............M. holarrhenae-pubescens

Colonies epiphyllous, thin, crustose; hyphae substraight; appressoria alternate to unilateral; head cells globose, ovate to cylindrical, entire to angular; Phialides separate; mycelial setae simple, acute to obtuse; ascospores cylindrical to subellipsoidal.

..............M. neurocali

Colonies amphigenous, mostly epiphyllous, subdense to dense; hyphae substraight to undulate; appressoria alternate; head cells globose, ovate, entire, sometimes sublobate; phialides mixed with appressoria; mycelial setae simple, acute to obtuse; ascospores oblong to subellipsoid.

..............M. clerodendricola
Colonies epiphyllous, thin to subdense; hyphae straight to substraight; appressoria alternate to unilateral; head cells globose, ovate to clavate, entire; phialides mixed with appressoria; mycelial setae simple, acute at the tip; ascospores ellipsoidal.

\ldots\ldots M. platypyllae
Meliola neuribiae T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 1

Colonies epiphyllae, nigrae, dispersae, tenuis, orbiculares, ad 3mm diam. et confluentes. Hyphae rectae, subrectae vel flexuosae, plerumque oppositae acutaeque vel laxe ramosae, laxe vel dense reticulatae, atrobrunneae, cellulae plerumque 12-20 x 6-10μm. Appressoria alternata vel unilateralia, atrobrunnea, antrorsa vel patentia, recta vel curvula, bicellularia, 12-20μm longa; cellulae basilares cylindraceae vel cuneatae, 6-10μm longae; cellulae apicales subglobosae, ovatae vel cylindraceae, integrae, raro angulariae vel leniter lobatae, 9-14 x 7-12μm. Phialides producentes in ramus separatus myceliales, oppositae vel alternatae, brunneae, unicellularae, ampulliformes, 15-18 x 9-12μm. Setae myceliales dispersae vel juxta perithecia aggregatae, simplices, rectae, nigrae, septatae, 1-2 dichotoma ramosae, ad 130μm longae ad ramificans, ramuli primus ad 18μm longae et secundarius ad 12μm longae, acutae ad apicem, ramuli reflexae. Perithecia dispersa, verrucosa, nigra, ad 100μm diam. Asci paucae, elliptici vel ovales, sessiles, 2-4 spori. Ascosporae cylindraceae vel subellipsoideae, 4 septatae, rectae vel leniter curvulae, brunneae, septis constrictae, 30-40 x 11-14μm.

Colonies epiphyllous, black, scattered, thin, orbicular, up to 3 mm in diameter and confluent. Hyphae straight, substraight to flexuous, branching mostly opposite at acute to wide angles, loosely to closely reticulate, dark brown, cells mostly 12-20 x 6-10μm. Appressoria alternate to unilateral, dark brown, antrorse to spreading, straight or bent, 2 celled, 12-20μm long; stalk cells cylindrical to cuneate, 6-10μm long; head cells subglobose, ovate to cylindrical, entire, rarely angular to slightly lobate, 9-14 x 7-12μm. Phialides borne on a separate mycelial branch, opposite to alternate, brown, unicellular, ampulliform, 15-18 x 9-12μm. Mycelial setae scattered to grouped around perithecia, simple, straight, black, septate, 1-2 dichotomously branched, up to 130μm long till the branching, up to 18μm long.
Fig. 1: *Meliola neuribiae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Mycelial setae.
E. Ascus bearing ascospores
F. Ascospores
till the primary branch and the secondary branches up to 12µm long, tip acute, branchlets reflexed. Perithecia scattered, verrucose, black, up to 100µm in diam. Asci few, elliptical to oval, sessile, 2-4 spored. Ascospores cylindrical to subellipsoidal, 4 septate, straight to slightly curved, brown, constricted at the septa, 30-40 x 11-14µm.

**Specimen studied:** On the leaves of *Neuribia* sp. (Family-Poaceae), Veterinary Colony, Dimapur, Nagaland, India, 02.02.2002, T.K. Jana, HClO 4312.2K (Holotype), PCC 5114 (Isotype).

**Etymology:** From the name of the host genus.

A review of literature (Hansford, 1961; Sanchez and Carrion, 1992; Hu and Lu, 1989; Hosagoudar, 1996, 2004 and Hosagoudar et al., 1998, 2003) shows that no species of *Meliola* has yet been described on genus *Neuribia*.

Based on Beeli formula 3141.4211, the present fungus *Meliola neuribiae* sp. nov. is close to *M. phyllostachydis* Yamam (Hansford, 1961), but differs from it in having smaller hyphal cells, appressoria, mycelial setae, perithecia and ascospores. It differs from *M. arundinis* Pat. (Hansford, 1961) in having epiphyllous colonies, straight, substraight to flexuous hyphae with smaller hyphal cells, appressoria, perithecial diameter and ascospores. It also differs from *M. cymbopogonis* Kapoor(Hosagoudar, 1996), in having smaller appressoria, phialides borne on a separate mycelial branch, smaller mycelial setae and smaller cylindrical to subellipsoidal ascospores (Table-1).
<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Hyphae</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Mycelial setae</th>
<th>Perithea</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. phyllostachydis</em></td>
<td>Epiphyllous</td>
<td>Straight to undulate; cells</td>
<td>20-40.5μm long; head cells ovate to</td>
<td>Borne on a separate mycelial branch</td>
<td>up to 200μm long till branching</td>
<td>Up to 235μm in diam.</td>
<td>Oblong to cylindrical, 4 septate, central cell slightly larger, 46-56 x 18-22μm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21-31 x 5-7μm</td>
<td>globose, stellately to irregularly lobate, 18-25 x 15-18.5μm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>M. arundinis</em></td>
<td>Amphigenous</td>
<td>Straight to crooked; cells</td>
<td>21-28μm long; head cells ovate, globose, entire, angular and rarely sublobate, 12-15.5 x 12-14μm</td>
<td>Borne on a separate mycelial branch</td>
<td>Up to 214μm long till branching</td>
<td>Up to 240μm in diam.</td>
<td>Slightly ellipsoidal to cylindrical, 4 septate, 46-53 x 15-18.5μm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15-18.5 x 8-10μm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>M. cymbopogonis</em></td>
<td>Epiphyllous, rarely amphigenous</td>
<td>Straight to tortuous; cells</td>
<td>10-24 μm long; head cells ovate, globose, angular to sublobate, 10-14 x 12-14μm</td>
<td>Mixed with appressoria</td>
<td>Up to 176μm long till branching</td>
<td>Up to 120μm in diam.</td>
<td>Ellipsoidal, 4 septate, 38-44 x 12-14μm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14-22 x 6-8μm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>M. neuribiae</em></td>
<td>Epiphyllous</td>
<td>Straight, straighth to flexuous; cells mostly 12-15 x 6-10μm</td>
<td>12-20μm long; head cells subglobe, ovate to cylindrical, entire, rarely angular to slightly lobate, 9-14 x 7-12μm</td>
<td>Borne on a separate mycelial branch</td>
<td>Up to 130μm long till branching</td>
<td>Up to 100μm in diam.</td>
<td>Cylindrical to subellipsoidal, 4 septate, 35-40 x 11-14μm</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
*Meliola capillipediae* T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 2

Colonies amphigenous, thin to subdense, black, orbicular to suborbicular, up to 4 mm in diameter, often confluent. Hyphae substraight to slightly crooked, brown, branching mostly opposite at acute to wide angles, loosely to closely reticulate, cells 12-28 x 7-10 μm. Appressoria alternate, straight or bent, brown, subantrorse or spreading, bicellular, 16-23 μm long; stalk cells cylindrical to cuneate, 6-10 μm long; head cells globose, ovate, entire to slightly angular, 10-17 x 9-12 μm. Phialides borne on a separate mycelial branch, opposite to alternate, conoid to ampulliform, unicellular, pale brown, 14-17 x 5-10 μm. Mycelial setae numerous, mostly, grouped around perithecia, straight, black, dichotomously branched, up to
Fig. 2: *Meliola capillipediae*
A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascus bearing ascospores
E. Ascospores
220μm long till branching, primary branch up to 25μm long, while secondary branch up to 20μm long, branchlets reflexed, acute to obtuse at the tip. Perithecia loosely scattered, black, verrucose, round, up to 170μm in diam. Asci are oval to elliptical, 2-4 spored. Ascospores cylindrical to subellipsoidal, straight, dark brown, 4 septate, rounded at ends, smooth walled, slightly constricted at each septum, 32-40 x 9-15μm.

**Specimen studied:** On the living leaves of *Capillipedium* sp. (Family-Poaceae), Diphu Road, Dimapur, Nagaland, India, T.K.Jana, 25.03.2000, ITCC 4438.01 (Isotype), PCC 5147 (Holotype).

**Etymology:** From the name of the host genus.

According to Beeli formula 3141.4221, *Meliola capillipediae* is similar to *M. cymbopogonis* Kapoor, but differs from it in having longer hyphal cells, phialides borne on a separate mycelial branch, longer mycelial setae, larger perithecia and smaller ascospores. It also differs from *M. arundinis* Pat. var. *angulosa* Hansf. in having amphigenous colonies, longer hyphal cells and mycelial setae, smaller perithecia and ascospores.

A review of literature (Hansford, 1961; Hosagoudar, 1996; Hosagoudar et al., 2000, 2003; Bilgrami et al., 1979, 1981, 1991; Sarbhoy et al., 1996; Sanchez and Carrion, 1992; Patil and Thite, 1997) shows that no species of *Meliola* has yet been reported on host *Capillipedium* sp. Hence a new species of *Meliola* is suggested (Table-2).
Table 2. Comparative account of *Meliola capillipediae* sp. nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Hyphae</th>
<th>Phialides</th>
<th>Perithecia</th>
<th>Mycelial setae</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. cymbopogonis</em></td>
<td>Epiphyllous, rarely amphigenous</td>
<td>Straight to tortuous, cells 14-22 x 6-8µm</td>
<td>Mixed with appressoria</td>
<td>Scattered, verrucose, up to 120µm in diam.</td>
<td>Up to 176µm long till branching</td>
<td>Ellipsoidal, 4 septate, constricted, 38-44 x 12-14µm</td>
</tr>
<tr>
<td><em>M. arundinis var. angulosa</em></td>
<td>Epiphyllous</td>
<td>Substraight to very crooked, cells mostly 15-20 x 7-10µm</td>
<td>Borne on a separate mycelial branch</td>
<td>Scattered, verrucose, up to 170µm in diam.</td>
<td>Up to 200µm long till branching</td>
<td>Oblong, obtuse, 4 septate, constricted, 40-46 x 15-16µm</td>
</tr>
<tr>
<td><em>M. capillipediae</em></td>
<td>Amphigenous</td>
<td>Substraight to slightly crooked, cells mostly 12-28 x 7-10µm</td>
<td>Borne on a separate mycelial branch</td>
<td>Loosely scattered, black, verrucose, up to 160µm in diam.</td>
<td>Up to 220µm long till branching</td>
<td>Cylindrical to subellipsoidal, straight, dark brown, 4 septate, 32-40 x 10-15µm</td>
</tr>
</tbody>
</table>
**Meliola aglaiae-eduliae** T.K. Jna S.N. Ghosh et A.K. Das sp. nov.

**Fig. 3**

Colonies epiphyllae, nigrae, dispersae, densae, velutinae, orbiculares, ad 4 mm diam. Hyphae rectae vel subrectae, brunneae, septatae, opposita, alternatae vel irregulariter acutaeque ramosae, dense reticulatae, cellulae plerumque 20-29 x 6-8μm. Appressoria alternata, antorsa vel patentia, bicellularia, recta vel leniter curvula, brunnea, 15-20μm longa; cellula basali cylindracea vel cuneata, 4-7μm longa; cellula apicali globosa, subglobosa vel ovata, integra, angularia vel irregulariter lobata, 10-15 x 7-12μm. Phialides paucae, proventes in ramus separatus myceliales, opposita vel alternata, unicellular, brunnea, ampulliformia, 16-20 x 5-8μm. Setae myceliales numerosae, dispersae vel juxta perithecia aggregatae, rectae, simplices, rigens, septatae, nigrae, acutae vel leniter dentatae ad apicem, ad 390μm longae. Perithecia pleuri, dispersa vel laxe aggregata, nigra, globosa, verrucosa, ad 165μm diam. Asci ovales vel elliptici, sessiles, 2 spori. Ascosporeae cylindraceae vel subellipsoideae, 4 septatae, septis constrictae, rectae, utrinque rotundatae, brunneae, 28-38 x 11-15μm.

Colonies epiphyllous, black, scattered, dense, velvety, orbicular, up to 4 mm in diameter. Hyphae straight to substraight, brown septate, branching opposite, alternate to irregular at acute angles, closely reticulate, cells mostly 20-29 x 6-8μm. Appressoria alternate, antorse to spreading, 2 celled, straight or slightly bent, brown, 15-20μm long; stalk cells cylindrical to cuneate, 4-7μm long; head cells globose, subglobose to ovate, entire, angular to irregularly lobate, 10-15 x 7-12μm. Phialides few, borne on a separate mycelial branch, opposite to alternate, unicellular, brown, ampulliform, 16-20 x 5-8μm. Mycelial setae numerous, scattered to grouped around perithecia, straight, simple, stiff, septate, black, acute to slightly dentate at the tip, up to 390μm long. Perithecia many,
Fig. 3: *Meliola aglaiæ-eduliae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascus bearing ascospores
E. Ascospores
scattered to loosely grouped, black, round, verrucose, up to 165\(\mu\)m in diam. Asci oval to elliptical, sessile, 2 spored. Ascospores cylindrical to subellipsoid, 4 septate, constricted at the septa, straight, rounded at ends, brown, 28-38 x 11-1\(\mu\)m.

**Specimen studied:** On the leaves of *Aglaia edulis* A. Gray. (Family-Meliaceae), Veterinary Colony, Dimapur, Nagaland, India, T.K.Jana, 28.11.2000, ITCC 4647.01 (Isotype), PCC 5165 (Holotype).

**Etymology:** From the name of the host genus.

A review of literature (Hansford, 1961; Hosagoudar, 1996; Hosagoudar et al., 2000, 2003; Bilgrami et al., 1979, 1981, 1991; Sarbhoy et al., 1996) shows that *Meliola aglaina* Hansf. and *M. opposita* Syd. from Philippines, *M. parvula* Syd. from Philippines and India, *M. obvallata* Syd. from Borneo and *M. aglaicola* Hansf. from Borneo and India have been reported on host *Aglaia* sp.

The present species *M. aglaiae-eduliae* has been compared with the above mentioned five species of *Meliola*.

Based on the Beeli formula \(31^{1/3}.3222\), *Meliola aglaiae-eduliae* is close to *M. aglaina* Hansf. in having epiphyllous colonies but differs from it in having longer and alternate appressoria, phialides borne on a separate mycelial branch, longer slightly dentate mycelial setae and larger cylindrical to subellipsoid ascospores. It differs from *M. parvula* Syd. in having epiphyllous colonies, phialides borne on a separate mycelial branch, smaller slightly dentate mycelial setae, larger cylindrical to subellipsoid ascospores and absence of amphigenous colonies and opposite appressoria. It differs from *M. obvallata* Syd. in having epiphyllous colonies, longer appressoria with angular to irregularly lobate head cells, longer straight acute to slightly dentate mycelial setae, phialides borne on a separate mycelial branch, smaller ascospores and absence of amphigenous colonies, 5% opposite appressoria. It
differs from *M. opposita* Syd. in having epiphyllous colonies, angular to irregularly lobate head cell of appressoria, phialides borne on a separate mycelial branch, smaller slightly dentate mycelial setae, smaller cylindrical to subellipsoidal ascospores and absence of hypophyllous colonies and opposite appressoria. It is also close to *M. aglaicola* Hansf. (Hosagoudar, 1996) in having epiphyllous colonies but differs from it in having longer appressoria with angular to irregularly lobate head cells, phialides borne on a separate mycelial branch, longer and acute to slightly dentate mycelial setae, larger ascospores. Hence a new species of *Meliola* is suggested (Table-3).
Table 3. A comparative account of *Meliola aglaie-eduliae* sp. nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Mycelial setae</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. aglaina</em></td>
<td>Epiphyllous</td>
<td>Opposite, 13-18μm long; head cells cylindric to clavulate, entire, 9 -14 x 6 -8μm</td>
<td>Mixed with appressoria</td>
<td>Straight, acute at the tip, up to 290μm long</td>
<td>Ellipsoid, 4septate, slightly constricted, 32-37 x 16 -18 x 12 -15μm</td>
</tr>
<tr>
<td><em>M. parvula</em></td>
<td>Amphigenous</td>
<td>Opposite and 30% alternate, 12-18.5μm long; head cells ovate, slightly attenuated at the apex, rounded, entire, 9 -12 x 6 -9.5μm</td>
<td>Mixed with appressoria</td>
<td>Straight, acute at the tip, up to 550μm long</td>
<td>Obovoidal, 4septate, constricted at the septa, 30-37.5 x 12 -15.5μm</td>
</tr>
<tr>
<td><em>M. obvallata</em></td>
<td>Hypophyllous</td>
<td>Alternate or about 5% opposite, 10-13 μm long; head cells ovate to oblong, entire, 6-11 x 5 -6μm</td>
<td>Mixed with appressoria</td>
<td>Obtuse, flexuous, uncinate or loosely coiled above, up to 300μm long</td>
<td>Oblong to narrow ellipsoid, obtuse, 4 septate, slightly constricted, 42 -48 x 12 -14μm</td>
</tr>
<tr>
<td><em>M. opposita</em></td>
<td>Hypophyllous</td>
<td>Opposite, rarely alternate, 15 -19 μm long; head cells ovate to piriform, sometimes subglobose, entire, 10 -14 x 9 -11μm</td>
<td>Mixed with appressoria</td>
<td>Straight, acute, up to 500μm long</td>
<td>Oblong, 4 septate, constricted, 32 -39 x 14 -16 x 12 -14μm</td>
</tr>
<tr>
<td><em>M. aglaicola</em></td>
<td>Epiphyllous</td>
<td>Alternate, 14 -16μm long; head cells globose, ovate, versiform, entire, 10 -12 x 8 -9μm</td>
<td>Mixed with appressoria</td>
<td>Straight, acute to obtuse at the tip, up to 252μm long</td>
<td>Obovoidal, 4 septate, slightly constricted, 32 -36 x 14 -16μm</td>
</tr>
<tr>
<td><em>M. aglaie-eduliae</em></td>
<td>Epiphyllous</td>
<td>Alternate, 15 -20 μm long; head cells globose, subglobose to ovate, entire, angular to irregularly lobate, 10 -15 x 7 -12μm</td>
<td>Borne on a separate mycelial branch</td>
<td>Straight, acute to slightly dentate at the tip, up to 390μm long</td>
<td>Cylindrical to subellipsoidal, 4 septate, constricted, 28 -38 x 11 -15μm</td>
</tr>
</tbody>
</table>
Meliola erioglossi Hansf. var. epiphyllae T.K. Jana, S.N. Ghosh et A.K. Das var. nov.

Fig. 4

Differt a typo coloniae epiphyllae, appressoriis 60% oppositae, phialides appressoriis intermixtae, setae myceliales acutae, leniter dentatae vel truncatae et longioribus, ascosporae brevioribus.

Colonies epiphyllous, thin, black, scattered, orbicular to irregular, up to 5 mm in diameter, confluent. Hyphae straight to substraight, brown, branching opposite at acute to wide angles, closely reticulate, cells mostly 18-30 x 5-8μm. Appressoria opposite (60%), alternate and unilateral, antrorse to subantrorse, mostly straight but rarely curved, 12-19.5μm long; stalk cells cylindrical to cuneate, 3-6μm long; head cells ovate to cylindrical, rounded to slightly narrowed towards the apex, entire, 10-17.5 x 6-9μm. Phialides mixed with appressoria, alternate to opposite, pale brown, unicellular, ampulliform, 16-20 x 6-8μm. Mycelial setae mostly grouped around perithecia, simple, straight to curved, acute to slightly dentate or truncate at the tip, up to 590μm long. Perithecia scattered to grouped; up to 145μm in diam. Asci round to oval, sessile, 4 spored. Ascospores oblong to subellipsoid, rounded at ends, 4 septate, slightly constricted at the septa, dark brown, 26-33 x 12-16μm.

Specimen studied: On the living leaves of Erioglossum edule (Roxb.) Bl. (Family-Sapindaceae), Chumukedima, Dimapur, Nagaland, India, T.K.Jana, 15.11.2000, HCIO 4448.01 (Holotype), PCC 5160 (Isotype).

Etymology: From the occurrence of colonies on leaves.

Meliola erioglossi Hansf. has been reported on host Erioglossum sp. from Philippines (Hansford, 1961). This collection is close to M. erioglossi Hansf. but differs from it in having epiphyllous colonies, 60% opposite appressoria, phialides mixed with appressoria, acute to
Fig. 4: *Meliola erioglossi var. epiphyllae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascus bearing ascospores
E. Ascospores
slightly dentate or truncate and longer mycelial setae, smaller ascospores. It is therefore suggested as a new variety of *M. erioglossi* Hansford (Table-4).
Table 4. A comparative account of *Meliola erioglossi* Hansf. and the present variety.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Mycelial setae</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. erioglossi</em></td>
<td>Amphigenous</td>
<td>Alternate or very rarely (much less than 1%) opposite, straight or bent, up to 17-25μm long; head cells subglobose to oblong, rounded angulose to sublobate, 13-19 x 9-15μm.</td>
<td>Borne on a separate mycelial branch</td>
<td>Straight, simple, obtuse, up to 340μm long</td>
<td>37-43 x 14-17μm</td>
</tr>
<tr>
<td><em>M. erioglossi</em> var. epiphyllae</td>
<td>Epiphyllous</td>
<td>Opposite (60%), alternate and unilateral, mostly straight, up to 12-19.5μm long; head cells ovate to cylindrical, rounded to slightly narrowed towards the apex, entire, 10-17.5 x 6-9μm</td>
<td>Mixed with appressoria</td>
<td>Straight to curved, acute to slightly dentate or truncate at the tip, up to 590μm long</td>
<td>26-33 x 12-16μm</td>
</tr>
</tbody>
</table>
Meliola lasianthi T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 5

Coloniae epiphyllae, tenuis vel subdenses, leniter velutinae, nigrae, dispersae, orbiculares, ad 4 mm diam., confluentes. Hyphae rectae vel leniter undulatae, brunneae, septatae, plerumque oppositae, acuteque vel laxe ramosae, dense reticulatae, cellulae plerumque 18-28 x 8-10μm. Appressoria alternata, unilateralia et ad 40% opposita, bicellularia, atrobrunnea, recta vel curvula, antorsa vel patentia, 16-22μm longa, cellula basali cuneata vel cylindracea, 4-7μm longa; cellula apicali globosa, subglobosa vel ovata, integra, rotundata ad apicem, recta vel curvula, 10-17 x 9-16μm. Phialides appressoriis intermixta, opposita vel alternata, pallide brunnea, unicellularia, ampullacea, 15 – 21 x 7 – 10μm. Setae myceliales juxta perithecia aggregatae, rigens, atrobrunneae vel nigrae, septatae, rectae vel leniter curvulæ, simplices, acutæ vel varie dentatæ ad apicem, ad 500 μm longæ. Perithecia dispersa, globosa, verrucosa, ad 155μm diam. Asci paucæ, ovales vel elliptici, sessiles, 2-4 spori. Ascosporae cylindraceæ vel leniter ellipsoideæ, 4 septatae, utrinque rotundatae, septis constritæ, brunneæ, rectæ, medio cellula leniter major, parietibus laevibus, 32- 38 x 10-15μm.

Colonies epiphyllous, thin to subdense, slightly velvety, black, scattered, orbicular, up to 4mm in diameter or confluent. Hyphae straight to slightly undulate, brown, septate, branching mostly opposite at acute to wide angles, closely reticulate, cells mostly 18-28 x 8-10μm. Appressoria alternate, unilateral and about 40% opposite, 2-celled, dark brown, straight or bent, antorse to subantorse, 16-22μm long; stalk cells small, cuneate to cylindrical, 4-7μm long; head cells globose, subglobose to ovate, entire, rounded at the apex, straight to curved, 10-17 x 9-16μm. Phialides mixed with appressoria, opposite to alternate, pale brown, unicellular, ampulliform, 15-21 x 7-10μm. Mycelial setae aggregated around
Fig. 5: *Meliola lasianthi*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Mycelial setae
E. Ascus bearing ascospores
F. Ascospores

20μm
perithecia, stiff, dark brown to black, septate, straight to slightly curved, simple, acute to variously dentate at the tip, up to 500μm long. Perithecia scattered, black, round, verrucose, seated in the centre of the mycelial colony, up to 155μm in diam. Asci few, oval to elliptical, sessile, 2-4 spored. Ascospores cylindrical to slightly ellipsoidal, 4 septate, rounded at ends, constricted at the septa, brown, straight, middle cell slightly larger, smooth walled, 32-38 x 10-15μm.

Specimen studied: On the living leaves of *Lasianthus lancifolius* HK.f. (Family-Rubiaceae), Chanki Village, Mokokchung, Nagaland, India, T.K. Jana, 10.5.2001, ITCC 4923.01 (Isotype), PCC 5180 (Holotype).

**Etymology:** From the name of the host genus.

According to Beeli formula 311/2 3.3222, *Meliola lasianthi* is similar to *M. anceps* Syd. (Hosagoudar 1996) in having epiphyllous colonies but differs from it in having smaller and 40% opposite appressoria, longer acute to variously dentate mycelial setae, larger perithecia and ascospores. It differs from *M. randiae* Hansf. & Deight. in having epiphyllous colonies, 40% opposite appressoria with globose, subglobose to ovate head cells, longer mycelial setae, larger perithecia and smaller ascospores. It also differs from *M. amaraliae* Hansf. & Deight. (Hansford, 1961) in having epiphyllous colonies, 40% appressoria, smaller mycelial setae, larger perithecia and ascospores. Review of literature (Hansford, 1961; Hosagoudar, 1996 and Hosagoudar *et al.*, 2003; Bilgrami *et al.*, 1991; Sarbhoy *et al.*, 1996) shows that no species of *Meliola* has yet been described on host *Lasianthus* sp. As such new species of *Meliola* is suggested (Table-5).
Table 5. Comparative account of *Meliola lasianthi* sp. nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Mycelial setae</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. anceps</em></td>
<td>Epiphyllous</td>
<td>Alternate to unilateral, closely antrorse, 18-24(\mu)m long; head cells ovate, globose, slightly angular, entire, 10-4 x 8-10(\mu)m</td>
<td>Bluntly rounded to bifid, often show knobs in the middle, up to 288(\mu)m long</td>
<td>Up to 130(\mu)m in diam.</td>
<td>Obovoidal, 4 septate, slightly constricted, 28-32 x 10-12(\mu)m</td>
</tr>
<tr>
<td><em>M. randiae</em></td>
<td>Hypophyllous</td>
<td>Alternate or to about 2% opposite, spreading or subantrorse, 15-20 (\mu)m long; head cells cylindric to slightly clavate, rounded at apex, entire, 11-14 x 6-9(\mu)m</td>
<td>Acute, obtuse or 2-3 dentate to 5(\mu)m, up to 320(\mu)m long</td>
<td>Up to 140(\mu)m in diam.</td>
<td>Cylindric to subellipsoid, 4 septate, constricted, 36-42 x 15-18(\mu)m</td>
</tr>
<tr>
<td><em>M. amaraliae</em></td>
<td>Hypophyllous</td>
<td>Alternate or to 2% opposite, spreading, 13-23(\mu)m; head cells subglobose, entire, 8-13 x 7-12(\mu)m</td>
<td>Very slightly attemate to the acute or 2-3 dentate apex, up to 1800(\mu)m long</td>
<td>Up to 130(\mu)m in diam.</td>
<td>Cylindric to subellipsoid, 4 septate, slightly constricted, 28-33 x 11-12 x 9(\mu)m</td>
</tr>
<tr>
<td><em>M. lasianthi</em></td>
<td>Epiphyllous</td>
<td>Alternate, unilateral and about 40% opposite, antrorse to subantrorse, 16-22(\mu)m long; head cells globose, subglobose to ovate, rounded at the apex, entire, 10-17 x 9-16(\mu)m</td>
<td>Acute to variously dentate at the tip, up to 500(\mu)m long</td>
<td>Up to 155(\mu)m in diam.</td>
<td>Cylindrical to slightly ellipsoidal, 4 septate, constricted, middle cell slightly larger, 32-38 x 10-15(\mu)m</td>
</tr>
</tbody>
</table>
Meliola circinatum T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 6

Coloniae epiphyllae, densae, velutinae, globosae, dispersae, nigrae, ad 5 mm diam. et confluentes. Hyphae subrectae, flexuose vel leniter anfractuae, alternatae vel irregulariter acuteque ramosae, laxe vel dense reticulatae, cellulae plerumque 16-30 x 5-8μm. Appressoria alternata, bicellula, antrorsa vel patentia, recta vel curvula, atrobrunnea, 16-24μm longa; cellulae basilares cylindraceae vel cuneatae, 4-8μm longae; cellulae apicales globosae vel subglobosae, integrae, 10-19 x 10-13μm. Phialides producentes in ramus separatus myceliales, alternatae, unilateraliae, raro oppositae, ampulliformes, brunnnea, 14-20 x 7-9μm. Setae myceliales numerosae, dispersae vel juxta perithecia aggregatae, rigens, nigrae, simplices, rectae infra et hamatae vel circinatae supra, obtuse ad apicem, ad 250μm longae. Perithecia dispersa, nigra, verrucosa, globosa, ad 200μm diam. Asci ovales vel elliptici, sessiles, 2-4 sporae, Ascosporae cylindraceae, atrobrunnea, 4 septatae, utrinque rotundatae, fortier constrictae, rectae, 28-33 x 9-12μm.

Colonies epiphyllous, dense, velvety, round, scattered, black, up to 5 mm in diameter and confluent. Hyphae substraight, flexuous to slightly crooked, branching alternate to irregular at acute angles, loosely to closely reticulate, cells mostly 16-30 x 5-8μm. Appressoria alternate, 2-celled, antrorsa to spreading, straight to curved, dark brown, 16-24μm long; stalk cells cylindrical to cuneate, 4-8 μm long; head cells globose to subglobose, entire, 10-19 x 10-13μm. Phialides borne on a separate mycelial branch, alternate, unilateral, unicellular, ampulliform, 14-20 x 7-9μm. Mycelial setae numerous, scattered to grouped around perithecia, stiff, black, simple, straight below and hamate to circinate above, obtuse at the tip, up to 250μm long. Perithecia scattered, black, verrucose, round, up to 200μm in diam.
Fig. 6: *Meliola circinatum*
A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Mycelial setae
E. Ascus bearing ascospores
F. Ascospores
Asci oval to elliptical, sessile, 2-4 spored. Ascospores cylindrical, dark brown, 4 septate, rounded at ends, deeply constricted at the septa, straight, 28-33 x 9-12 μm.

**Specimen studied:** On the living leaves of *Uncaria senssilifolia* Roxb. (Family-Rubiaceae), Patkai Hill, Dimapur, Nagaland, India, T.K.Jana, 8.11.2000, HCIO 4450.01 (Holotype), PCC 5161. (Isotype).

**Etymology:** From the nature of mycelial setae.

Based on the Beeli formula 3121.3231, the new species *Meliola circinatum* sp. nov. is comparable with *M. cyrtochaëa* Deight. described on *Uncaria* sp. from Borneo (Hansford, 1961).

However, the new species differs from it in having epiphyllous colonies, globose to subglobose head cells of appressoria, smaller and circinète mycelial setae, larger perithecia and smaller cylindrical ascospores. These striking characters suggest separate identity of the species (Table-6).
Table 6. A comparative account of *Meliola cyrtochaecta* Deight. and *M. circinatum* sp. nov.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Mycelial setae</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. cyrtochaeta</em></td>
<td>Hypophyllous</td>
<td>Head cells ovate to piriform, entire, 10-17 x 10-20μm</td>
<td>Scattered, irregularly arcuate to hamate above, simple, obtuse, up to 300μm long</td>
<td>Up to 170μm in diam.</td>
<td>Oblong to subellipsoid, 4 septate, slightly constricted, 32-37 x 11-13μm</td>
</tr>
<tr>
<td><em>M. circinatum</em></td>
<td>Epiphyllous</td>
<td>Head cells globose to subglobose, entire, 10-19 x 10-13μm</td>
<td>Scattered to grouped around perithecia, simple, straight below, hamate to circinate above, obtuse at the tip, up to 250μm long</td>
<td>Up to 200μm in diam.</td>
<td>Cylindrical, 4 septate, deeply constricted, 28-33 x 9-12μm</td>
</tr>
</tbody>
</table>
Meliola tectonae T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 7

Colonies epiphyllae, tenuis vel subdensae, nigrae, confluentes. Hyphae rectae vel subrectae, brunneae, plerumque oppositae, acuteque vel laxe ramosae, laxe reticulatae, cellulae plerumque 22-40 x 6-10μm. Apressoria alternata, ad 40% opposita, antrorsa vel subantrorsa, brunnea, plerumque recta, 15-25μm longa; cellula basali cylindracea vel cuneata, 5-8μm longa; cellula apicali globosa, ovata, integra, 12-17 x 10-15μm. Phialides producentes in ramus separatus myceliales, opposita vel alternata, ampulliformia, brunnea, unicellularia, 20-25 x 8-10μm. Setae myceliales dispersae vel aggregatae circa perithecia, simplices, rectae, septatae, atrobrunneae vel nigrae, acuta ad apicem, ad 400μm longae. Perithecia dispersa, globosa, nigra, verrucosa, ad 250μm diam. Asci oblongae vel elliptici, 2 spori. Ascosporae atrobrunneae, cylindraceae, rectae, 4 septatae, utrinque rotundatae, parietibus laevibus, septis leniter constrictae, 45-55 x 15-20μm.

Colonies epiphyllous, thin to subdense, black, confluent and cover the entire leaf surface. Hyphae straight to substraight, brown, branching mostly opposite at acute to wide angle, loosely reticulate, cells mostly 22-40 x 6-10μm. Apressoria alternate about 40% opposite, antrorse to subantrorse, brown mostly straight, 15-25μm long; stalk cells cylindrical to cuneate, 5-8μm long; head cells globose, ovate, entire, 12-17 x 10-15μm. Phialides born on a separate mycelial branch, opposite to alternate, ampulliform, brown, unicellular, 20-25 x 8-10μm. Mycelial setae scattered to grouped around perithecia, simple, straight septate, dark brown to black, acute at the tip, up to 400μm long. Perithecia scattered to loosely grouped, round, black, verrucose, up to 250μm in diameter. Asci oblong to elliptical, 2 spored; ascospores dark brown, cylindrical, straight, 4 septate, rounded at ends, smooth walled, slightly constricted at each septum, 45-55 x 15-20μm.
Fig. 7: *Meliola tectonae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascus bearing ascospores
E. Ascospores
Specimen studied: On the living leaves of *Tectona grandis* Linn. (Family-Verbenaceae), Diphu Road, Dimapur, Nagaland, India, T.K.Jana, 20.06.2001, ITCC 4931.01 (Isotype), PCC 5188 (Holotype).

Etymology: From the name of the host genus.

Based on the Beeli formula 3113. 5232, the present species *Meliola tectonae* is similar to *M. calicarpica* Yaman but differs from it in having straight to substraight hyphae, 40% opposite appressoria, phialides borne on a separate mycelial branch, smaller mycelial setae, longer ascospores. It differs from *M. symphoremae* Stev. & Rold. in having longer hyphal cells, smaller mycelial setae, larger perithecia and longer cylindrical ascospores. It also differs from *M. callicarpae* Syd. in having 40% opposite and longer appressoria, phialides born on a separate mycelial branch, smaller mycellial setae, large perithecia and longer cylindrical ascospores.

Review of literature (Hosagoudar, 1996; Hosagoudar *et al.*, 2003; Hansford, 1961; Patil & Thite, 1997; Sarbhoy *et al.*, 1996; Mibey and Hawksworth, 1997; Sanchez and Carrion, 1992; Bilgrami *et al.*, 1991) shows that no species of *Meliola* has yet been reported on host *Tectona grandis* Linn. f. Hence new species of *Meliola* is suggested (Table-7).
<table>
<thead>
<tr>
<th>Name of species</th>
<th>Hyphae</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. callicarpidota</em></td>
<td>Undulate to sinuous, cells 25 - 37 x 6 - 7 μm</td>
<td>Alternate or rarely opposite, 15 - 21 μm long</td>
<td>Mixed with appressoria</td>
<td>Up to 460 μm long</td>
<td>Oblong, 38 - 44 x 12 - 14 μm</td>
</tr>
<tr>
<td><em>M. symphoveae</em></td>
<td>Undulate, cells mostly 12 - 25 x 6 μm</td>
<td>Opposite or alternate, 13 - 20 μm long</td>
<td>Mixed with appressoria</td>
<td>Up to 600 μm long</td>
<td>Oblong, 35 - 40 x 13 - 15 μm</td>
</tr>
<tr>
<td><em>M. callicarpae</em></td>
<td>Substraight to undulate, cells mostly 12 - 20 x 5 - 7 μm</td>
<td>Alternate or 50% opposite, 10 - 15 μm long</td>
<td>Mixed with appressoria</td>
<td>Up to 80 μm long till branching</td>
<td>Oblong, 30 - 38 x 13 - 15 μm</td>
</tr>
<tr>
<td><em>M. tectonae</em></td>
<td>Straight to substraight, cells mostly 22 - 40 x 6 - 10 μm</td>
<td>Alternate about 40% opposite, 15 - 25 μm long</td>
<td>Born on a separate mycelial branch</td>
<td>Up to 400 μm long</td>
<td>Cylindrical, 45 - 55 x 15 - 20 μm</td>
</tr>
</tbody>
</table>

Table 7. Comparative account of *Meliola tectonae* sp. nov. with other species.
Meliola lonicerae T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 8

Coloniae amphigenae, tenuis, nigrae, dispersae, orbiculares, ad 4 mm diam., confluentes. Hyphae rectae vel leniter anfractuae, brunneae, septatae, plerumque oppositae acuteque vel laxe ramosae, laxe reticulatae, cellulae plerumque 18-28 x 4-6μm. Appressoria opposita, ad 3% alternata, antorsa vel patentia, bicellula, brunnea, recta vel leniter curvula, 10-16μm longa; cellulae basilares cylindraceae vel cuneatae, 2-4μm longae; cellulae apicales globosae, ovatae vel cylindraceae, integrae, rotundatae vel subtruncatae ad apicem, 8-10 x 4-7μm. Phialides appressoriis intermixtae, oppositae vel alternatae, brunneae, unicellularae, ampulliformes, 16-24 x 6-8μm. Setae myceliales paucae, juxta perithecia aggregatae, rigens, simplices, septatae, rectae, nigrae, acutae ad apicem, ad 486 μm longae. Perithecia dispersa, globosa, nigra, verrucosa, ad 220μm diam. Ascii ovales vel elliptici, sessiles, 2-4 spori. Ascosporae ellipsoideae, 4 septatae, utrinque rotundatae, parietibus laevibus, fortissim septis constrictae, rectae vel leniter curvulae, atrobrunneae, medio cellula major, 36-46 x 10-15μm.

Colones amphigenous, thin, black, scattered oribicular up to 4 mm in diameter, confluent. Hyphae straight to slightly crooked, brown, septate, branching mostly opposite at acute to wide angles, loosely reticulate, cells mostly 18-28 x 4-6μm. Appressoria opposite, about 3% alternate, antorse to spreading, 2 celled, brown, straight to slightly curved, 10-16 μm long; stalk cells cylindrical to cuneate, 2-4μm long; head cells globose, ovate to cylindrical, entire, rounded to subtruncate at the apex, 8-10 x 4-7μm. Phialides mixed with appressoria, opposite to alternate, brown, unicellular, ampulliform, 16-24 x 6-8μm. Mycelial setae few, grouped around perithecia, stiff, simple, septate, straight, black, acute at the tip, up to 486μm long. Perithecia scattered, round, black, verrucose, up to 220μm in diameter. Ascii oval to elliptical, sessile, 2-4 spored. Ascospores ellipsoidal, 4 septate, rounded at ends,
Fig. 8: *Meliola lonicerae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascus bearing ascospores
E. Ascospores
smooth walled, deeply constricted at the septa, straight to slightly curved, dark brown, middle cell larger than the remaining, 36-46 x 10-15μm.

**Specimen studied:** On the leaves of *Lonicera glabrata* Wall. (Family-Caprifoliaceae), Sakraba Village, Phek, Nagaland, India, 10.03.2000, T.K. Jana, HCIO 4650.01 (Holotype), PCC 5140 (Isotype).

**Etymology:** From the name of the host genus.

A review of literature (Hosagoudar, 1996, 2004 and Hosagoudar et al., 2003; Hansford, 1961; Bilgrami et al., 1979, 1981, 1991; Crane and Jones, 2001) shows that no species of *Meliola* has been described on the genus *Lonicera*.

According to Beeli formula 3113.4232, the new species *Meliola lonicerae* sp. nov. is similar to *M. aequatoriensis* Petrak, but differs from it in having amphigenous colonies, smaller opposite appressoria, phialides mixed with appressoria, longer mycelial setae, and ellipsoidal ascospores with large middle cell (Hansford, 1961). It differs from *M. goosii* Hosag. in having amphigenous colonies, opposite appressoria, phialides mixed with appressoria, longer mycelial setae, larger perithecia and longer ellipsoidal ascospores with large middle cell (Hosagoudar, 1996). It also differs from *M. leycesteriae* Kar & Maity (Kar & Maity, 1970) in having opposite appressoria, smaller mycelial setae, larger perithecia, longer ellipsoidal ascospores (Table-8). It is mixed with *Irenopsis* sp.
<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Mycelial setae</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. aequatoriensis</em></td>
<td>Epiphyllous</td>
<td>Alternate, 21-25 µm long; head cells ovate, versiform, globose, entire, angular to slightly lobate, 15-18.5 x 12-15.5 µm</td>
<td>Borne on a separate mycelial branch</td>
<td>Grouped around perithecia, acute to obtuse at the tip, up to 260 µm long</td>
<td>Up to 125 µm in diam.</td>
<td>Obovoidal, 4 septate, slightly constricted at the septa, 34-41 x 15-18.5 µm</td>
</tr>
<tr>
<td><em>M. goosii</em></td>
<td>Epiphyllous</td>
<td>Alternate, 21-28 µm long; head cells ovate, globose, irregular and stellately sublobate, 12-18 x 12-15.5 µm</td>
<td>Borne on a separate mycelial branch</td>
<td>Scattered, acute to obtuse at the tip, up to 450 µm long</td>
<td>Up to 120 µm in diam.</td>
<td>Obovoidal to cylindrical, 4 septate, slightly constricted at the septa, 40-44 x 15-19 µm</td>
</tr>
<tr>
<td><em>M. leycesteriae</em></td>
<td>Amphigenous, mostly epiphyllous</td>
<td>Alternate, 13-15 µm long; head cells oval, globose, entire, 8-11.5 x 9-10 µm</td>
<td>Mixed with appressoria</td>
<td>Scattered to grouped around perithecia, acute at the tip, up to 937 µm long</td>
<td>Up to 172 µm in diam.</td>
<td>Ellipsoidal, 4 septate, constricted at the septa, 28-33 x 8-13 µm</td>
</tr>
<tr>
<td><em>M. lonicerae</em></td>
<td>Amphigenous</td>
<td>Opposite, about 3% alternate, 10-16 µm long; head cells globose, ovate to cylindrical, entire, rounded to subtruncate at apex, 8-10 x 4-7 µm</td>
<td>Mixed with appressoria</td>
<td>Grouped around perithecia, acute at the tip, up to 486 µm long</td>
<td>Up to 220 µm in diam.</td>
<td>Ellipsoidal, 4 septate, deeply constricted at the septa, middle cell larger than the remaining, 36-46 x 10-15 µm</td>
</tr>
</tbody>
</table>
**Meliola mastitiae** T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig.9

Colonies epiphyllae, dense, velvety, globose, black, up to 6 mm in diameter and confluent. Hyphae substraight to undulate, brown, septate, branching opposite to irregular at acute to wide angles, closely reticulate, cells mostly 20-40 x 4-7μm. Appressoria alternate, about 15% opposite, straight to curved, antrorse to spreading, 2 celled, dark brown, 10-17μm long; stalk cells cylindrical to cuneate, 2-4μm long; head cells ovate, globose or cylindrical, entire to slightly angular, broadly rounded to subtruncate at the apex, 8-15 x 7-12μm. Phialides mixed with appressoria, alternate to opposite, ampulliform, unicellular, brown, 15-17 x 6-8μm, neck elongated. Mycelial setae scattered to grouped around perithecia, simple, straight to flexuous, acute, subacute to truncate at the tip, up to 520μm long. Perithecia
Fig. 9: Meliola mastitiae
A. Hyphae with appressoria
B. Hyphae with phialides
C. Peritheciun associated with mycelium and setae
D. Mycelial setae
E. Ascus bearing ascospores
F. Ascospores
scattered, round, black, verrucose, up to 155μm in diam. Asci ovate to elliptical, sessile, 2-4 spored. Ascospores cylindrical, 4 septate, rounded at ends, constricted at the septa, straight, dark-brown, smooth walled, 28-34 x 9-12μm.

Specimen studied: On the leaves of Mastitia assamica Bl. (Family-Papilionaceae), AO-Kashiram, Dimapur, Nagaland, India, IMI 390509(Holotype), PCC 5142(Isotype), T.K. Jana, 15.11.2000.

Etymology: From the name of the host genus.

A review of literature (Hosagoudar, 1996, 2004; Hansford, 1961; Bilgrami et al., 1979, 1981, 1991; Sarbhoy et al., 1996; Hu and Lu, 1989) shows that no species of Meliola has yet been described on host Mastitia assamica Bl.

According to Beeli formula 3113.3223, the present fungus Meliola mastitiae sp. nov. is close to M. baphiae-nitidae Hansf. & Deight., but differs from it in having epiphyllous colonies, smaller and flexuous mycelial setae with subacute to truncate tip, larger perithecia, smaller & cylindrical ascospores. It also differs form M. milletiae-racemosae V.B. Hosagoudar et M. Mohann in having 15% opposite appressoria, smaller and flexuous mycelial setae with subacute to truncate tip, smaller perithecia and ascospores (Table-9).
Table 9. Comparative account of *Meliola mastitiae* sp. nov. with other species

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Mycelial setae</th>
<th>Perithea</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. baphiae-nitidae</em></td>
<td>Amphigenous</td>
<td>Opposite to alternate (to 50%), spreading, 13-19μm long; head cells subglobe, ovate or piriform, straight or bent, entire, 9-14 x 9-12μm</td>
<td>Scattered, straight, simple, acute, up to 700μm long</td>
<td>Up to 140μm in diam.</td>
<td>Oblong, constricted, 4 septate, 34-39 x 13-16μm</td>
</tr>
<tr>
<td><em>M. milletiae-racemosae</em></td>
<td>Epiphyllous, rarely amphigenous</td>
<td>Alternate, up to 5% opposite, antrorse, subantrorse to retrorse, 12-15.5μm long; head cells globose, entire, curved &amp; rounded at the apex, 9-10 x 10-12.5μm</td>
<td>Scattered, straight, simple, acute at the tip, up to 575μm long</td>
<td>Up to 170μm in diam.</td>
<td>Cylindrical, slightly constricted, 4 septate, 34-37.5 x 15-18μm</td>
</tr>
<tr>
<td><em>M. mastitiae</em></td>
<td>Epiphyllous</td>
<td>Alternate to 15% opposite, antrorse to spreading, 10-17μm long; head cells ovate, globose or cylindrical, entire or slightly angular, broadly rounded to subtruncate at the apex, 8-15 x 7-12μm</td>
<td>Scattered to grouped around perithecia, simple, straight to flexuous, acute, subacute to truncate at the tip, up to 520μm long</td>
<td>Up to 155μm in diam.</td>
<td>Cylindrical, constricted, 4 septate, 28-34 x 9-12μm</td>
</tr>
</tbody>
</table>
**Meliola picrasmae** Hansf. var. **nagalandis** var. nov. T.K Jana, S.N. Ghosh et A.K. Das

var. nov.

Fig.-10

Differt a typo coloniae epiphyllae, hyphae rectae, appressoriis 20% alternae, setae myceliales brevioribus et acutae, ascosporae oblongae vel ellipsoideae et brevioribus.

Colonies epiphyllous, thin, black, scattered, up to 3mm in diameter or confluent. Hyphae straight to substraight, brown, branching opposite to irregular at acute to wide angles, loosely reticulate, cells mostly 23-30 x 6-8μm. Appressoria opposite, about 20% alternate, rarely solitary, subantrorse, straight to curved, 13-20μm long; stalk cells cuneate to cylindrical, 3-6μm long; head cells ovate, oblong, slightly attenuated at the apex, round, entire to slightly angular, 10-16 x 6-8μm. Phialides mixed with appressoria, opposite, unicellular, ampulliform, 14-24 x 6-9μm. Mycelial setae thinly scattered and grouped around perithecia, straight or slightly bent, simple, acute at the apex, up to 390μm long. Perithecia scattered, verrucose, black, up to 150μm in diam. Asci not seen. Ascospores oblong to ellipsoidal, 4 septate, dark brown, constricted at each septum, rounded at ends, 24-34 x 10-16μm.

**Specimen Studied:** On the leaves of *Picrasma javonica* Bluma. (Family- Simaroubiaceae), Longla Village, Wokha, Nagaland, India, T.K. Jana, 19.02.2000, ITCC 4436.01, PCC 5145.

**Etymology:** From the name of the place.

*Meliola picrasmae* Hansf. has been reported on host *Picrasma javonica* Bluma. from Philippines (Hansford, 1961). The Present collection differs from *M. picrasmae* Hansf. in having epiphyllous colonies, straight hyphae, 20% alternate appressoria, smaller and acute mycelial setae, smaller and oblong to ellipsoidal ascospores. As such new variety of *Meliola picrasmae* Hansf. is suggested (Table-10).
Fig. 10: *Meliola picrasmae var. nagalandis*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascospores
Table 10. Comparative account of *Meliola picrasmae* Hansf. and *M. picrasmae* var. *nagalandis* var. nov.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Hyphae</th>
<th>Appressoria</th>
<th>Mycelial setae</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. picrasmae</em></td>
<td>Hypophyllous</td>
<td>Substraight to undulate</td>
<td>Alternate or to 20% opposite</td>
<td>Straight, simple, 2-4 dentate or furcate, up to 450μm long</td>
<td>Cylindric, 4 septate, costricted, 40-46 x 15-16 x 12-13μm</td>
</tr>
<tr>
<td><em>M. picrasmae</em> var. <em>nagalandis</em></td>
<td>Epiphyllous</td>
<td>Straight to substraight</td>
<td>Opposite, about 20% alternate</td>
<td>Straight or slightly bent, simple, acute at the apex, up to 390μm long</td>
<td>Oblong to ellipsoidal, 4 septate, constricted at each septum, 24-34 x 10-16μm</td>
</tr>
</tbody>
</table>

Fig. 11

Differt a typo appressoriis longioribus et 20% oppositae, cellulae apicales globosae, ovatae, setae myceliales, perithecia et ascosporae brevioribus.

Colonies amphigenous, subdense, black, scattered, up to 10 mm in diameter and confluent. Hyphae straight to flexuous, brown, septate, branching opposite to irregular at wide angles, loosely reticulate, cells mostly 20-37 x 5-8 μm. Appressoria alternate, about 15% opposite, antorose to spreading, 2 celled, brown, straight to slightly curved, 14-22 μm long; stalk cells cylindrical to cuneate, 3-8 μm long; head cells globose, ovate, tapered and broadly rounded at the apex, entire, 10-14 x 6-11 μm. Phialides mixed with appressoria, opposite to alternate, pale brown, unicellular, ampulliform, 16-24 x 7-9 μm. Mycelial setae scattered to grouped around perithecia, straight to curved, simple, dark brown to black, septate, acute to obtuse, up to 350 μm long. Perithecia scattered to loosely grouped, black, verrucose, seated on exhyphopodiate and hyphopodiate mycelium, up to 180 μm in diam. Asci not seen. Ascospores straight, deep brown, 4 septate, oblong to subellipsoid, constricted at the septa, smooth walled, 33-37 x 10 - 17 μm.

**Specimen studied:** On the living leaves of *Eugenia oblata* Roxb. (Family- Myrtaceae), Chanki Village, Mokokchung, Nagaland, India, T. K. Jana, 22.03.2000, PCC 5144 (Holotype), ITCC 4435.01 (Isotype).

**Etymology:** From the name of the place.

*Melioila cylindropoda* Doidge has been reported on host *Eugenia* sp. from South Africa (Hansford, 1961). The present collection differs from *M. cylindropoda* Doidge in having longer and 20% opposite appressoria with globose, ovate head cells, smaller mycelial setae,
Fig. 11: *Meliola cylindropoda* var. *indica*

A. Hyphae with appressoria

B. Hyphae with phialides

C. Perithecium associated with mycelium and setae

D. Ascospores
perithecia and ascospores. As such new variety of *M. cylindropoda* Doidge is suggested (Table -11).
Table 11. Comparative account of *Meliola cylindropoda* Doidge and *M. cylindropoda* Doidge var. *indica* var. nov.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Appressoria</th>
<th>Mycelial setae</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. cylindropoda</em></td>
<td>Alternate, straight or bent, 12-16 μm long; head cells cylindric</td>
<td>Tip obtuse, up to 500μm long</td>
<td>Scattered, verrucose up to 240μm diam.</td>
<td>38-44 x15-17μm</td>
</tr>
<tr>
<td><em>M. cylindropoda var. indica</em></td>
<td>Alternate, about 15% opposite, straight to slightly curved, 14-22μm long; head cells globose, ovate, tapered &amp; broadly rounded at the apex</td>
<td>Tip acute to obtuse, up to 400μm long</td>
<td>Scattered to loosely grouped, verrucose, seated on exhyphopodiate and hyphopodiate mycelium, up to 170μm diam.</td>
<td>33-37 x 10-17μm</td>
</tr>
</tbody>
</table>
Meliola gymnemae T.K.Jana, S.N.Ghosh et A.K.Das sp.nov.

Fig-12

Coloniae epiphyllae, pertenuis, nigrae, patentiae, ad 3mm diam. Hyphae rectae vel leniter flexuoses, brunnea, septatae, oppositae, raro irregulariter, acuteque vel laxe ramosae, laxe reticulatae, cellulae plerumque 12-22 x 4-7μm. Appressoria alternata, raro unilateralia, recta vel leniter curvula, antorsa vel subantrorsa, biccellula, brunnea, 13-24μm longa; cellulae basilares cylindraceae vel cuneatae, 4-6μm longae; cellulae apicales subglobaseae vel cyllindraceae, integrae, attenuatae vel rotundatae ad apicem, 10-13 x 6-8μm. Phialides in hyphis distinctis, oppositae, ad 20% alternatae, unicellularae, ampulliformes, 16-23 x 7-9μm. Setae myceliales dispersae vel juxta perithecia aggregatae, simplices, rigens. rectae vel curvulae, acuta vel obtusa ad apicem, nigrae, 370 x 6-8μm. Perithecia dispersa. vel aggregata, nigra, globosa, verrucosa, ad 152μm diam. Asci ovales vel elongati, sessiles, 2-spori. Ascosporeae cylindriceae vel ellipsoideae, 3-4 septatae. utrinque rotundatae. septis consritctae, rectae, atro brunnea, parietibus laevibus, 35-46 x 10-16μm.

Colonies epiphyllous, very thin, black, spreading, up to 3mm in diameter. Hyphae straight to slightly flexuous, brown, septate, branching opposite, rarely irregular, at acute to wide angles, loosely reticulate, cells mostly 12-22 x 4-7μm. Appressoria alternata, rarely unilateral, straight or slightly bent, antorse to subantrorse, 2 celled, brown, 13-24μm long; stalk cells cylindrical to cuneate, 4-6μm long; head cells subglobose to cylindrical, entire, attenuated and rounded apex, 10-13 x 6-8μm. Phialides few, borne on a separate mycelial branch, opposite, about 20% alternate, unicellular, ampulliform, 16-23 x 7-9μm. Mycelial setae scattered to grouped around perithecia, simple, stiff, straight to curved in middle, acute to obtuse at the tip, black, 370 x 6-8μm. Perithecia scattered to grouped, black, round, verrucose, seated in the centre of the mycelial colony, up to 152μm in diam. Asci oval to
Fig. 12: *Meliola gymnemae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Mycelial setae
E. Ascus bearing ascospores
F. Ascospores
elongated, sessile, 2-spored. Ascospores cylindrical to ellipsoid, 3-4 septate, rounded at ends, constricted at each septum, straight, dark brown, smooth walled, 35-46 x 10-16μm.

**Specimen studied:** On the leaves of *Gymnema* sp. (Family; Asclepiadaceae), Patkai Hill, Dimapur, Nagaland, India 15.11.2000., T.K. Jana ITCC 4323.2K (Holotype), PCC 5122 (Isotype).

**Etymology:** From the name of the host genus.

A review of literature (Bilgrami *et al.*, 1979, 1981, 1991; Crane and Jones, 2001; Hansford, 1961; Hosagoudar, 1996, 2002a, 2002b; Mibey and Hawksworth, 1997; Patil and Mahamulkar, 1999; Sanchez and Carrion, 1992; Sarbhoy *et al.*, 1996) shows that no species of *Meliola* has yet been reported on host *Gymnema* sp.

Based on the Beeli formula 3111.4222, this new species is close to *M. asclepiadacearum* Hansf. in having epiphyllous colonies (Hansford, 1961) but differs from it in having smaller appressoria with subglobose to cylindrical head cells, phialides borne on a separate mycelial branch, longer acute mycelial setae, 3-4 septate smaller ascospores. It differs from *M asclepiadacearum* Hansf. var. *brasiliensis* Hansf. (Hansford, 1961) in having epiphyllous colonies, smaller subglobose to cylindrical head cells, phialides borne on a separate mycelial branch, longer acute mycelial setae, smaller 3-4 septate and cylindrical ascospores. It also differs from *M. secamonis* Hansf. and *M. Hughesiana* Hansf. (Hansford, 1961) in having only epiphyllous colonies, smaller subglobose to cylindrical head cells, smaller straight to curved mycelial setae, 3-4 septate smaller ascospores (Table-12).
Table 12. Comparative account of *Meliola gymnemae* sp. nov. with other species of *Meliola*.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Mycelial setae</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. asclepiadacearum</em></td>
<td>Epiphyllous</td>
<td>20-30µm long; head cells ovate to clavate- cylindric, entire, rounded</td>
<td>Mixed with appressoria, opposite or alternate</td>
<td>Scattered, straight, obtuse, up to 330µm long</td>
<td>Cylindric to narrowly ellipsoid, 4 septate, constricted, 45-49 x 15-18µm</td>
</tr>
<tr>
<td><em>M. asclepiadacearum</em> var. brasiliensis</td>
<td>Hypophyllous</td>
<td>20-25µm long; head cells ovate, entire or sometimes slightly angulose, 13-18 x 10-13µm</td>
<td>Mixed with appressoria</td>
<td>Scattered and grouped around perithecia, straight, obtuse, up to 330µm long</td>
<td>Oblong to ellipsoid, 4 septate, 40-48 x 16-18 14-15µm</td>
</tr>
<tr>
<td><em>M. secamonis</em></td>
<td>Amphigenous &amp; epiphyllous</td>
<td>17-26µm long; head cells subglobose, ovate or clavate, entire or angulose, rarely sublobate, 15-21 x 10-13µm</td>
<td>Mostly borne on a separate mycelial branch</td>
<td>Scattered, straight, acute, up to 450µm long</td>
<td>Cylindric, 4 septate, rather deeply constricted, 37-45 x 14-17 x 12-15µm</td>
</tr>
<tr>
<td><em>M. hughesiana</em></td>
<td>Amphigenous</td>
<td>21-30µm long; head cells ovate, widely rounded or slightly pointed at the apex, entire, 13-20 x 9-11µm</td>
<td>Borne on a separate mycelial branch</td>
<td>Scattered, straight, obtuse, up to 430µm long</td>
<td>Subellipsoid, obtuse, 4 septate, constricted, 37-44 x 14-17µm</td>
</tr>
<tr>
<td><em>M. gymnemae</em></td>
<td>Epiphyllous</td>
<td>13-24µm long; head cells subglobose to cylindrical, entire, attenuated and rounded at the apex, 10-13 x 6-8µm</td>
<td>Borne on a separate mycelial branch</td>
<td>Scattered to grouped around perithecia, straight to curved in the middle, acute to obtuse, up to 370µm long</td>
<td>Cylindrical to ellipsoid, 3-4 septate, rounded at end, constricted at each septum, 32-46 x 10-16µm</td>
</tr>
</tbody>
</table>
**Meliola cyathocali** T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 13

Colonies hypophyllous, subdense, crustose, black, scattered, orbicular, up to 10 mm in diameter and confluent. Hyphae crooked, brown, septate, branching alternate to irregular at wide angles, closely reticulate, cells mostly 15-38 x 6-8μm. Appressoria alternate to unilateral, 2 celled, brown, straight or bent, antrorse to retrorse, 16-27μm long; stalk cells cylindrical to cuneate, 4-9μm long; head cells ovate, globose, entire, angular to sublobate, straight to curved, 13-18 x 8-15μm. Phialides mixed with appressoria, opposite to alternate, pale brown, unicellular, ampulliform, 23-35 x 7-12μm. Mycelial setae scattered to aggregated around perithecia, stiff, dark brown to black, septate, straight to slightly flexuous, simple, acute at the tip, up to 450μm long. Perithecia scattered to loosely grouped, round, black, verrucose, up to 150μm in diameter. Asci oval to elliptical, sessile, 4 spored. Ascospores
Fig. 13: *Meliola cyathocali*

A. Hyphae with appressoria

B. Hyphae with phialides

C. Perithecium associated with mycelium and setae

D. Ascus bearing ascospores

E. Ascospores

Fig. 13: *Meliola cyathocali*

A. Hyphae with appressoria

B. Hyphae with phialides

C. Perithecium associated with mycelium and setae

D. Ascus bearing ascospores

E. Ascospores
cylindrical, 4 septate, rounded at ends, constricted at the septa, straight to curved, dark brown, 42 – 48 x 13 – 17µm.

**Specimen studied:** On the leaves of *Cyathocalyx zeylanicus* Champ. (Family-Anonaceae), Chichema Village, Kohima, Nagaland, India, 10.6.2001, T.K. Jana, ITCC 4934.01 (Isotype), PCC 5191 (Holotype).

**Etymology:** From the name of the host genus.

Based on the Beeli formula 3111.4222, *Meliola cyathocali* is similar to *M. popowiae* Doidge var. *tenuis* Hansf. & Deight. (Hansford, 1961) but differs from it in having hypophyllous colonies, longer appressoria with angular to sublobate head cells, phialides mixed with appressoria, longer acute mycelial setae and larger cylindrical ascospores. It also differs from *M. golaensis* Deight. in having hypophyllous colonies, angular to sublobate head cells of appressoria, smaller acute mycelial setae, cylindrical ascospores.

A review of literature (Honsford, 1961; Bilgrami *et al.*, 1991; Sarbhoy *et al.*, 1996; Hosagoudar, 1996; Hosagoudar *et al.*, 2003) shows that no species of *Meliola* has yet been described on host *Cyathocalyx zeylanicus* Champ. As such a new species of *Meliola* is suggested (Table-13).
Table 13. A comparative account of *Meliola cyathocali* sp. nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Mycelial setae</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. popowiae</em> var. <em>tenuis</em></td>
<td>Epiphyllous</td>
<td>Alternate, straight or slightly bent, 19-23μm long; head cells subglobose, entire, 11-15μm diam.</td>
<td>Borne on a separate mycelial branch</td>
<td>Straight, obtuse, up to 220μm long</td>
<td>Oblong to subellipsoid, 4 septate, constricted, 33-41 x 14-16μm</td>
</tr>
<tr>
<td><em>M. golaensis</em></td>
<td>Epiphyllous</td>
<td>Alternate, straight, 16-28 μm long; head cells cylindric, ovate or clavate, entire, 12-18 x 9-13μm</td>
<td>Mixed with appressoria</td>
<td>Straight or sometimes slightly bent or geniculate, obtuse to subacute, up to 710μm long</td>
<td>Oblong to subellipsoid, 4 septate, constricted, 43-47 x 19-22μm</td>
</tr>
<tr>
<td><em>M. cyathocali</em></td>
<td>Hypophyllous</td>
<td>Alternate to unilateral, straight or bent, 16-27 μm long; head cells ovate, globose, entire, angular to sublobate, 13-18 x 8-15μm</td>
<td>Mixed with appressoria</td>
<td>Straight to slightly flexuous, acute at the tip, up to 450μm long</td>
<td>Cylindrical, 4 septate, constricted, straight to curved, 42-48 x 13-17μm</td>
</tr>
</tbody>
</table>
**Meliola anisomali** T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Coloniae epiphyllae, nigrae, dispersae, orbiculares, tenuis vel subdensae, ad 5mm diam., plerumque confluentes. Hyphae subrectae vel undulatae, brunneae, septatae, plerumque oppositae acuteque vel laxe ramosae, laxe vel dense reticulatae, cellulae plerumque 15-25 x 6-9μm. Appressoria alternata vel unilateralia, bicellulare, brunnea, recta vel curvula, antrorsa vel patentia, 15-23μm longa ; cellula basali cylindracea vel cuneata, 5 – 10μm longa ; cellula apicali ovata vel globosa, angularia vel lobata, 10 – 19 x 10 – 17.5μm. Phialides appressoriis intermixta, opposita vel alternata, pallide brunnea, unicellulæ, ampullacea, 20-32 x 7-10μm. Setae myceliales dispersae vel plerumque juxta perithecia aggregatae, rigens, rectae vel curvulae, simplices, atrobrunneae vel nigrae, septatae, acutæ ad apicem, ad 260μm longæ. Perithecia dispersa, nigra, globosa, verrucosa, ad 130μm diam. Asci ovales, sessiles, 4- spori. Ascosporae cylindraceae vel subellipsoideae, 4 septatae, septis constrictæ, utrinque rotundatae, atrobrunneæ, rectæ vel curvulae, 40-45 x 10-15μm.

Colonies epiphyllous, black, scattered, orbicular, thin to subdense, up to 5mm in diameter, mostly confluent. Hyphae substraight to undulate, brown, septate, branching mostly opposite at acute to wide angles, loosely to closely reticulate, cells mostly 15-25 x 6-9μm. Appressoria alternate to unilateral, 2 celled, brown, straight to curved, antrorse to spreading, 15-23μm long ; stalk cells cuneate to cylindrical, 5-10μm long ; head cells ovate to globose, angular to lobate, 10-19 x 10-17.5μm. Phialides mixed with appressoria, opposite to alternate, pale brown, unicellular, ampulliform, 20-32 x 7-10μm. Mycelial setae scattered to mostly grouped around perithecia, stiff, straight to curved, simple, dark brown to black, septate, acute at the tip, up to 260μm long. Perithecia scattered, black, round, verrucose, seated in the centre of the mycelial colony, up to 130μm in diameter. Asci oval, sessile, 4 spored.
Fig. 14: *Meliola anisomali*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascus bearing ascospores
E. Ascospores
Ascospores cylindrical to subellipsoid, 4 septate, constricted at the septa, rounded at ends, dark brown, straight to curved, 40-45 x 10-15μm.

**Specimen studied:** On the leaves of *Anisomales ovata* Br. (Family Labiatae), Diphu Road, Dimapur, Nagaland, India. T.K. Jana, 20.05.2001, ITCC 4933.01 (Isotype), PCC 5190 (Holotype).

**Etymology:** From the name of the host genus.

Based on the Beeli formula 3111.4221, *Meliola anisomali* is close to *M. prostantherae* Hansf. but differs from it in having angular to irregularly lobate head cells, longer phialides and mixed with appressoria, longer acute mycelial setae, smaller perithecia and larger ascospores. It differs from *M. ambigua* Pat. & Gaill. in having smaller appressoria with angular to irregularly lobate head cells, longer phialides, smaller acute mycelial setae and perithecia, larger ascospores. It also differs from *M. capnodioides* Theum. in having longer appressoria with angular to irregularly lobate head cells, longer phialides, smaller perithecia and larger ascospores.

Review of literature (Hansford 1961; Hosagoudar, 1996; Hosagoudar et al., 2003; Bilgrami et al., 1991; Sanchez and Carrion 1992; Mibey and Hawksworth, 1997; Jiang, 1989; Crane and Jones, 2001) shows that no species of *Meliola* has yet been reported on host *Anisomales ovata* Br. Hence new species of *Meliola* is suggested (Table-14).
Table 14. Comparative account of *Meliola anisomali* sp. nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Mycelial setae</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. prostantherae</em></td>
<td>16 – 23 μm long; head cells subglobose to wide ovate, entire, 11-15 x 8-11μm</td>
<td>Mostly borne on a separate mycelial branch, 15-20 x 7-9μm</td>
<td>Obtuse to clavulate, straight, up to 220μm long</td>
<td>Up to 140μm in diam.</td>
<td>Oblong, 31-40 x 13-15μm</td>
</tr>
<tr>
<td><em>M. ambigua</em></td>
<td>19 – 28 μm long; head cells ovate, entire, 13-18 x 8-12μm</td>
<td>Mixed with appressoria, 15-20 x 7-9μm</td>
<td>Obtuse, straight, up to 280μm long</td>
<td>Up to 170μm in diam.</td>
<td>Oblong to subellipsoid, 35-42 x 13-16μm</td>
</tr>
<tr>
<td><em>M. csapnodioides</em></td>
<td>15 – 21 μm long; head cells subglobose to wide ovate, entire, 10-14 x 9-11μm</td>
<td>Mixed with appressoria, 12-18 x 7-9μm</td>
<td>Obtuse, straight or slightly flexuous, up to 320μm long</td>
<td>Up to 150μm in diam.</td>
<td>Cylindric to subellipsoid, 27-34 x 12.5-15μm</td>
</tr>
<tr>
<td><em>M. anisomali</em></td>
<td>15 – 24 μm long; head cells globose to ovate, angular to lobate, 10-19 x 10-17.5μm</td>
<td>Mixed with appressoria, 20-32 x 7-10μm</td>
<td>Acute, straight to curved, up to 260μm long</td>
<td>Up to 130μm in diam.</td>
<td>Cylindric to subellipsoid, 40-45 x 10-15μm</td>
</tr>
</tbody>
</table>

Fig. 15

Coloniae epiphyllae, subdensae vel densae, leniter velutinae, nigræ, dispersæ, orbiculares, ad 7 mm diam. Hyphae rectae, subrectae vel flexuosæ, septatae, brunneæ, plerumque oppositaæ, acuteque ramosae, laxæ vel dense reticulatae, cellulae plerumque 16-37 x 6-10 μm. Appressoria alternata vel unilateralia, recta vel curvula, subantrorsa vel patentia, brunnea, 15-22 μm longa; cellulae basilares cylindraceae vel cuneatae, 4-8 μm longae; cellulae apicales globosæ, ovatae vel clavatae, integrae vel sublobatae, 10-16 x 8-13 μm. Phialides producentes in ramus separatus myceliales, opposita vel alternata, unicellular, ampullacea, brunnea, colum elongatus, 14-21 x 6-9 μm. Setae myceliales numerosae, dispersae vel juxta perithecia aggregatae, atrobrunneae vel nigrae, rigens, rectæ vel leniter curvatae, simplices, septatae, acutaæ vel obtusaæ ad apicem, nigrae, ad 586 μm longae. Perithecia dispersa, globosa, nigra, verrucosa, ad 165 μm diam. Asci ovales vel elliptici, sessiles, 2-spori. Ascosporae cylindraceae vel leniter ellipsoidae, atrobrunneae, rectæ, 4 septatae, septis constrictæ, utrinque rotundatae, parietibus laevibus, 30-37 x 13-15.5 μm.

Colonies epiphyllous, subdense to dense, slightly velvety, black, scattered, orbicular, up to 7 mm in diameter. Hyphae straight, substraight to flexuous, septate, brown, branching mostly opposite at acute angles, loosely to closely reticulate, cells mostly 16-37 x 6-10 μm. Appressoria alternate to unilateral, straight to curved, subantrorse to spreading, brown, 15-22 μm long; stalk cells cylindrical to cuneate, 4-8 μm long; head cells globose, ovate to clavate, entire to sublobate, 10-16 x 8-13 μm. Phialides borne on a separate mycelial branch, opposite to alternate, unicellular, ampulliform, brown, neck elongated, 14-21 x 6-9 μm. Mycelial setae numerous, scattered to grouped around perithecia, dark brown to black, stiff, straight to slightly curved, simple, septate, acute to obtuse at the tip, black, up to 586 μm long.
Fig. 15: *Meliola mucunae-imbricatae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascus bearing ascospores
E. Ascospores
Perithecia many, scattered, globose, black, verrucose, up to 165μm in diam. Asci oval to elliptical, sessile, 2 spored. Ascospores cylindrical to slightly ellipsoidal, dark brown, straight, 4 septate, constricted at the septa, rounded at ends, smooth walled, 30-37 x 13-15.5μm.

**Specimen studied:** On the leaves of *Mucuna imbricata* DC. [= *Mucuna nigricans* (Lour) Steud.], (Family-Fabaceae), Vaterinary Colony, Dimapur, Nagaland, India, T.K.Jana, 10.10.2000, ITCC 4444.01 (Isotype), PCC 5156(Holotype).

**Etymology:** From the name of the host genus.

So far *Meliola motatanensis* Hansf. on host *Mucuna imbricata* DC by Kar & Maty, *M. mucunae* Hansf. var *hirsutae* Hasag. on *Mucuna hirsuta* Wight & Arn. and *M. mucunae-acuminatae* Hansf. var *indica* Hasag. Siddappa & Udaiyan on *Mucuna pruriens* (L.) DC. have been reported form India (Meliolales of India, 1996). The present collection is compared with the above mentioned species of *Meliola* and other one species *M. bantamensis* Hansf.

According to Beeli formula 3111.3223, *Meliola mucunae imbricatae* differs from *M. motatanensis* Hansf. in having phialides borne on a separate mycelial branch, longer mycelial setae, smaller perithecia and ascospores and in not having opposite appressoria. It differs from *M. mucunae acuminatae* Hansf. var. *indica* Hosag, Siddappa & Udaiyan in having phialides borne on a separate mycelial branch, longer mycelial setae, larger perithecia and ascospores and in absence of 5% opposite appressoria. It differs from *M. mucunae* Hansf. var. *hirsutae* Hosag. in absence of longer mycelial setae, smaller perithecia and in absence of 40% appressoria. It also differs from *M. bantamensis* Hansf. in having sublobate head cells of appressoria, phialides borne on a separate mycelial branch, longer mycelial setae and smaller cylindrical ascospores. These striking characters suggest separate identity of the species (Table-15).
Table 15. A comparative account of *Meliola mucunae-imbricatae* sp. nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Mycelial setae</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. motatanensis</em></td>
<td>Alternate to opposite, straight to curved, 13-16.5μm long; head cells ovate, globose, entire to angular, 9 - 13 x 9 - 10μm</td>
<td>Mixed with appressoria</td>
<td>Acute to obtuse, up to 540μm long</td>
<td>Up to 171μm in diam.</td>
<td>Cylindrical, 4septate, 38-42 X 13-16μm</td>
</tr>
<tr>
<td><em>M. mucunae-acuminatae</em> var. <em>indica</em></td>
<td>Alternate to opposite, straight to variously curved, 12-18.5μm long; head cells ovate, globose, entire, curved, 9 - 12.5 x 10 - 12.5μm</td>
<td>Mixed with appressoria</td>
<td>Acute to obtuse to few dentate at the tip, up to 280μm long</td>
<td>Up to 125μm in diam.</td>
<td>Cylindrical, 4septate, constricted, 30-34 x 12 - 15.5μm</td>
</tr>
<tr>
<td><em>M. mucunae</em> var. <em>hirsutae</em></td>
<td>Alternate and about 40% opposite, straight, 14-20 μm long; head cells globose, entire, 10 - 12μm</td>
<td>Mixed with appressoria</td>
<td>Acute at the tip, up to 324μm long</td>
<td>Up to 176μm in diam.</td>
<td>Ellipsoidal, 4 septate, constricted 30-36 x 12 - 14μm</td>
</tr>
<tr>
<td><em>M. bantamensis</em></td>
<td>Alternate, straight or slightly bent, 12 - 18μm long; head cells globose to oblong, entire, straight or bent 8 - 13 x 7 - 11μm</td>
<td>Mixed with appressoria</td>
<td>Acute at the tip, up to 420μm long</td>
<td>Up to 160μm in diam.</td>
<td>Oblong to subellipsoidal, constricted, 4 septate, 34 - 39 x 12 - 14μm</td>
</tr>
<tr>
<td><em>M. mucunae-imbricatae</em></td>
<td>Alternate to unilateral, straight to slightly curved, 15 - 22μm long; head cells globose, ovate to clavate, entire to sublobate, 10 - 16 x 8 - 13μm</td>
<td>Borne on a separate mycelial branch</td>
<td>Acute to obtuse at the tip, up to 586μm long</td>
<td>Up to 171μm in diam.</td>
<td>Cylindrical to slightly ellipsoidal, constricted, 4 septate, 30 - 37 x 13 - 15.5μm</td>
</tr>
</tbody>
</table>
Meliola holarrhenae-pubescens T.K.Jana, S.N.Ghosh et A.K. Das sp. nov.

Fig. 16

Coloniae amphigenae, tenuis vel subdensae, nigrae, dispersae, ad 5mm diam. epiphyllae et ad 10mm diam. hypophyllae, raro confluentes. Hyphae rectae vel subrectae, brunneae, septatae, plerumque oppositae ad acuteque ramosae, dense reticulatae, cellulae 24-40 x 5-8µm. Appresoria alternata, raro irregulariter, atrobrunnea, bicellularia, recta vel raro curvula, antrorsa, 12-20µm longa; cellulae basilares cylindraceae vel cuneatae, 2-8µm longae; cellulae apicales, globosae, ovatae, integrae, 10-14 x 8-12µm. Phialides paucae, producentes in ramus separatus myceliales, oppositae vel alternatae, unicellularae, ampulliformes, pallide brunneae; 16-20 x 4-8µm. Setae myceliales paucae, hypophyllae, plerumque epiphyllae, dispersae vel plerumque juxta perithesia aggregatae, simplices, nigrae, septatae, rectae vel leniter curvulae, subacutae vel obtusae ad apicem, 300 x 6-8µm. Perithecia dispersa vel laxe aggregata, nigra, globosa, leniter verrucosa, ad 200 µm diam. Asci paucae, ovales vel elliptici, sessiles, 2-4 spori, 40-44 x 28-36µm. Ascosporae oblongae vel cylindraceae, 4 septatae, utrinque rotundatae, parietibus laevibus, septis constrictae, rectae vel leniter curvulae, atrobrunneae, 28-32 x 9-13µm.

Colonies amphigenous, thin to subdense, black, scattered, up to 5mm diameter on the upper surface and up to 10µm in diam. on the lower surface, rarely confluent. Hypae straight to substraight, brown, septate, branching mostly opposite at acute angles, closely reticulate, cells 24-40 x 5-8µm. Appressoria alternate, rately irregular, dark brown, 2 celled, straight to rarely bent, antrorse, 12-20µm long; stalk cells cylindrical to cuneate, 2-8µm long; head cells globose, ovate, entire, with a small hyaline circular spot at the centre, 10-14 x 8-12µm. Phialides few, borne on a separate mycelial branch, opposite to alternate, unicellular, ampulliform, pale brown, 16-20 x 4-8µm. Mycelial setae few on lower surface of the leaf, more on upper surface, scattered to mostly aggregated around perithecia, simple, black,
Fig. 16: *Meliola holarrhenae-pubescens*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascus bearing ascospores
E. Ascospores
septate, straight to slightly curved, subacute to obtuse at the tip, 340 x 6-8μm. Perithecia scattered to loosely grouped, black, round with slightly verrucose wall, up to 200μm in diam. Ascii few, oval to elliptical, broad, sessile, 2-4 spored, 40-44 x 28-36μm. Ascospores oblong to cylindrical, 4 septate, rounded at ends, smooth walled, constricted at the septa, straight to slightly curved, dark brown, 28-32 x 9-13μm.

**Specimen studied:** On the leaves of *Holarrhena pubescens* (Buch-Ham.) Wallich ex G.Don. (Family-Apocynaceae), Veterinary Colony, Dimapur, Nagaland, India, T.K. Jana, 16.02.2000, ITCC 4313.2K (Holotype), PCC5115 (Isotype).

**Etymology:** From the name of the host genus.

So far only two species of *meliola*, namely *M. holarrhena* Hanf. & Thirum and *M.simillima* Ellis & Everh. var. major Hansf. have been recorded on *Holarrhena antidysenterica* Wall. under the family Apocynaceae from India (Hansford, 1961; Hosagoudar, 1996; Bilgrami et al., 1979, 1981, 1991; Sarbhoy et al., 1996).

The present species *M. holarrhenae-pubescens* sp. nov. has been compared with the above mentioned two species of *Meliola* and with two other species viz. *M. euopla* Syd. and *M. tabernaemontanae* Speg. var. *odontadeniae* Hansf. (Table-16).

Based on the Beeli formula 3111.4222, this new species is close to *M. holarrhena* Hanf. & Thirum. (Hansford, 1961) and *M. simillima* Ell. And Everh. var. *major* Hansf. (Hansford, 1961) but differs from these in having phialides borne on a separate mycelial branch, smaller subacute mycelial setae, few on lower surface and more on upper surface of the leaf, larger perithecia with slightly verrucose wall, smaller oblong ascospores. It differs from *M. euopla* Syd. And *M. tabernaemontanae* Speg. var. *odontadeniae* Hansf. (Hansford, 1961) in having amphigenous colonies, phialides borne on a separate mycelial branch, longer acute mycelial setae, larger perithecia, smaller oblong ascospores.
<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Hyphae</th>
<th>Phialides</th>
<th>Mycelial setae</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. holarrhenae</em></td>
<td>Amphigenous, mostly epiphyllous and confluent</td>
<td>Substraight to undulate</td>
<td>Mixed with appressoria</td>
<td>Tip acute, up to 450µm long</td>
<td>Scattered, up to 190µm diam., verruculose</td>
<td>Cylindric to subellipsoidal, 30-38 x 12-15µm</td>
</tr>
<tr>
<td><em>M. simillima var. major</em></td>
<td>Amphigenous</td>
<td>Sinuous to crooked</td>
<td>Mixed with appressoria</td>
<td>Tip obtuse, up to 330µm long</td>
<td>Scattered, up to 140µm diam., verrucose</td>
<td>Cylindric, 33-40 x 12-15µm</td>
</tr>
<tr>
<td><em>M. euopla</em></td>
<td>Hypophyllous, often confluent</td>
<td>Substraight to undulate</td>
<td>Mixed with appressoria</td>
<td>Tip obtuse, up to 250µm long</td>
<td>Scattered, up to 150µm diam., slightly verrucose</td>
<td>Cylindric, 25-36 x 12-14µm</td>
</tr>
<tr>
<td><em>M. tabernaemontanae var. odontadeniae</em></td>
<td>Epiphyllous</td>
<td>Straight to undulate</td>
<td>Separate or mixed with appressoria</td>
<td>Tip obtuse, up to 280µm long</td>
<td>Scattered, up to 140µm diam., verrucose</td>
<td>Cylindric, 30-35 x 10-15µm</td>
</tr>
<tr>
<td><em>M. holarrhenae-pubescens</em></td>
<td>Amphigenous, rarely confluent</td>
<td>Straight to substraight</td>
<td>Borne on a separate mycelial branch</td>
<td>Few on lower surface of the leaf, more on upper surface, tip subacute to obtuse, up to 300µm long</td>
<td>Scattered to loosely grouped, up to 200µm diam., slightly verrucose</td>
<td>Oblong to cylindrical, 28-32 x 9-13µm</td>
</tr>
</tbody>
</table>
Meliola neurocali T.K.Jana, S.N. Ghosh et A.K. Das sp. nov.

Coloniae epiphyllae, tenuis, crustosae, dispersae, nigrae, orbiculares, ad 3mm diam. et confluentes. Hyphae subrectae, brunneae, septatae, plerumque oppositae, laxe ramosae, laxe vel dense reticulatae, cellulae 13-35 x 7-10μm. Appressoria alternata vel unilateralia, bicellula, brunnea, recta vel curvula, antrorsa vel patentia, 15-28μm longa; cellula basali cylindracea vel cuneata, 3-7μm longa ; cellula apicali globosa, ovata vel cylindracea, integra vel angularia, rotundata vel truncata ad apicem, 10-20 x 7-13μm. Phialides producentes in ramus separatus myceliales, opposita, alternata vel unilateralia, unicellular, ampullacea, 19-32 x 6-10μm. Setae myceliales paucae, dispersae vel juxta perithecia aggregatae, rectae vel curvulae simplices, atrobrunneae vel nigrae, acutae vel obtusae, ad 225μm longae. Perithecia dispersa, verrucosa, nigra, globosa, ad 150μm diam. Asci ovales vel elliptici, sessiles, 2 spori. Ascosporeae cylindraceae vel subellipsoidae, atrobrunneae, 4 septatae, rectae, septis constrictae, utrinque rotundatae, parietibus laevibus, 34-39 x 15-18μm.

Colonies epiphyllous, thin, crustose, scattered, black, orbicular, up to 3mm in diameter and confluent. Hyphae substraight, brown, septate, branching mostly opposite at wide angles, loosely to closely reticulate, cells 13-35 x 7-10μm. Appressoria alternate to unilateral, 2 celled, brown, straight to curved, antrorse to spreading, 15-28μm long ; stalk cells cylindrical to cuneate, 3-7μm long ; head cells globose, ovate to cylindrical, entire to angular, broadly rounded to truncate at the apex, 10-20 x 7-13μm. Phialides borne on a separate mycelial branch, opposite, pale brown, alternate to unilateral, unicellular, ampulliform, 19-32 x 6-10μm. Mycelial setae few, scattered to grouped around perithecia, straight to curved, simple, dark brown to black, septate, acute to obtuse, up to 225μm long. Perithecia scattered, verrucose, black, round, up to 150μm in diam. Asci oval to elliptical,
Fig. 17: *Meliola neurocali*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascus bearing ascospores
E. Ascospores
sessile, 2 spored. Ascospores cylindrical to subellipsoidal, dark brown, 4 septate, straight, constricted at the septa, rounded at ends, smooth walled, 34-39 x 15-18μm.

**Specimen studied:** On the leaves of *Neurocalyx calycinus* (R. Br. ex. Been) Robinson (Family-Acanthaceae), near N.S.T. Colony, Mon, Nagaland, India, T.K.Jana, 15.12.2001, ITCC 4862.01 (Isotype), PCC 5166 (Holotype).

**Etymology:** From the name of the host genus.

According to Beeli formula 3111.3221, the present species *Meliola neurocali* is similar to *M. cladacatha* Cif. (Hansford, 1961) but differs from it in having epiphyllous colonies, phialides borne on a separate mycelial branch, smaller curved and obtuse mycelial setae, longer cylindrical to subellipsoid ascospores. It also differs from *M. nilgirianthi* Hosag. (Hosagoudar, 1996) in having epiphyllous colonies, phialides borne on a separate mycelial branch, smaller mycelial setae, smaller perithecia, larger cylindrical to subellipsoid ascospores.

Table 17. A comparative account of *Meliola neurocali* sp. nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Phialides</th>
<th>Mycelial setae</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. cladacantha</em></td>
<td>Amphigenous</td>
<td>Mixed with appressoria</td>
<td>Straight, acute, up to 300 μm long</td>
<td>In central group, verrucose, up to 150 μm in diam., surface cells mammillate</td>
<td>Oblong to ellipsoid, 4 septate, constricted, 32-35 x 14-16 μm</td>
</tr>
<tr>
<td><em>M. nilgirianti</em></td>
<td>Hypophyllous</td>
<td>Mixed with appressoria</td>
<td>Curved, acute to obtuse to wavy at the apex, up to 270 μm long</td>
<td>Aggregated, verrucose, up to 180 μm in diam.</td>
<td>Obovoidal, 4 septate, constricted, 30-38 x 10-12 μm</td>
</tr>
<tr>
<td><em>M. neurocali</em></td>
<td>Epiphyllous</td>
<td>Borne on a separate mycelial branch</td>
<td>Straight to curved, acute to obtuse, up to 225 μm long</td>
<td>Scattered, verrucose, up to 150 μm in diam.</td>
<td>Cylindrical to subellipsoidal, broad, 4 septate, constricted, 34-39 x 15-18 μm</td>
</tr>
</tbody>
</table>


Fig. 18

Colonies amphigenous, mostly epiphyllous, black, scattered, orbicular, subdense to dense, up to 4 mm in diameter and confluent. Hyphae substraight to undulate, dark brown, septate, branching alternate to opposite at acute to wide angles, loosely reticulate, cells mostly 17-30 x 5-8 μm. Appressoria alternate, 2-celled, dark brown, antorse to subantrorse, 14-20 μm long; stalk cells cuneate to cylindrical, 4-9 μm long; head cells globose, ovate, entire, sometimes sublobate, 10-12.5 x 8-12 μm. Phialides mixed with appressoria, opposite to alternate, pale brown, unicellular, ampulliform, 16-20 x 6-8 μm. Mycelial setae scattered to grouped around perithecia, not numerous, stiff, simple, septate, dark brown, acute to obtuse at the tip, straight to substraight, up to 260 μm long. Perithecia many, scattered, round, black, verrucose, seated in the centre of the mycelial colony, up to 150 μm in diam. Asci oval to elliptical, broad, sessile, 2-spored. Ascospores oblong to subellipsoid, broad, 4 septate, straight to substraight, brown, smooth walled, constricted at the septa, 30-38 x 11-17 μm.

**Specimen studied**: On the living leaves of *Clerodendron infortunatum* Gaertn. (Syn. *Clerodendron viscosum* Vent.) (Family-Verbenaceae), Chumukedima, Dimapur, Nagaland, India, T.K. Jana, 12.02. 2001, PCC 6134, ARI 6054.
Fig. 18: *Meliola clerodendricola*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascus bearing ascospores
E. Ascospores
**Meliola platyphyllae** T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

![Image of colonie epiphyllae](image)

Fig.19

Coloniae epiphyllae, nigrae, tenuis vel subdensae, dispersae, orbiculares, ad 5mm. diam., raro confluentes. Hyphae rectae vel subrectae, atrobrunneae, plerumque oppositae acutaeque ramosae, laxe vel dense reticulatae, cellulae 20-40 x 6-8μm. Appressoria alternata vel unilateralia, antrorsa vel subantrorsa, brunnea, bicellularia, recta vel curvula, 16-26μm longa; cellula basali cylindracea vel cuneata, recta, 5-7μm longa; cellula apicali globosa, ovata vel clavata, recta vel curvula, integra, rotundata ad apicem, 12-20 x 10-14μm. Phialides appressoriis intermixta, unicellularia, ampullacea, 14-22 x 5-8μm. Setae myceliales plerumque juxta perithecia aggregatae, simplices, rectae, rigens, septatae, atrobrunneae vel nigrae, acutae ad apicem, ad 166μm longae. Perithecia dispersa, nigra, globosa, verrucosa, ad 14μm diam. Ascospores ellipsideoae, rectae vel curvulae, 3 septatae, brunnea, septis constrictae, utrinque rotundatae, parietibus laevibus, 40-48 x 12-16μm.

Colonies epiphyllous, black, thin to subdense, scattered, orbicular, up to 5mm. in diameter, rarely confluent. Hyphae straight to substraight, dark brown, branching mostly opposite at acute angles, loosely to closely reticulate, cells 20-40 x 6-8μm. Appressoria alternate to unilateral, antrorse to subantrorse, brown, 2-celled, straight to curved, 16-26μm long; stalk cells cylindrical to cuneate, straight, 5-7μm long; head cells globose, ovate to clavate, straight to curved, entire, rounded at apex, 12-20 x 10-14μm. Phialides mixed with appressoria, pale brown, opposite to alternate, unicellular, ampulliform, 14-22 x 5-8μm. Mycelial setae mostly grouped around perithecia, simple, straight, stiff, septate, dark brown to black, acute at the tip, up to 166μm long. Perithecia scattered, black, seated in the mycelial colony, round with verrucose wall, up to 140μm diam. Ascospores ellipsoidal, straight to
Fig. 19: *Meliola platyphyllae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Peritheciun associated with mycelium and setae
D. Ascospores
curved, 3 septate, brown, constricted at the septa, rounded at the ends, smooth walled, 40-48 x 12-16μm.

**Specimen studied:** On the living leaves of *Boehmeria platyphylla* D. Don., (Family-Urticaceae), near Agriculture University, Dimapur, Nagaland, India, T.K.Jana, 20.06.2001, ITCC 4434.01 (Isotype), PCC 5143 (Holotype).

**Etymology:** From the name of the host species.

According to Beeli formula 2111.4221, the present species *Meliola platyphyllae* is close to *M. earlii* Stev. but differs from it in having epiphyllous colonies, longer appressoria, smaller mycelial setae, longer ascospores. It differs from *M. thomasiana* Sacc. in having smaller obtuse mycelial setae, 3 septate and longer ascospores. It also differs from *M. achudemiae* Hansf. in having epiphyllous colonies, longer appressoria, smaller acute mycellial setae, 3 septate and longer ascospores.

A review of literature (Hansford, 1961; Hosagoudar, 1996; Hosagoudar *et al.*, 2003; Patil & Thite, 1997; Patil and Mahamulkar, 1999; Bilgrami *et al.*, 1991, Mibey and Hawksworth, 1997) shows that no species of *Meliola* has yet been described on host *Boehmeria platyphyla* D. Don. As such a new species of *Meliola* is suggested (Table-18). This fungus is associated with *Irenopsis* sp.
Table 18. Comparative account of *Meliola platyphyllae* sp. nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Mycelial setae</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. earlii</em></td>
<td>Amphigenous</td>
<td>11-17μm long; head cells globose to bent clavate, entire or rarely slightly angulose, 9-12 x 8-13μm</td>
<td>Acute, up to 220μm long</td>
<td>4 septate, 28 – 33 x 11 – 12μm</td>
</tr>
<tr>
<td><em>M. thomasiana</em></td>
<td>Epiphyllous</td>
<td>19 – 28μm long; head cells subglobose to clavate, rarely entire, usually round angulose, 2 – 4 lobate</td>
<td>Acute, up to 340μm long</td>
<td>4 septate, 33 – 37 x 14 – 15μm</td>
</tr>
<tr>
<td><em>M. achudemiae</em></td>
<td>Amphigenous</td>
<td>14 – 22μm long; head cells ovate, entire, 11 – 18 x 8 – 10μm</td>
<td>Obtuse, up to 270μm long</td>
<td>4 septate, 28 – 34 x 11 – 13μm</td>
</tr>
</tbody>
</table>

Mycelium superficial, brown, septate, branched, hyphopodiate. Perithecia borne on the mycelia, globose, non-ostiolate, with true perithecial setae, without perithecial appendages, lacks mycelial setae; asci 2-4 spored, evanescent; ascospores brown, 3-4 septate. (Hosagoudar, 1996)

**Type species:** *I.tortuosa* (Wint.) Stev.
Suggested key to the included species of *Irenopsis* of Nagaland

3401-4320- Colonies hypophyllous, thin; hyphae substraight, flexuous to slightly crooked; appressoria alternate, about 10% opposite; head cells globose, ovate, entire to sublobate; phialides separate; perithecial setae straight below, hamate to irregularly bent above, obtuse at the apex; ascospores cylindric to subcylindric, 3-4 septate.

............ *Irenopsis hypophyllae*

3401-4220- Colonies epiphyllous, dense; hyphae substraight to slightly crooked; head cells globose, ovate, entire, irregularly sublobate to lobate; perithecial setae straight to curved, obtuse or 2-3 dentate at the apex; ascospores cylindrical to ellipsoidal, 3-4 septate.

............ *I. sterculiae*

3401-4220- Colonies epiphyllous, thin; hyphae substraight to undulate; appressoria alternate, antrorse to reflexed; head cells ovate, globose, entire; phialides separate; perithecial setae straight, obtuse at the tip; ascospores cylindrical.

............ *I. boehmeriae*

3401-3220- Colonies amphigenous, thin to subdense; hyphae straight to substraight; appressoria alternate, antrorse to spreading; head cells globose, ovate, entire to slightly angular; phialides mixed with appressoria; perithecial setae straight to curved, obtuse at the apex; ascospores cylindrical to subellipsoid.

............ *I. glabratae.*

3401-3220- Colonies epiphyllous, thin to subdense; hyphae straight to substraight; appressoria alternate, antrorse to spreading; head cells subglobose, ovate, entire; phialides separate; perithecial setae straight, obtuse at the tip;
ascospores cylindric to subcylindric, rounded to slightly conic at ends, 3-4 septate.

............. \textit{I. dysoxyli}

\textit{Irenopsis hypophyllae} T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 20

Coloniae hypophyllae, nigrae, dispersae, orbiculares, tenuis, ad 5mm diam. Hyphae subrectae, flexuosae vel leniter anfractuae, atrobrunneae, plerumque alternatae, raro oppositae acuteque ramosae, laxe reticulatae, cellulae plerumque 30-60 x 5-8\mu m. Appressoria alternata, ad 10% opposita, recta vel curvula, antrorsa vel patentia, atrobrunnea, 13-28\mu m longa; cellula basali cylindracea vel cuneata, 6-13\mu m longa; cellula apicali globosa, ovata, integra vel sublobata, 10-15 x 10-17\mu m. Phialides producentes in ramus separatus myceliales, opposita vel unilateralia, unicellularia, brunnea, ampullacea, 18-27 x 6-10\mu m. Perithecia dispersa, atrobrunnea vel nigra, globosa, verrucosa, ad 150\mu m diam; setae peritheciales 6-10, erectae, simplices, septatae, brunnea, rectae infra, hamatae vel irregulariter curvulae supra, obtusae ad apicem, ad 145\mu m longae. Asci elliptici, sessiles, 2-4 spori. Ascosporae cylindraceae, rectae, 3-4 septatae, utrinque rotundatae, parietibus laevibus, septis constrictae, atrobrunneae, 35-50 x 10-21\mu m.

Colonies hypophyllous, black, scattered, orbicular, superficial, thin, up to 5mm in diameter. Hyphae substraight, flexuous to slightly crooked, dark brown, branching mostly alternate, rarely opposite at acute angles, loosely reticulate, cells mostly 30-60 x 5-8\mu m. Appressoria alternate, about 10% opposite, straight to curved, antororse to spreading, dark brown, 13-28\mu m long; stalk cells cylindric to cuneate, 6-13\mu m long; head cells globose, ovate, entire to sublobate with a small circular, hyaline spot at the centre, 10-15 x 10-17\mu m.
Fig. 20: *Irenopsis hypophyllae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and perithecial setae
D. Perithecial setae
E. Ascus bearing ascospores
F. Ascospores
Phialides borne on a separate mycelial branch, opposite to unilateral, unicellular, brown, ampulliform, 18-27 x 6-10μm. Perithecia scattered, dark brown to black, globose, verrucose, up to 150μm in diam.; perithecial setae 6-10, erect, simple, septate, brown, straight below, hamate to irregularly bent above, obtuse at the apex, up to 145μm long. Ascii many, elliptical, sessile, 2-4 spored. Ascospores cylindric to subcylindric, broad, straight, 3-4 septate, rounded at the ends, smooth walled, constricted at the septa, dark brown, 35-50 x 10-20μm.

**Specimen studied:** On the leaves of *Mallotus roxburghianus* Muell. (Family-Euphorbiaceae), Diphu Road, Dimapur, Nagaland, India, T.K.Jana, 20.03.2000, ITCC 4642.01 (Holotype), PCC 5155 (Isotype).

**Etymology:** From the nature of mycelial colonies on leaves.

Based on Beeli formula 3401.4320, the present species *Irenopsis hypophyllae* is comparable with *I. paulensis* Hansf. described on *Croton* sp. from India (Hosagaudar, 1996). However, the new species differs from it in having hypophyllous colonies, 10% opposite appressoria, phialides borne on a separate mycelial branch, larger perithecia and longer perithecial setae with hamate to irregularly bent above and longer cylindric to subcylindric ascospores.

A review of literature (Hosagoudar, 1996; Hansford, 1961; Bilgrami *et al.*, 1991; Sarbhoy *et al.*, 1996; Crane and Jones, 2001; Sanchez and Carrion, 1992) shows that no species of *Irenopsis* has yet been reported on host *Mallotus roxburghianus* Muell. Therefore, it is suggested as a new species (Table-19).
Table 19. Comparative account of *Irenopsis paulensis* Hansf. and *I. hypophyllae* sp. nov.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Perithecia</th>
<th>Perithecial setae</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>I. paulensis</em></td>
<td>Epiphyllous</td>
<td>Alternate, straight, antrorse to subantrorse, 12-18.5 μm long; head cells globose entire, 9-12.5 x 12-15.5 μm</td>
<td>Mixed with appressoria</td>
<td>Up to 110 μm in diam.</td>
<td>4-6, straight, obtuse at the apex, up to 80 μm long</td>
<td>Obovoidal, 4 septate, 27-43.5 x 12-22 μm</td>
</tr>
<tr>
<td><em>I. hypophyllae</em></td>
<td>Hypophyllous</td>
<td>Alternate, about 10% opposite, straight to curved, subantrorse to spreading, 13-28 μm long; head cells globose, ovate, entire to sublobate, 10-15 x 10-17 μm</td>
<td>Borne on a separate mycelial branch</td>
<td>Up to 150 μm in diam.</td>
<td>5-10, erect, simple, septate, straight below, hamate to irregularly bent above, obtuse, up to 145 μm long</td>
<td>Cylindric, to subcylindric, straight, 3-4 septate, 35-52 x 10-21 μm</td>
</tr>
</tbody>
</table>
**Irenopsis sterculiae** T.K. Jana, S.N. Ghosh et. A.K. Das sp. nov.

Fig. 21

Colonies epiphyllae, nigrae, orbiculares, dispersae, densae, ad 6mm diameter et. confluentes. Hyphae subrectae vel leniter anfractuae, atrobrunneae, septatae, oppositae laxe ramosae, laxe reticulatae, cellularae plerumque 25-40 x 7-10μm. Appressoria alternata, recta vel curvula, bicellula, antrorsa vel patentia, atrobrunnea, 25-49μm longa; cellularae basilares cylindraceae vel cuneatae, 5-18μm longae; cellularae apicales ovatae, globosae, integrae, irregulariter sublobatae vel lobatae, 13-26 x 17-24μm. Phialides nulla. Perithecia dispersa, nigra, globosa, verrucosa, ad 150μm diam.; setae peritheciales 3-10, rectae vel curvulae; simplices, brunneae, septatae, obtusae vel 2-3 dentatae ad apicem, ad 120μm longae. Asci ovales, sessiles, 2-4 spori. Ascospores cylindraceae vel ellipsoideae, brunneae, rectae, 3-4 septatae, septis constrictae, utrinque rotundatae, 28-48 x 12-20μm.

Colonies epiphyllous, black, orbicular, spreading, superficial, dense, up to 6mm in diameter and confluent. Hyphae substraight to slightly crooked, dark brown, septate, branching opposite at wide angles, loosely reticulate, cells mostly 25-40 x 7-10μm. Appressoria alternate, straight or bent, 2-celled, antorose to spreading, dark brown, 25-49μm long; stalk cells cylindrical to cuneate, 5-18 μm long; head cells ovate, globose, entire, irregularly sublobate to lobate, 13-26 x 17- 24μm. Phialides not seen. Perithecia scattered, black, round, verrucose, up to 150μm in diam.; perithecial setae 3-10, straight to curved, simple, brown, septate, obtuse or 2-3 dentate at the apex, up to 120μm long. Asci oval, sessile, 2-4 spored. Ascospores cylindrical to ellipsoidal, brown, straight, 3-4 septate, constricted at the septa, rounded at ends, 28-48 x 12-20μm.
Fig. 21: *Irenopsis sterculiae*

A. Hyphae with appressoria

B. Perithecium associated with mycelium and perithecial setae

C. Perithecial setae

D. Ascus bearing ascospores

E. Ascospores
Specimen studied: On the living leaves of *Sterculia roxburghii* Wall. (Family- Sterculiaceae), Sakraba Village, Phek, Nagaland, India, T.K. Jana, 25.03.2005, PCC 5187 (Holotype).

Etymology: From the name of the host genus.

Based on the Beeli formula 3401.4220, the present species *Irenopsis sterculiae* is comparable with *I. nesogordoniae* Deighton, described on *Nesogordonia* sp. from Sierra Leone (Hansford, 1961). However the new species differs from it in having epiphyllous colonies, longer appressoria with ovate and globose head cells, larger perithecia with longer obtuse to dentate perithecial setae, larger cylindrical to ellipsoidal and 3 septate ascospores.

A review of literature (Hansford, 1961; Hosagoudar, 1996 and Hosagoudar et al., 1998, 2000; Kar and Maity, 1970; Song-Bin et al., 2001; Crane & Jones, 2001; Brayford, 1999; Sanchez & Carrion, 1992; Mibey & Hawksworth, 1997) shows that no species of *Irenopsis* has yet been reported on host *Sterculia roxburghii* Wall. Hence it is suggested as a new species (Table- 20).
Table 20. Comparative account of *Irenopsis nesogordoniae* and *I. sterculiae* sp. nov.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Perithecia</th>
<th>Perithecial setae</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>I. nesogordoniae</em></td>
<td>Amphigenous</td>
<td>Alternate or very rarely opposite, antrorse, 15-23µm long; head cells ovate to clavate, entire or sinuous to sublobate, 12-19 x 9-12µm</td>
<td>In central group, rugose, up to 120µm diam.</td>
<td>2-18, slightly flexuous above and granulose, continuous, up to 42 µm long</td>
<td>Oblong, 4 septate, 37-42 x 17-19 x 13µm</td>
</tr>
<tr>
<td><em>I. sterculiae</em></td>
<td>Epiphyllous</td>
<td>Alternate, antrorse to spreading, dark brown, 25-45µm long; head cells ovate, globose, entire, irregularly sublobate to lobate, 13-26 x 17-24µm</td>
<td>Scattered, verrucose, up to 150µm diam.</td>
<td>3-10, straight to curved, 2-3 septate, obtuse or 2-3 dentate at the apex, up to 120µm long</td>
<td>Cylindrical to ellipsoidal, 3-4 septate, 28-48 x 12-19µm</td>
</tr>
</tbody>
</table>
Irenopsis boehmeriae T.K.Jana, S.N.Ghosh et A.K.Das sp.nov.

Fig. 22

Coloniae epiphyllae, nigrae, dispersae, orbiculares, tenuis, ad 6mm diam. et confluentes. Hyphae subrectae vel undulatae, brunnea, oppositae vel irregulariter laxe ramosae, laxe reticulatae, cellulae plerumque 25-45 x 6-10μm. Appressoria alternata, antrorsa, subantrorsa vel reflexa, brunnea, bicellularia, recta vel leniter curvula, 18-22μm longa; cellula basali cylindracea vel cuneata, recta, 4-8 μm longa; cellula apicali ovata, globosa, integra, 12-18 x 10-17μm. Phialides producentes in ramus separatam myceliales, opposita vel alternata, conoidea vel ampullacea, unicellularia, brunnea, 16-25 x 7-10μm. Perithecia dispersa, verrucosa, nigra, globosa, ad 125μm diam.; setae peritheciales 8-12, rectae, simplices, septatae, obtusae ad apicem, ad 130μm longae. Asci ovales vel elliptici, sessiles, 4 spori. Ascospores cylindracea vel rectae, 4 septatae, brunnea, septis constrictae, 36-41 x 14-18μm.

Colonies epiphyllous, black, scattered, orbicular, thin, up to 6mm in diameter and confluent. Hyphae substraight to undulate, brown, branching opposite to irregular at wide angles, loosely reticulate, cells mostly 25-45 x 6-10μm. Appressoria alternate, antrorse, subantrorse to reflexed, brown, 2-celled, straight to slightly curved, 18-22μm long; stalk cells cylindrical to cuneate, 4-8μm long; head cells ovate, globose, entire, 12-18 x 10-17μm. Phialides borne on a separate mycelial branch, opposite to alternate, conoid to ampulliform, unicellular, brown, 16-25 x 7-10μm. Perithecia scattered, globose, verrucose, black, globose, up to 125μm in diameter; perithecial setae 8-12, straight, simple, septate, obtuse at the tip, brown, up to 130μm long. Ascospores broad, cylindrical, straight, 4 septate, brown, constricted at the septa, 36-41 x 14-18μm.
Fig. 22: *Irenopsis boehmeriae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and perithecial setae
D. Perithecial setae
E. Ascus bearing ascospores
F. Ascospores
Specimen Studied: On the leaves of *Boehmeria platyphylla* D.Don (Family-Urticaceae), near Agriculture University, Medziphema, Dimapur, Nagaland, India, T.K.Jana, 20.08.2000, ITCC 4434.01 (Holotype), PCC 5143 (Isotype).

**Etymology:** From the name of the host.

Based on the Beeli formula 3401.4220, the present species *Irenopsis boehmeriae* is close to *I.oreocnidae* Hansf. described on *Oreocnida* sp. from Philippines (Hansford, 1961) but differs from it in having smaller appressoria with entire head cells, smaller perithecia, longer septate perithecial setae and smaller cylindrical ascospores.

A review of literature (Kar and Maity, 1970; Hosagoudar, 1996, 1998 and Hosagoudar et al., 2003; Hansford, 1961; Patil and Mahamulkar, 1999; Bilgrami et al., 1991; Sarbhoy et al., 1996; Crane and Jones, 2001) shows that no species of *Irenopsis* has yet been reported on host *Boehmeria platyphylla* D.Don. Hence new species of *Irenopsis* is suggested. This species was mixed with *Meliola* sp. (Table-21).
Table 21. Comparative account of *Irenopsis oreocnidae* Hansf. and *I. boehmeriae* sp. nov.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Appressoria</th>
<th>Perithecia</th>
<th>Perithecial setae</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>I. oreocnidae</em></td>
<td>Alternate, subantrorse, 22-23μm long; head cells ovate to clavate, entire or angulose, 15-21 x 11-15μm</td>
<td>Slightly verrucose, up to 160μm diam.</td>
<td>4-12, straight or slightly bent, continuous, obtuse, up to 110μm long</td>
<td>Oblong, 39-45 x 15-17μm</td>
</tr>
<tr>
<td><em>I. boehmeriae</em></td>
<td>Alternate, antrorse, subantrorse to reflexed, 18-22μm long; head cells ovate, globose, entire, 12-18 x 10-17μm</td>
<td>Verrucose, up to 125μm in diam.</td>
<td>8-12, straight, simple, septate, obtuse at the tip, up to 130μm long</td>
<td>Broad, cylindrical, 36-41 x 14-18μm</td>
</tr>
</tbody>
</table>
Irenopsis glabratae  T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 23

Colonies amphigenous, thin to subdense, black, scattered, orbicular, up to 4mm in diameter, confluent. Hyphae rectae vel subrectae, brunnea, septatae, plerumque alternatae, acuteque ramosae, laxe reticulatae, cellulæ plerumque 16-32 x 7-10µm. Appressoria alternata, recta vel curvula, antrorsa vel patentia, bicellula, brunnea, 16-20µm longa; cellulæ apicali globosa, ovata, integra vel leniter angularia, 10-15 x 10-12µm. Phialides appressoriis internmixtæ, oppositæ vel alternatae, ampulliformes, pallide brunnea, unicellulæ, 14-20 x 6-10µm. Perithecia dispersa, globosa, nigra, verrucosa, ad 150µm diam. Setae pertheciales 10-15, rectæ vel curvulæ, atrobrunneaæ, simplices, septatae, multi, ovales vel elliptici, sessiles, 2-spore. Ascosporae cylindraceæ vel subellipsoidæ, utrinque rotundatae, 4 septatae, rectæ, septis constrictæ, parietibus laevibus, atrobrunneaæ, 30-38 x 10-18µm.

Colonies amphigenous, thin to subdense, black, scattered, orbicular, up to 4mm in diameter, confluent. Hyphae straight to substraight, brown, septate, branching mostly alternate at acute to wide angles, loosely reticulate, cells mostly 16-32 x 7-10µm. Appressoria alternate, straight to curved, antrorse to spreading, 2 celled, brown, 16-20µm long; stalk cells cylindrical to cuneate, 3-7µm long; head cells globose, ovate, entire to slightly angular, 10-15 x 10-12µm. Phialides mixed with appressoria, opposite to alternate ampulliform, pale-brown, unicellular, 14-20 x 6-10µm. Perithecia scattered, round, black, verrucose, up to 150µm in diam. Perithecal setae 10-15, straight, curved, dark-brown, simple, septate, obtuse at the tip, 40-88 x 6-10µm. Asci many, oval to elliptical, sessile, 2-spored. Ascospores cylindrical to subellipsoid, rounded at ends, 4 septate, straight, constricted at the septa, thick walled, dark-brown, 30-38 x 10-18µm.
Fig. 23: *Irenopsis glabratae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascus bearing ascospores
E. Ascospores
Specimen studied: On the leaves of *Lonicera glabrata* Wall. (Family -Caprifoliaceae), Sakraba Village, Phek, Nagaland, India, T.K.Jana, 20.04.2000, ITCC 4650.01 (Holotype), PCC 5140 (Isotype).

**Etymology:** From the name of the host species.

Based on the Beeli formula 3401.3220, the present species *Irenopsis glabratae* is close to *I. eriolaenae* Hosag. and *I. leeae* Hansf. var.indica Hosag. (Hosagoudar, 1996) but differs in having amphigenous colonies, cylindrical ascospores. It differs from *I. helicteridis* Hosag. in having smaller appressoria, perithecia, peritrichal setae and ascorpores. It differs from *I. eriolaenae* Hosag. in having longer appressoria, perithecial setae and larger perithecia. It also differs from *I. leeae* Hansf. var. *indica* Hosag. in having smaller appressoria, perithecia, peritrichal setae and larger ascospores.

Review of literature (Hansford, 1961; Hosagoudar, 1996; Crane and Jones, 2001; Hosagoudar & Abraham, 1998; Brayford, 1999; Sarbhoy et al., 1986) shows that no species of *Irenopsis* has yet been reported on host *Lonicera glabrata* Wall. Hence a new species of *Irenopsis* is suggested (Table-22). This fungus is mixed with *Meliola* sp.
Table 22. Comparative account of *Irenopsis glabratae* sp. nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Perithecia</th>
<th>Prithecial setae</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>I. helicteridis</em></td>
<td>Epiphyllous</td>
<td>18-29μm long</td>
<td>Up to 175μm in diam.</td>
<td>4-10, straight to curved, obtuse at the tip, up to 120μm long</td>
<td>Obovoidal, 31-40.5 x 12-15.5μm</td>
</tr>
<tr>
<td><em>I. eriolaenae</em></td>
<td>Epiphyllous</td>
<td>14-16μm long</td>
<td>Up to 110μm in diam.</td>
<td>8-12, straight, acute to obtuse at the tip, up to 72μm long</td>
<td>Obovoidal, 32-38 x 10-14μm</td>
</tr>
<tr>
<td><em>I. leae var. indica</em></td>
<td>Epiphyllous</td>
<td>18-24μm long</td>
<td>Up to 150μm in diam.</td>
<td>3-8, straight to flexuous, tip obtuse, up to 150μm long</td>
<td>Obovoidal, 30-36 x 12-16μm</td>
</tr>
<tr>
<td><em>I. glabratae</em></td>
<td>Amphigenous</td>
<td>16-20μm long</td>
<td>Up to 140μm in diam.</td>
<td>10-16, straight to curved, obtuse at the tip, up to 88μm long</td>
<td>Cylindrical to sub-ellipsoid, 30-38 x 10-18μm</td>
</tr>
</tbody>
</table>
Irenopsis dysoxyli T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Coloniae epiphyllae, atrobrunneae vel nigrae, globosae, tenuis vel subdensae, ad 6 mm diam. et confluentes. Hyphae rectae vel subrectae, atrobrunneae, septatae, plerumque oppositae, laxe ramosae, laxe vel dense reticulatae, cellulae plerumque 20-32 x 6-10μm. Appressoria alternata vel curvula, antrorsa vel patentia, atrobrunnea, bicipitaria, 20-28 μm longa; cellula basali cylindracea vel cuneata, 8-13μm longa; cellula apicali subglobosa, ovata, integra, 14-18 x 10-17μm. Phialides producentes in ramus separatam myceliales, alternata vel opposita, ampullacea vel conoidea, unicellularia, brunnea, 15-20 x 6-9μm. Perithecia dispersa, globosa, verrucosa, nigra, ad 190μm diam.; setae peritheciales 7-10, erectae, rectae, simplices, septatae, atrobrunneae, obtusae ad apicem, ad 130μm longae; ascosporae cylindraceae vel subcylindracea, utrinque rotundatae vel leniter conicus, 3-4 septatae, septis constrictae, atrobrunneae, 20-32 x 12-16μm.

Colonies epiphyllous, dark brown to black, globose, thin to subdense, up to 6mm in diameter and confluent. Hyphae straight to substraight, dark brown, septate, branching mostly opposite at wide angles, loosely to closely reticulate, cells mostly 20-32 x 6-10μm. Appressoria alternate, straight to curved, antrorse to spreading, dark brown, 2-celled, 20-28μm long; stalk cells cylindrical to cuneate, 8-13μm long; head cells subglobose, ovate, entire, 14-18 x 10-17μm. Phialides borne on a separate mycelial branch, alternate to opposite, ampulliform or conoid, unicellular, brown, 15-20 x 6-9μm. Perithecia scattered, globose, verrucose, black, up to 190μm in diam.; perithecial setae 7-10, erect, straight, simple, septate, dark brown, obtuse at the tip, up to 130μm long. Ascospores cylindric to subcylindric rounded to slightly conical at ends, 3-4 septate, constricted at the septa, dark brown, 20-32 x 12-16μm.
Fig. 24: *Irenopsis dysoxyli*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Perithecial setae
E. Ascus bearing ascospores
F. Ascospores
Specimen studied: On the leaves of Dysoxylum, *arborescens* Miq. (Family-Meliaceae), Intanki Forest, Peren, Nagaland, India, T.K.Jana, 29.03.2003, PCC 5189 (Holotype).

Etymology: From the name of the host genus.

Based on the Beeli formula 3401.3220, *Irenopsis dysoxyli* is closed to *I.chukrasiae* Hosag. (Hosagoudar, 1996) but differs from it in having epiphyllous colonies, smaller appressoria with entire head cells, smaller phialides, 3-4 septate and smaller ascospores. It also differs from *L.indica* (Anahosur) Hosag. (Hosagoudar, 1996) in having epiphyllous colonies, longer appressoria, phialides borne on a separate mycelial branch, smaller perithecia and ascospores.

Review of literature (Hosagoudar, 1996; Hansford, 1961; Brayford, 1999; Bilgrami et al., 1991; Patil and Thite, 1997) shows that no species of *Irenopsis* has yet been reported on host *Dysoxylum* sp. Hence new species of *Irenopsis* is suggested. (Table-23)
Table 23. Comparative account of *Irenopsis dysoxyli* sp.nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>I. chukrasiae</em></td>
<td>Hypophyllous</td>
<td>18-46.5μm long; stalk cells cylindrical to cuneate, straight to flexuous, 1-3 celled, 6-34 μm long; head cells ovate, globose, angular to sublobate to deeply lobate, 9-15.5 x 12-18.5μm</td>
<td>Borne on a separate mycelial branch</td>
<td>Scattered, verrucose, up to 210μm in diam</td>
<td>Oblong, obovate, 4 septate, 40-46.5 x 15-18.5μm</td>
</tr>
<tr>
<td><em>I. indica</em></td>
<td>Hypophyllous</td>
<td>15-18.5μm long; stalk cells cuneate to cylindrical, 3-6.5 μm long; head cells ovate, entire to angular, 9.5-12.5 x 12.5-15.5μm</td>
<td>Mixed with appressoria</td>
<td>Mostly grouped, up to 233μm in diam.</td>
<td>Obovoidal, 4 septate, 40-43.5 x 18.5-22μm</td>
</tr>
<tr>
<td><em>I. dysoxyli</em></td>
<td>Epiphyllous</td>
<td>20-28μm long; stalk cells cuneate to cylindrical, 8-13μm long; head cells subglobose, ovate, entire, 14-18 x 10-17μm</td>
<td>Borne on a separate mycelial branch</td>
<td>Scattered, verrucose, globose, up to 190μm in diam</td>
<td>Cylindric to subcylindric, 3-4 septate, rounded to slightly conic at ends, 20-32 x 12-16μm</td>
</tr>
</tbody>
</table>
1919.


Mycelium superficial, brown septate, branched, hyphopodiately. Perithecia globose,
non-ostiolate, true perithecial larviform and striated appendages present. Mycelial setae and
perithecial setae absent. Asci 2-4 spores, evanescent. Ascospores brown, 3-4 septate.

Type species: A. calostroma (Desm.) Hoehnel based on Sphaeria calostroma Desm.
Appendiculella wendlandiae  T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 25

Colonies amphigenous, black, scattered, orbicular, superficial, thin, up to 3mm in diameter, rarely confluent. Hyphae substraight to undulate, branching alternate to opposite at acute to wide angles, dark brown, loosely to closely reticulate, cells mostly 20-35 x 5-8μm. Appressoria alternate, straight to slightly curved, brown, antrorse to subantrorse, 16-26μm long; stalk cells cylindrical to cuneate, 4-8μm long; head cells globose, ovate to clavate, entire, angular to sublobate, 12-18 x 10-16μm. Phialides few, borne on a separate mycelial branch, opposite, alternate to unilateral, brown, ampulliform, unicellular, 13-20 x 6-10μm. Perithecia loosely scattered, dark brown to black, flattened initially and round at maturity, up to 150μm in diam.; perithecial appendages many, cylindrical, brown, obtuse to hamate at the tip, up to 100μm long. Asci few, oval to elliptical, sessile, 2 spored. Ascospores cylindric to
Fig. 25: *Appendiculella wendlandiae.*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and appendages
D. Ascus bearing ascospores
E. Ascospores
subcylindric, straight, brown, 4 septate, thickwalled, rounded at ends, constricted at the septa, 30-39 x 10-15 μm.

**Specimen studied:** On the leaves of *Wendlandia scabra* Kurz. (Family-Rubiaceae), Patkai, Dimapur, Nagaland, India, 15.11.2000, T.K.Jana, ITCC 4433'01 (Holotype), PCC 5141 (Isotype).

According to Beeli formula 3201.3220, *Appendiculella wendlandiae* is close to *A. vernoniae* (Stev.) Hansf., but differs from it in having large amphigenous colonies, longer appressoria, phialides borne on a separate mycelial branch, longer perithecial appendages with hamate at the apex, larger ascospores. It also differs from *A. tonkinensis* (K&R.) Toro. var. *cecropiae* (Stev.) Hansf. in having small colonies, longer appressoria, phialides borne on a separate mycelial branch, longer perithecial appendages, larger ascospores.

Review of literature (Hansford, 1961; Hosagoudar, 1996; Bilgrami *et al.*, 1991; Sarbhoy *et al.*, 1996; Patil and Mahamulkar, 1999) shows that no species of *Appendiculella* has yet been described on host *Wendlandia scabra* Kurtz. Therefore, it is proposed as a new species (Table -24).
Table 24. Comparative account of *Appendiculella wendlandiae* sp. nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Perithecial appendages</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. vernoniae</em></td>
<td>Epiphyllous, thin, up to 1mm diam.</td>
<td>12-18μm long; head cells globose, entire, 10-12μm diam.</td>
<td>Mixed with appressoria</td>
<td>0-4, erect-spreading, straight or uncinate, pale clear brownish, obtuse and slightly swollen at apex, up to 60μm long</td>
<td>Cylindric to subellipsoid, 4 septate, slightly constricted, 31-36 x 13-15 x 10-12μm</td>
</tr>
<tr>
<td><em>A. tonkinensis var. cecropiae</em></td>
<td>Epiphyllous, thin, up to 10mm diam.</td>
<td>13-20μm. long; head cells globose, entire, 10-14 x 10-13μm</td>
<td>Mixed with appressoria</td>
<td>None to numerous, clear pale brown, obtuse, bent at the dark tip, up to 40μm long</td>
<td>Cylindric to subellipsoid, 4 septate, constricted, 32-36 x 14-15μm</td>
</tr>
<tr>
<td><em>A. wendlandiae</em></td>
<td>Amphigenous thin, orbicular, superficial, up to 3mm diam.</td>
<td>16-26μm. long; head cells globose, ovate, entire, angular to sublobate, 12-18 x 10-16μm</td>
<td>Borne on a separate mycelial branch</td>
<td>Many, cylindrical, brown, obtuse to hamate at the apex, up to 100μm long</td>
<td>Cylindric to subcylindric, straight, 4 septate, constricted at the septa, 30-39 x 10-15μm</td>
</tr>
</tbody>
</table>


Mycelium superficial, brown, septate, branched, hyphopodiate, devoid of mycelial setae and appendage. Perithecia borne on the mycelia, globose, non ostiolate, without mycelial and perithecial setae, lacks perithecial appendages, perithecial surace cells protruberent, conoid; asci 2-4 spored, evanescent; ascospores brown, 3-4 septate. (Hosagoudar, 1996)

Type species: Asteridiella solani Mc Alpine.

The genus Asteridiella was founded by Mc Alpine in 1897. Asteridiella is in fact a true Irene in the original sense of Theission & sydow (1917b). As Asteridiella was founded in 1987, it long antedates Irene. Stevens (1927) erected the genus Irenina for species devoided of mycelial setae and having neither larviform appendages nor setae on the perithecia. The genus Irenina is nothing but Irene of Theiss. & Sydow (1917b).
Suggested key to the included species of *Asteridiella* of Nagaland

3101-4220- Colonies epiphyllous, subdense, velvety; hyphae straight to slightly crooked; head cells ovate, clavate to cylindrical, entire to angular; phialides mixed with appressoria; ascospores cylindrical to subellipsoidal.

........... *Asteridiella mangiferae*

3101-3230- Colonies epiphyllous, thin to subdense; hyphae flexuous, crooked; appressoria straight to variously curved; head cells ovate, globose to cylindrical, angular to slightly lobate, rounded to truncate; phialides separate; ascospores cylindrical to slightly ellipsoidal.

........... *A. colebrookiae*

3101-3230- Colonies epiphyllous, subdense, slightly velvety; hyphae straight to undulate; head cells globose to ovate, entire; phialides separate; perithecial cells conoid, acute to obtuse at the apex; ascospores oblong.

........... *A. micheliae*

3101-3220- Colonies epiphyllous, thin; hyphae straight to undulate; head cells globose, ovate to clavate, entire, angular to truncate; phialides mixed with appressoria; perithecial setae conoid, acute at the apex; ascospores cylindrical to ellipsoidal.

........... *A. engeniae - fruticosae*

3101-3220- Colonies epiphyllous, thin; hyphae substraight to flexuous; appressoria closely to distantly placed; head cells globose to subglobose, entire; phialides mixed with appressoria; perithecial cells conoid, acute to obtuse at the apex; ascospores cylindrical.

............ *A. wrightiae*
Colonies epiphyllous, thin to subdense; hyphae straight to substraight; 
appressoria antrorse to subantrorse; head cells globose to cylindrical, entire 
to slightly angular; phialides separate; ascospores cylindrical to 
subellipsoid.

............... *A. combreti* var. *leonensis*

*Asteridiella mangiferae* T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 26

Coloniae epiphyllae, subdensae, velutinae, nigrae, dispersae, globosae, ad 6mm diam. 
Hyphae subrectae vel leniter anfractuae, atrobrunneae, oppositae vel irregulariter acutae 
vel laxe ramosae, dense reticulatae, cellulae plerumque 20-30 x 7-10μm. Appressoria 
alternata vel unilateralia, bicellularia, atrobrunnea, antrorsa vel subantrorsa, recta vel leniter 
curvula, 15-25μm longa; cellula basali cylindracea, cuneata, 4-8μm longa; cellula apicali 
ovata, clavata vel cylindracea, integra vel angularia, 10-16 X 8-12μm. Phialides appressoriis 
intermixta, opposita vel alternata, unicellularia, brunnea, ampullacea, 15-25 x 6-10μm. 
Perithecia pleuri, dispersa, nigra, globosa, ad 125μm diam.; cellulae peritheeiales conoideae, 
rectae, ad 10μm longae. Ascosporae cylindraceae vel subellipsoideae, rectae vel curvulae, 4 
septatae, atrobrunnea, septis constrictae, utrinque rotundatae, medio cellula leniter major, 
42-45 x 14-20μm.

Colonies epiphyllous, subdense, velvety, black, scattered, round, superficial, upto 
6mm in diameter. Hyphae substraight to slightly crooked, dark brown, devoid of setae 
branching opposite to irregular at acute to wide angles, closely reticulate, cells mostly 20-30 
x 7-10μm. Appressoria alternate to unilateral, 2 celled, dark brown, antrorsa to subantrorsa, 
straight or slightly bent, 15-25μm long; stalk cells cylindric to cuneate, 4-8 μm long; head
Fig. 26: *Asteridiella mangiferae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium
D. Ascospores
cells ovate, clavate to cylindrical, entire to angular, 10-16 x 8-12μm. Phialides mixed with appressoria, opposite to alternate, unicellular, brown, ampulliform, 15-25 x 6-10μm. Perithecia many, scattered, black, round up to 125μm in diam.; perithecial cells conoid, straight, up to 10μm long. Intact asci bearing ascospores not found; ascospores cylindrical to subellipoidal, straight to curved, 4 septate, dark brown, constricted at the septa, rounded at ends, middle cell slightly larger than the adjacent cells, 42-45 x 14-20μm.

Specimen studied: On the living leaves of Mangifera sp. (Family-Anacardiaceae), Ao-kashiram, Dimapur, Nagaland, India, 05.11.2000, T.K.Jana, ITCC 4437.01 (Holotype), PCC 5146 (Isotype).

Etymology: From the name of the host genus.

A review of literature (Hosagoudar, 1996; Hansford, 1961; Bilgrami et al., 1991; Sarbhoy et al., 1996; Jiang, 1995; Patil and Mahamulkar, 1999) shows that there is no report of occurrence of Asteridiella on host genus Mangifera except that of Meliola mangiferae Earle. Therefore, it is suggested as a new species.

_Asteridiella colebrookiae_ T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 27

Coloniae epiphyllae, nigrae, dispersae, orbiculares, tenuis vel subdensae, ad 5 mm diam., confluentes. Hyphae flexuosae vel anfractuae, brunneae, alternatae vel irregulariter acutéque ramosae, laxe reticulatae, cellularae plerumque 15-24 x 6-9μm. Appressoria alternata, recta vel curvula, bicellularia, brunnea, antrorsa vel patentia, 20-40μm longa; cellula basali cylindracea vel cuneata, recta vel vario curvula, 5-25μm longa; cellula apicali ovata, globosa vel cylindracea, integra, angularia vel leniter lobata, rotundata vel truncata ad apicem, 10-16 x 6-12μm. Phialides producentes in ramus separatam myceliales alternata vel unilateralia,
Fig. 27: *Asteridiella colebrookiae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium
D. Ascus bearing ascospores
E. Ascospores
raro opposita, unicellularia, conoidea vel ampullacea, brunnea, 10-18 x 5-9\mu m. Perithecia dispersa, nigra, globosa, verrucosa, ad 245\mu m diam.; cellulae peritheeiales conoideae, obtusae ad apicem, ad 8 \mu m longae. Asci ovales, sessiles, 2 spori. Ascosporae cylindraceae vel leniter ellipsoideae, 4 septatae, atrobrunneae, septis constrictae, utrinque rotundatae, rectae vel leniter curvulae, 27-37 x 10-15\mu m.

Colonies epiphyllous, black, scattered, orbicular, superficial, thin to subdense, up to 5mm in diameter or confluent. Hyphae flexuous, crooked, brown, branching alternate to irregular at acute angles, loosely reticulate, cells mostly 15-24 x 6-9\mu m. Appressoria alternate, straight to variously curved, 2-celled, brown, antrorse to spreading, 20-40\mu m long; stalk cells cylindrical to cuneate, 5-25\mu m long; head cells ovate, globose to cylindrical, entire, angular to slightly lobate, rounded to truncate at the apex, 10-16 x 6-12\mu m with a small circular hyaline spot at the centre. Phialides borne on a sparat mycelial branch, aternate to unilateral, rarely opposite, unicellular, ampulliform, brown, 10-18 x 5-9\mu m. Perithecia scattered, black, round, verrucose, up to 245\mu m in diam.; perithecial cells conoid, obtuse at apex, up to 8\mu m long. Asci oval, sessile, 2-spored. Ascospores cylindrical to slightly ellipsoidal, 4 septate, dark brown, constricted at the septa, rounded at ends, straight to slightly curved, 27-37 x 10-15\mu m.

**Specimen studied:** On the living leaves of *Colebrookia oppositifolia* Sm. (Family-Labiatae), Rottomi Village, Zunheboto, Nagaland, India, 12.10.2000, T.K.Jana, ITCC 4443.01 (Holotype), PCC 4152 (Isotype).

**Etymology:** From the name of the host.

According to Beeli formula 3101.3230, *Asteridiella colebrookiae* is close to *A. anastomosans* (Wint.) Hansf. (Hansford, 1961) but differs from it in having crooked hyphae,
longer appressoria with cylindrical head cells, larger perithecia with smaller surface cells, phialides borne on a separate mycelial branch, cylindrical to slightly ellipsoidal ascospores.

Review of literature (Hansford, 1961; Hosagoudar, 1996; Sarbhoy et al., 1996; Bilgrami et al., 1991; Mibey and Hawksworth, 1997) shows that no species of Asteridiella was reported on Colebrookia oppositifolia Sm. Therefore, it is proposed as a new species (Table- 25).
Table 25. Comparative accounts of *Asteridiella anastomosans* (Wint.) Hansf. and *A. colebrookiae* sp. nov.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Hyphae</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. anastomosans</em></td>
<td>Undulate to tortuous; cells mostly 10-20 x 7-8μm</td>
<td>Alternate, usually straight, 15-25μm long; stalk cells cylindric to cuneate, 3-10 μm long; head cells globose to wide ovate, entire, 12-16 x 10-13μm.</td>
<td>Mixed with appressoria</td>
<td>In central groups, upto 150 μm diam., surface cells rounded convex, up to 12μm long</td>
<td>Oblong, 4 septate, 28-35 x 12-14μm</td>
</tr>
<tr>
<td><em>A. colebrookiae</em></td>
<td>Crooked; cell mostly 15-24 x 9μm</td>
<td>Alternate, straingt to curved, 20-40μm long; stalk cells cylindric to cuneate, straight to variously curved, 5-25μm long; head cells ovate, globose, cylindric, entire, angular to slightly lobate, round to truncate at the apex, 6-12μm</td>
<td>Borne on a separate mycelial branch</td>
<td>Scattered, up to 245 μm in diam.; perthecial cells obtusely conoid, up to 8μm long</td>
<td>Cylindrical to slightly ellipsoidal, 4 septate, 27-37 x 10-15μm</td>
</tr>
</tbody>
</table>
Asteridiella micheliae T.K Jana, S.N.Ghosh et A.K.Das sp. nov.

Fig.-28

Coloniae epiphyllae, nigrae, dispersae, orbiculares, subdensae, leniter velutinae, ad 4mm diam. et confluentes. Hyphae rectae vel undulatae, brunneae, septatae, oppositae vel irregulariter acuteque vel laxe ramosae, laxe reticulatae, celularum plerumque 16-40 x 7-10μm.

Appressoria alternata vel unilateralia, antrorsa vel patentia, brunnea, bicellularia, recta vel curvula, 20-26μm longa; cellula basali cylindracea vel cuneata, 6-11μm longa; cellula apicali globosa vel ovata, integra, 11-18 x 13-17μm. Phialides producentes in ramus separatam myceliales, pallide brunnea, opposita vel alternata, ampullacea, unicellularia, 16-21 x 7-10μm. Perithecia dispersa, atrobrannea vel nigra, globosa, ad 202μm diam.; cellularae peritheciales conoideae, rectae vel curvulae, acuta vel obtusa ad apicem, ad 20μm longae.

Asci ovales, sessiles, 4 spori. Ascosporae oblongae, rectae, 4 septatae, utrinque rotundatae, septis constrictae, brunneae, 32-36 x 15-18μm.

Colonies epiphyllums, black scattered, orbicular, subdense, slightly velvety, up to 4 mm in diameter and confluent. Hyphae straight to undulate, brown, septate, branching opposite to irregular at acute to wide angles, loosely reticulate, cells mostly 16-40 x 7-10μm. Appressoria alternate to unilateral, antorosae to spreading, brown, 2-celled, straight to curved, 20-26μm long; stalk cells cylindrical to cuneate, 6-11μm long; head cells globose to ovate, entire, 11-18 x 13-17μm. Phialides borne on a separate mycelial branch, pale brown, opposite to alternate, ampulliform, unicellular, 16-21 x 7-10μm. Perithecia scattered, dark brown to black, globose, up to 202 μm in diam.; perithecial cells conoid, straight to curved, acute to obtuse at the apex, up to 20μm long. Ascii oval, sessile, 4 spored. Ascospores oblong, straight, broad, 4 septate, rounded at ends, constricted at the septa, brown, 32-36 x 15-18μm.
Fig. 28: *Asteridiella micheliae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium
D. Ascus bearing ascospores
E. Ascospores
Specimen Studied: On the living leaves of *Michelia velutina* DC. (Family-Magnoliaceae), Intanki Forest, Peren, Nagaland, India, T.K. Jana, 20.02.2003, PCC 5186 (Holotype).

Etymology: From the name of the host genus.

According to the Beeli formula 3101.3230, *Asteridiella micheliae* is close to *A.crustacea* (Speg.) Hansf., but differs from it in having smaller appressoria with globose to ovate and entire head cells, phialides borne on a separate mycelial branch, smaller perithecia with longer surface cells and smaller ascospores. It also differs from *A. werdermannii* Hansf. in having epiphyllous colonies, smaller appressoria and perithecia with longer surface cells, smaller ascospores.

Review of literature (Hansford, 1961; Hosagoudar, 1996; Sarbhoy et al, 1996; Bilgrami et al., 1991; Crane and Jones, 2001) shows that no species of *Asteridiella* has yet been recorded on host *Michelia velutina* DC. Hence new species of *Asteridiella* is suggested (Table-26).
Table 26. Comparative account of *Asteridiella micheliae* sp.nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Peritheaicia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. crustacea</em></td>
<td>Epiphyllous</td>
<td>30-35µm long; head cells clavate with crenate to sublobate margin, 20-25 x 12-18µm</td>
<td>Mixed with appressoria, 22-30 x 8-10µm</td>
<td>290µm diam., surface cells rounded to obtusely conoid up to 15µm long</td>
<td>60-70 x 30-34µm</td>
</tr>
<tr>
<td><em>A. werdermannii</em></td>
<td>Hypophyllous</td>
<td>25-43µm long; head cells globose to piriform and entire or bent cylindric to rounded-angulose, 19-29 x 12-20µm</td>
<td>Borne on a separate mycelial branch, 17-25 x 8-10µm</td>
<td>350µm diam., surface cells about 40 diam. and to 12µm high, bluntly or acutely conoid-mammillate</td>
<td>50-57 x 22-26µm</td>
</tr>
<tr>
<td><em>A. micheliae</em></td>
<td>Epiphyllous</td>
<td>20-26µm long; head cells globose to ovate, entire, 11-18 x 13-17µm</td>
<td>Borne on a separate mycelial branch, 16-21 x 7-10µm</td>
<td>202µm diam., surface cells conoid, straight to curved, acute to obtuse at the apex, up to 20µm long</td>
<td>32-36 x 15-18µm</td>
</tr>
</tbody>
</table>
**Asteridiella eugeniae-fruticosae** T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Coloniae epiphyllae, nigrae, dispersae, globosae, tenuis, ad 4mm diam., confluentes. Hyphae rectae vel undulatae, plerumque oppositae acutaeque ramosae, dense reticulatae, atrobrunneae, cellulae plerumque 13-19 x 4-6μm. Appressoria alternata vel unilateralia, recta vel leniter curvula, bicornis, brunnea, subantronse vel patentia, 12-17μm longa; cellula basali cylindracea vel cuneata, 3-5μm longa; cellula apicali globosa, ovata vel clavata, integra, angularia, rotundata ad apicem vel truncata, 9-14 x 7-12μm. Phialides appressoriis intermixta, opposita vel alternata, unicellularia, brunnea, ampullacea, 15-20 x 5-7μm. Perithecia dispersa vel laxe aggregata, atrobrunnea, ad 165 μm diam.; cellulae peritheciales conoideae, rectae vel curvulae, acutae ad apicem, ad 16μm longae. Asci ovales vel elliptici, sessiles, 2 spori. Ascospores cylindraceae vel ellipsoideae, utrinque rotundatae, rectae, septis constrictae, brunnea, 27-35 x 10-16μm.

Colonies epiphyllous, black, spreading, round, superficial, thin, up to 4mm in diameter or sometimes confluent. Hyphae straight to undulate, branching mostly opposite at acute angles, closely reticulate, dark brown, cells mostly 13-19 x 4-6μm. Appressoria alternate to unilateral, straight or slightly bent, 2-celled, brown, subantronse to spreading, 12-17μm long; stalk cells cylindric to cuneate, 3-5μm long; head cells globose, ovate to clavate, entire, angular, rounded at apex to truncate, 9-14 x 7-12μm. Phialides mixed with appressoria, opposite to alternate, unicellular, brown, ampulliform, 15-20 x 5-7μm. Perithecia scattered to loosely grouped, dark brown, up to 165 μm in diam.; perithecial surface cells conoid, straight to curved, acute at the apex, up to 16 μm long. Asci few, oval to elliptical, sessile, 2-spored. Ascospores cylindrical to ellipsoidal, rounded at ends, usually straight, constricted at the septa, brown, 27-35 x 10-16μm.
Fig. 29: *Asteridiella eugeniae-fruticosae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium
D. Ascus bearing ascospores
E. Ascospores
Specimen Studied: On the living leaves of *Eugenia fruticosa* Roxb. (Family-Myrtaceae), Medziphema, Dimapur, Nagaland, India, T.K.Jana, 10.03.2001, ITCC 4944.01 (Holotype), PCC 5201 (Isotype).

Etymology: - From the name of the host genus.

According to Beeli formula 31013220, the present species *Asteridiella eugeniae-fruticosae* is close to *A. mammillata* Hansf. but differs from it in having thin colonies, smaller hyphal cells and appressoria with angular to truncate head cells, smaller perithecia and ascospores. It also differs from *A. atricha* (Speg.) Hansf. in having large epiphyllous colonies, straight to undulate hyphae, smaller appressoria and perithecia with acutely conoid surface cells and smaller ascospores.

A review of literature (Hansford, 1961; Bilgrami *et al*., 1991; Sarbhoy *et al*., 1996; Hosagoudar, 1996; Hu and Lu, 1989; Goos and Uecker, 1992) shows that no species of *Asteridiella* has yet been reported on host *Eugenia fruticosa* Roxb. Therefore it is suggested as a new species (Table-27).
Table 27. Comparative account of *Asteridiella eugeniae-fruticosae* sp. nov. with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Colonies</th>
<th>Hyphae</th>
<th>Appressoria</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. mammillata</em></td>
<td>Epiphyllous, dense, up to 3 mm diam.</td>
<td>Substraight to sinuous; cells mostly 15-25 x 6-7μm</td>
<td>Alternate, 17-23μm long; head cells ovate, piriform, entire, 12-16 x 8-10μm</td>
<td>Scattered, 180μm diam.; surface cells obtusely conoid to mammillate, up to 25μm long</td>
<td>34-39 x 14-16μm</td>
</tr>
<tr>
<td><em>A. atricha</em></td>
<td>Amphigenous, thin, up to 2 mm diam</td>
<td>Substraight, cells mostly 20-30 x 7-8μm</td>
<td>Alternate, 15-22μm long; head cells ovate to cylindric, entire, 12-16 x 8-10μm</td>
<td>Loosely scattered, verrucose, up to 180μm diam.; surface cells obtusely conoid; up to 15μm long</td>
<td>35-39 x 15-17μm</td>
</tr>
<tr>
<td><em>A. eugeniae-fruticosae</em></td>
<td>Epiphyllous, thin, up to 4 mm diam.</td>
<td>Straight to undulate, cells mostly 13-19 x 4-6μm</td>
<td>Alternate to unilateral, 12-17μm long; head cells globose, ovate to clavate, entire, angular, rounded at apex to truncate, 9-14 x 7-12μm</td>
<td>Scattered to loosely grouped, rough, up to 162μm diam.; surface cells conoid, straight to curved, acute at the apex, up to 16μm long</td>
<td>27-35 x 10-16μm</td>
</tr>
</tbody>
</table>
Coloniae epiphyllae, nigrae, dispersae, orbiculares, tenuis, ad 5mm diam. Hyphae subrectae vel flexuosae, brunneae, septatae, alternatae vel irregulariter acuteque ramosae, laxe vel dense reticulatae, cellulae plerumque 20-45 x 6-10µm. Appressoria dense vel remotus, alternata vel unilateralia, brunnea, bicellularia, recta vel curvula, antorsa vel patentia, 18-26µm longa; cellula basali cylindracea vel cuneata, recta vel curvula, 5-13µm longa; cellula apicali globosa vel subglobosa, integra, 12-17 x 10-16µm. Phialides appressoriis intermixta, brunnea, opposita vel alternata, conoidea vel ampullacea, unicellularia, 16.5-25 x 8-14µm. Perithecia dispersa, atrobrunnea, globosa, verrucosa ad 160 µm diam.; cellulae peritheciales conoideae, subacutae vel obtusae ad apicem, 10-16µm longae. Asci ovales, sessiles, 2 spori; ascosporae rectae, cylindraceae, 4 septatae, septis constrictae, brunneae, 35-40 x 15-17µm.

Asteridiella wrightiae T.K Jana, S.N.Ghosh et A.K.Das sp.nov.
Fig. 30: *Asteridiella wrightiae*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium and setae
D. Ascus bearing ascospores
E. Ascospores
Specimen Studied: On the living leaves of *Wrightia coccinea* Sims. (Family- Apocynaceae), AO-Kashiram, Dimapur, Nagaland, India, T.K.Jana, 28.09.2000, ITCC 4638.01, PCC 5154 (Holotype).

Etymology: From the name of the host.

Based on the Beeli formula 3101.3220, *Asteridiella wrightiae* is close to *A.plumeriae* (Hansf. & Deight.) Hansf. (Hansford, 1961) but differs from it in having smaller appressoria with globose to subglobose head cells, phialides mixed with appressoria, smaller perithecia and surface cells and smaller cylindrical ascospores. It also differs from *A.voacangae* Deight.(Hansford 1961)in having longer appressoria and phialides mixed with appressoria, smaller perithecia and smaller cylindrical ascospores.

Review of literature (Hansford, 1961; Sarbhoy et al., 1986; Jiang, 1989; Bilgrami et al., 1991; Hosagoudar, 1996 and Hosagoudar et al., 2003) shows that no species of *Asteridiella* has yet been recorded on host *Wrightia coccinea* Sims. Hence new species of *Asteridiella* is suggested (Table-28).
Table 28. A comparative account of *Asteridiella wrightiae* sp.nov., with other species.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Appressoria</th>
<th>Phialides</th>
<th>Perithecia</th>
<th>Ascospores</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. plumeriae</em></td>
<td>Alternate, 25-35μm long; head cells irregularly clavate, often bent, angulose to sinuous-lobate, 15-23 x 10-17</td>
<td>Borne on a separate mycelial branch</td>
<td>Up to 170μm diam., surface cells obtusely conoid, up to 25μm long</td>
<td>Oblong, 40-44 x 18-19μm</td>
</tr>
<tr>
<td><em>A. voacangae</em></td>
<td>Alternate, 14-20μm long; head cells subglobose to ovate, entire, straight, 10-16 x 10-12μm</td>
<td>Borne on a separate mycelial branch</td>
<td>Up to 180μm diam., surface cells obtusely conoid, up to 15μm long</td>
<td>Oblong, 36-42 x 14-17 x 12-13μm</td>
</tr>
<tr>
<td><em>A. wrightiae</em></td>
<td>Alternate to unilateral, closely to distantly placed, 18-26μm long; head cells globose to subglobose, entire, 12-17 x 10-16μm</td>
<td>Mixed with appressoria</td>
<td>Up to 160 diam., perithecial cells subacute to obtuse at the apex, 10-18 long</td>
<td>Cylindrical, 35-40 x 15-17μm</td>
</tr>
</tbody>
</table>

Fig. 31

Colonies epiphyllous, thin to subdense, black, scattered up to 5mm in diameter and confluent. Hyphae straight to substraight, brown, branching alternate to opposite at acute to wide angles, loosely reticulate, cells mostly 18-36 x 5-10\(\mu\)m. Appressoria alternate, antrorse to subantrorse, 2-celled, brown, 18-28\(\mu\)m long; stalk cells cylindrical to cuneate, 5-10\(\mu\)m long; head cells globose to cylindrical, entire to slightly angular with a small circular hyaline spot at the centre, 10-20 x 10-14\(\mu\)m. Phialides few, borne on a separate mycelial branch, opposite to alternate, ampulliform, unicellular, pale brown, tip occasionally bent variously, 16-20 x 5-8\(\mu\)m. Perithecia scattered, dark brown to black, verrucose, seated on exphopodiate and hyphopodiate mycelia, globose, up to 140\(\mu\)m in diam.; perithecial cells conoid to mammiform, straight to curved, up to 16\(\mu\)m long. Ascus few, ovate to elliptical, sessile, 2 spored. Ascospores cylindrical to subellipsoid, straight to curved, 4 septate, rounded at ends, constricted at the septa, dark brown, 30-36 x 10-16\(\mu\)m.

Specimen studied: On the living leaves of Combretum decundrum Roxb. (Family: Combretaceae), New Minister Hill, near Botanical Garden, Kohima, Nagaland, India, T.K. Jana, 18.10. 2000, PCC 5153.

Literature study (Bilgrami \textit{et al.}, 1979, 1981, 1991; Sarbhaoy \textit{et al.}, 1996; Hansford, 1961) reveals that the specimen has not been reported from the state Nagaland. Hence it is reported for the first time from this state.
Fig. 31: *Asteridiella combreti var. leonensis*

A. Hyphae with appressoria
B. Hyphae with phialides
C. Perithecium associated with mycelium
D. Ascus bearing ascospores
E. Ascospores


Asterella Sacc., Syll. Fung. 1: 42. (Subgen.) 9: 393. 1891.


Superficial on leaves, free mycelium present; mycelium brown to dark brown, septate, much branched and hyphopodiately; thyriothecia dimidiate, radiate, circular; asci parallel in a single row, oblong, ellipsoidal, oval or roundish, bitunicate, 8-spored; paraphysoids absent or soon become mucilaginous or fibrous; ascospores oval to elliptical, 2-celled, brown to dark brown.

Type species: Asterina melastomatis Lev. Sensu Armaud. (1918).

The genus Asterina was founded by Lévèille (1845.) Lévèille’s Asterina has been thoroughly worked out and discussed by different workers. Theissen (1913b) separated the species into Englerulaster whose perithecial cells dissolve into slime at maturity, exposing the enclosed asci. He divided Asterina into three sub-genera: Euasterina, Dimerosporim and Clypeolaster. To these three sub-genera, Doidge (1942) added Englerulaster. Müller and Von Arx (1962) followed Doidge in the delimation of the genus Asterina and characterised the genus by protective layer of thyriothecia which soon becomes mucilaginous. The importance
of this character for delimitation of the genus has already been proposed earlier by Petrak (1928) and later by Hansford (1946). Müller and Von Arx (1962) included those species in *Asterina* which are included in the genera *Englerulaster* and *Englera* by Stevens and Ryan (1939). Theissen and Sydow (1917b), Araud (1918), Stevens and Ryan (1939) and others wished to divide the species hitherto included in *Asterina* into different genera i.e. *Dimerosporium* and *Parasterina* on the basis of whether paraphysoids are present or not. But Müller and Von Arx (1962) merged *Dimerosporium* and *Parasterina* in the sense of Doidge (1942) with *Asterina*. They also treated *Englerulaster* and the genus *Englera*, established for *Englerulaster* species without paraphysoids, as synonyms to *Asterina*. Petrak (1915) stated that the type species of *Calothyriolum* also belongs to the genus *Asterina*. Again *Asterella* is distinguished from *Asterina* by colourless spores. Müller and Von Arx (1962) treated *Asterella* as synonym to *Asterina* because the ascospores of the type species of *Asterella* becomes brown at maturity.
Suggested Key to the species of Asterina of Nagaland

A. Colonies epiphyllous

B. Appressoria 2-celled

C. Colonies subdense

Colonies up to 4µm diam.; head cells of appressoria

ovate, globose to cylindrical, entire, 8-14 x 5-7cm; thyriothecia up to 250µm diam.

and margin crenate; ascospores 16-20 x 8-12µm.

On Eugenia fruticosa

........ Astera jambolanae var. fruticosae

CC. Colonies thin

Colonies up to 5mm diam; head cells of appressoria stellately to irregularly

lobate, 8-12 x 12-15µm; thyriothecia up to 150µm diam. and margin crenate;

ascospores 16-19 x 9-11µm.

On Wrightia coccinea.

........... Asterina wrightiae - coccineae

BB. Appressoria 1-celled

C. Colonies thin

D. Hyphae substraight; appressoria deeply and irregularly lobate, 7-13 x 6-12µm;

thyriothecia up to 120µm diam. and margin crenate to fimbriate; ascospores

17-20 x 8-10µm.

On Phlogacanthus thysiformis

.......... Asterina phlogacanthae var. nagalandis

DD. Hyphae straight to undulate; appressoria ovate, clavate, rarely globose,

entire, 10-13 x 6-8µm ; thyriothecia up to 100µm diam. and margin

fimbriate; ascospores 17-23 x 7-10µm.
On *Rhamnus* sp.

\[\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ld…
Fig. 32: *Asterina jambolanae* var. *fruticosae*
A. Hyphae with appressoria
B. Thyriothecia associated with mycelium
C. Ascus bearing ascospores
D. Ascospores
unilateral, 2-celled, dark brown, straight or slightly curved, antrorse, 14-22μm long; stalk cells cylindrical to cuneate, 5-8μm long; head cells ovate, globose to cylindrical, entire, 8-14 x 5-7μm. Thyriothecia few, scattered, mostly aggregated, orbicular, up to 250μm diam., dark brown, stellately dehisced at the centre, margin crenate. Asci many, subglobose to ovate, sessile, octosporous, 35-44 x 28-34μm. Ascospores crowded, oblong, conglobate, brown, uniseptate, constricted at the septum, rounded at ends, smooth walled, 16-20 x 8-12μm.

**Specimen studied:** On leaves of *Eugenia fruticosa* Roxb. (Family-Myrtaceae), Medziphema, Dimapur, Nagaland, India, T. K. Jana, 10.05.2001 ITCC 4944.01, (Isotype) PCC 5201 (Holotype).

**Etymology:** From the name of the host species.

This fungus is close to *Asterina jambolanae* Kar & Maity (Kar and Maity, 1970) known on *Eugenia jambolana* Lam. but differs from it in having epiphyllous colonies, straight to substraight hyphae, smaller thyriothecia and ascospores. Hence new variety of *Asterina jambolanae* Kar & Maity is suggested.

*Fig. 33*

*Asterina wrightiae-coccineae* T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Coloniae epiphyllae, tenuis, nigrae, orbiculares, ad 5mm diam. Hyphae rectae vel undulatae, brunneae, septatae, alternatae vel irregulariter acuteque vel laxe ramosae, laxe vel dense reticulatae, cellulae plerunque 26-40 x 6-8μm. Appressoria alternata vel unilateralia, bicellularia, antrorsa vel subantrorsa, recta vel curvula, brunnea, 13-16μm longa; cellulae basilares cylindraceae vel cuneatae, 2.5-4μm longae; cellulae apicales stellatim vel irregulariter lobatae, 8-12 x 12-15μm. Thyriothecia dispersa, raro connata, orbicularia, atrobrunnea, stellatim dehiscentes ad centro, margine crenata, ad 150μm diam. Asci globosi
Fig. 33: *Asterina wrightiae-coccineae*

A. Hyphae with appressoria
B. Thyriothecia associated with mycelium
C. Ascus bearing ascospores
D. Ascospores
vel ovati, sessiles, octospori, ad 42μm diam., paraphysati. Ascsporae brunneae, oblongae, conglobatae, uniseptatae, constrictae, 16-19 x 9-11μm.

Colonies epiphyllous thin, black orbicular, up to 5mm in diameter. Hyphae straight to undulate, brown, septate, alternate to irregular at acute to wide angles, loosely reticulate, cells mostly 26-40 x 6-8μm. Appressoria alternate to unilateral, 2-celled, antrorse to subantrorse, straight to curved, brown, 13-16μm long; stalk cells cylindrical to cuneate, 2.5-4μm long; head cells stellately to irregularly lobate, 8-12 x 12-15μm. Thyriothecia scattered, rarely connate, orbicular, dark brown, stellately dehisced at the centre, margine crenate, up to 150 μm in diam. Asci globose to ovate, sessile, octosporous, up to 42μm diam. Ascospores brown, oblong, conglobate, uniseptate, constricted at the septum, 16-19 x 9-11μm.


**Asterina phlogacanthae** Kar & Ghosh var. *nagalandis* T.K. Jana, S.N. Ghosh et A.K. Das var. nov.

Fig.34

Different a typo coloniae epiphyllae, hyphis subrectis, ascorsporis brevioribus, cellula inferior conica.

Colonies epiphyllous, black, scattered, orbicular, superficial, thin, up to 4mm diameter and confluent. Hyphae substraight, septate, brown, branching opposite, alternate to irregular at acute to wide angles, loosely to closely reticulate, cells mostly 17-30 x 3-5μm. Appressoria few, unicellular, alternate to unilateral, brown, deeply and irregularly lobate, straight or bent, 7-13 x 6-12μm. Thyriothecia closely scattered, up to 120 μm diam., dark brown, stellatey dehisced at the centre, convex, margin crenate to fimbriate. Asci many, subglobose, sessile, octosporous, up to 46μm diam. Ascospores crowded, oblong, uniseptate, upper cell round, lower cell conic, constricted at the septum, brown, smooth walled, 17-20 x 8-10μm.

**Specimen studied:** On the living leaves of *Phlogacanthus thysiformis* (Hardw). Mabberley, (Family-Acanthaceae), Diphu Road, Dimapur, Nagaland, India, 19.03.2000, T. K. Jana, ITCC 4315.2K, (Isotype), PCC 5118 (Holotype).

**Etymology:** From the name of the place.

The present collection is close to *Asterina phlogacanthae* Kar & Ghosh known on *Phlogacanthus curviflorus* Nees. but differs from it in having epiphyllous colonies, substraight hyphae, smaller ascospores, lower cell conic. So the new variety of *Asterina phlogacanthae* Kar & Ghosh is suggested.
Fig. 34: *Asterina phlogacanthae var. nagalandis*

A. Hyphae with appressoria
B. Thyriothecia associated with mycelium
C. Ascus bearing ascospores
D. Ascospores
Asterina rhamnii Kar & Ghosh var. dimapurensis T. K. Jana, S. N. Ghosh et A. K. Das var. nov.

Differt a typo appressoria ovata, clavata, raro globosa et integra, ascosporis longioribus.

Colonies epiphyllous, black, thin, up to 4mm in diameter and cover most of the leaf area. Hyphae straight to undulate, brown, branching alternate to irregular at wide angles, loosely to closely reticulate, cells mostly 15-25 x 3-5μm. Appressoria unicellular alternate to unilateral, brown, straight or bent, ovate, clavate, rarely globose, entire, 10-13 x 6-8μm. Thyriothecia many, closely scattered, mostly connate, dark brown, orbicular, up to 100μm diam., margin fimbriate, stellately dehisced and widely opened at the centre. Asci many, subglobose, octosporous, up to 45μm diam. Ascospores crowded, brown, oblong, conglobate, unisepitate, constricted at the septum, smooth walled, 17-23 x 7-10μm.

Specimen studied: On the living leaves of Rhamnus sp. (Family-Rhamnaceae), Chumukedima, Dimapur, Nagaland, India, T. K. Jana, 11.11.2000, ITCC 4640.01 (Isotype), PCC 5139 (Holotype).

Etymology: From the name of the place.

Asterina rhamnii Kar & Ghosh was reported on Rhamnus sp from Darjeeling district of West Bengal, India (Kar and Ghosh, 1986). However the present fungus is close to A. rhamnii Kar & Ghosh but differs from it in having ovate, clavate, rarely globose and entire appressoria, longer ascospores. So the new variety of Asterina rhamnii Kar & Ghosh is suggested.
Fig. 35: *Asterina rhamnii var. dimapurensis*

A. Hyphae with appressoria
B. Thyriothecia associated with mycelium
C. Ascus bearing ascospores
D. Ascospores
Asterina psychotriae-symplocifoliae T. K. Jana, S. N. Ghosh et. A.K. Das sp. nov.

Fig. 36

Coloniae epiphyllae, tenuis vel subdensae, nigrae, dispersae, orbiculares, ad 6mm diam., confluentes. Hyphae rectae, subrectae vel leniter flexuæ, brunnea, oppositae, alternatae vel irregulariter acute vel laxe remosae, laxæ vel dense reticulatae, cellulae plerumque 16-44 x 5-8μm. Appressoria alternata vel unilateralia, unicellularia, recta vel curvula, globosa, raro oblonga, integra, angularia vel 2-3. sublobata, 10-16 x 9-13μm. Thyriothecia dispersa vel aggregata, orbicularia, ad 165μm diam., stellatim dehiscentes et parlata ad centro, margine subcrenata vel fimbriata. Asci pauci, subglobos, octospori, ad 45 μm diam., paraphysati. Ascospores congestæ, oblongæ, brunnea, conglobatae, constrictæ, 18-22 x 8-11μm.

Coloniæ epiphyllæ, tenuis vel subdensæ, nigrae, dispersæ, orbiculares, ad 6mm diam., confluentes. Hyphae rectæ, subrectæ vel leniter flexuæ, brunnea, oppositae, alternatae vel irregulariter acute vel laxæ remosæ, laxæ vel dense reticulatae, cellulae plerumque 16-44 x 5-8μm. Appressoria alternata vel unilateralia, unicellularia, recta vel curvula, globosa, raro oblonga, integra, angularia vel 2-3. sublobata, 10-16 x 9-13μm. Thyriothecia dispersa vel aggregata, orbicularia, ad 165μm diam., stellatim dehiscentes et parlata ad centro, margine subcrenata vel fimbriata. Asci pauci, subglobos, octospori, ad 45 μm diam., paraphysati. Ascospores congestæ, oblongæ, brunnea, conglobatae, constrictæ, 18-22 x 8-11μm.

Specimen studied: On the living leaves of Psychotria symplocifolia Kurz. (Family-Rubiaceae), Medziphema, Dimapur, Nagaland, India, T.K. Jana, 28.11.2000, ITCC 4634.01, (Isotype) PCC 5163 (Holotype).

Etymology: From the name of the host genus.
Fig. 36: *Asterina psychotriae-symplcifoliae*

A. Hyphae with appressoria
B. Thyriothecia associated with mycelium
C. Ascus bearing ascospores
D. Ascospores
Review of literature (Hosagoudar, 1995, 2003; Hosagoudar and Abraham, 1998, 2000; Hosagoudar and Agarwal, 2003; Hosagoudar et al., 2001, 2004; Kar and Ghosh, 1986; Mibey and Hawksworth, 1997; Rahayu and Parbery, 1991; Reynolds, 1999; Song, Bin et al., 1996; Thite and Kulkarni, 1977) shows that there is no report of *Asterina* on the present host *Psychotria syngicifolia* Kurz. Of the family Rubiaceae. The new species *Asterina psychotriae-syngicifoliae* sp. nov. is closely similar to *A. lauracearum* Hosagoudar and Biju (Hosagoudar et al., 2004) but differs from it in having epiphyllous colonies, larger thyriothecia, longer and smooth walled ascospores.

*Asterina talaumae* T.K. Jana, S.N. Ghosh et A.K. Das sp. nov.

Fig. 37

Coloniae amphigenous, atrobunnea vel nigrae, dispersae, orbiculares, subdensae, ad 6mm diam., raro confluentes. Hyphae rectae, subrectae vel leniter flexuosae, brunnea, septatae, alternatæ vel irregulariter acutæque vel laxæ romosae, laxæ reticulatae, cellulae plerumque 20-40 x 5-8µm. Appressoria alternata vel unilateralia, unicellularia, globosa, ovata, integra, recta vel curvula, brunnea, 10-14 x 6-9µm. Thyriothecia numerosa, plerumque aggregata, globosa vel orbicularia, ad 98µm diam., stellatim dehiscentes ad centro, atrobrunnea, convexa, margine crenata vel fimbriata. Asci pluri, subglobosi vel ovati, apice rotundatae, octospori, sessiles, 36-46 x 29-35µm, paraphysati. Ascosporae congestae, elliptico-oblongae, uniseptatae, constrictae, brunneae, parietibus laevibus, cellula superior macro, utrinque rotundata et cellula inferior minor, leniter conica, 17-21 x 8-10µm.

Colonies amphigenous, dark brown to black, scattered, orbicular, subdense, up to 6mm diameter, rarely confluent. Hyphae straight, substraight to slightly flexuous, brown, septate, alternate to irregular at acute to wide angles, loosely reticulate, cells mostly 20-40 x 5-8µm. Appresoria alternate to unilateral, unicellular, globose, ovate, entire, straight to
Fig. 37: *Asterina talaumae*
A. Hyphae with appressoria
B. Thyriothecia associated with mycelium
C. Ascus bearing ascospores
D. Ascospores
curved, brown, 10-14 x 6-9μm. Thyriothecia numerous, mostly aggregated, round to orbicular, up to 98μm diam., stellately dehisced at the centre, dark brown, convex, margin crenate to fimbriate. Asci many, subglobose to ovate, tip rounded, octosporous, sessile, 36-46 x 29-35μm, paraphysate. Ascospores crowded, elliptic-oblong, 1-septate, constricted at the septum, brown, smooth walled, upper cell larger, rounded at end and lower cell smaller, slightly conical, 17-21 x 8-10μm.

**Specimen studied:** On the living leaves of *Talauma rabaniana* Hook.f. & Thomson. (Family: Magnoliaceae), Intanki Forest, Peren, Nagaland, India, T.K. Jana, 10.06.2001, ITCC 4938.01, (Isotype) PCC 5195 (Holotype).


**DEMATIACEOUS HYPHOMYCETOUS GROUP**


Colonies effuse, brown, blackish brown or black, often crust-like. Mycelium superficial, sometimes torulose; hyphae much branched and anastomosing to form a network. Stroma none. Setae and hyphopodia absent. Conidiophores semi-macronematous, mononematous, erect or ascending, unbranched or occasionally loosely branched, pale to mid
brown or olivaceous brown, smooth. Conidiogenous cells monoblastic or polyblastic, integrated, terminal or intercalary, determinate, cylindrical or doliiform. Conidia solitary, dry, acrogenous or pleurogenous, branched, usually made up of a pyriform or ellipsoidal stalk cell and 4 divergent, subulate, multisepitate arms, pale to mid brown or olivaceous brown, smooth. Perfect states often belong to the Capnodiales (Ellis, 1976).

**Type species:** *Tripospermum acerinum* (Syd.) Speg.

*Tripospermum polyalthiae* T.K.Jana, A.K. Das et. S.N. Ghosh sp. nov.

Fig.38

Colonies epiphyllae, tenuis vel subdensae, nigrae, crustosae, confluentes. Hyphae rectae vel flexuosa, alternatae vel irregulariter acuteque vel laxe ramosae, dense reticulatae, cellulae 5-12µm crassae, doliiformae. Conidiophora lateribusque hypharum oriunda, semimacronemata, mononemata, simplicia, interdum ramosa, erecta, pallide vel modice brunnea, laevia, recta vel curvata, 60-130 x 4-9µm. Conidia solitaria, sicca, ramosa, constare cellula basali piriformia, 8-12X6-9 µm et 4 armare, 1-6 septata, olivaceo-brunnea, 30-80µm longa, 6-12 µm. crassa ad basim, 2-3µm. ad apicem, plerumque ad septum constricta.

Colonies epiphyllous, thin to subdense, black, crustaceous, confluent and cover the entire surface of the leaves. Hyphae straight to flexuous, branching irregular at acute to wide angles, closely reticulate, cells 5-12 µm thick, doliiform. Conidiophores arising laterally on the hyphae, semimacronematous, mononematous, unbranched, occasionally branched, erect, pale to mid brown, smooth, straight to curved, 60-130 x 4 - 9µm. Conidia solitary, dry, branched, made up of a pyriform stalk cell, 8-12 x 6-9µm with 4 divergent arms, 1-6 septate, olivaceous brown, 30-80µm long, 6-12µm thick at the base, tapering to 2-3µm towards the tip, often constricted at the septa.
Fig. 38: *Tripospermum polyalthiae*
A-D. Mycelial hyphae with conidiophores
E&F. Conidia
Specimen studied: On the living leaves of *Polyalthia longifolia* Benth. & Hook.f. (Family- Anonaceae), Diphu Road, Dimapur, Nagaland, India, T.K. Jana, 16.02.2001, PCC-6142 (Holotype), ARI 6240 (Isotype).

Etymology: - From the name of the host genus.

A large number of species of the genus *Tripospermum* has been reported from India (Sarbhoy *et al.*, 1996; Bilgrami *et al.*, 1991). Review of literature (Ellis, 1971; Ando 1994; Sharma *et al* 1995) shows that no species of *Tripospermum* has yet been reported on the present host *Polyalthia longifolia* Benth. & Hook.f. under the family Anonaceae. A comparative study of characters between the present collection and *Tripospermum myrti* (Lind) Hughes. is given in the table-29. From the comparative account it can be concluded that the proposed species *Tripospermum polyalthiae* slightly resembles with *T. myrti* (Lind.) Hughes., but differs by its mycelial hyphae (5-12µm thick ), conidiophores ( up to 130µm long) and conidia ( arms up to 80µm long & 8 - 12µm thick at the base). Hence a new species of *Tripospermum* is suggested.
Table 29. A Comparative account of *Tripospermum myrti* (Lind.) Hughes and the proposed new species (*T.*polyalthiae* sp. nov.)*

<table>
<thead>
<tr>
<th>Characters</th>
<th><em>T. myrti</em></th>
<th>Proposed new species *T.*polyalthiae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyphae</td>
<td>4-8μm thick</td>
<td>5-10μm thick</td>
</tr>
<tr>
<td>Conidiophores</td>
<td>Up to 90μm long</td>
<td>Up to 130μm long</td>
</tr>
<tr>
<td>Conidia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stalk cell</td>
<td>6-10x4-7μm</td>
<td>8-12 x 6-9μm</td>
</tr>
<tr>
<td>Arm</td>
<td>Up to 30 μm long, 4-8μm thick at the base, 1-4 septate</td>
<td>Up to 80μm long, 8-12μm thick at the base, 1-6 septate</td>
</tr>
</tbody>
</table>

Synonyms: Cometella Schw. in Fr., 1835, Corpus Florarum Provincialium Sueciae, 1, Floram Scanicam, Upsala: 361-362.


Colonies usually effuse, dark brown to black, often velvety. Mycelium superficial. Stroma none. Setae present or absent, sometimes seen only in old colonies; when present simple, dark, smooth. Hyphopodia present. Conidiophores macronematous, mononematous, straight or flexuous, unbranched, mid to dark brown, smooth. Conidiogenous cells monoblastic, integrated, terminal, determinate or percurrent, cylindrical. Conidia solitary, acrogenous, simple, straight or curved, cylindrical or obclavate, sometimes rostrate, transversely septate, mid to dark brown, smooth, rugose or verrucose (Ellis, 1971).

Type species: *Clasterosporium caricinum* Schw.


Fig.39

Colonies amphigenous, mostly hypophyllous, superficial, effuse, scattered, almost black, velvety, irregular in outline, 8-12mm in extent. Mycelium superficial, branched, hyphae straight to bent, thick walled, septate, light brown, bearing hyphopodia and conidiophores, 7-10μm wide (cells mostly 34-40μm long). Stroma none. Hyphopodia alternate, unicellular, 2-4 lobed, brown, thick walled, 8-18 x 10-24μm, with a small circular to ovoid hyaline spot at the centre. Setae absent. Conidiophores macronematous,
Fig. 39: *Clasterosporium sclerae*
A. Hyphae with appressoria
B. Mycelial hyphae with conidiophores
C. Conidia  D. Conidium showing germ tube
mononematous, arising laterally from the hyphae, erect, straight or slightly curved, cylindrical, thick walled, septate, dark brown, unbranched, smooth, 200-480 x 7-9μm. Conidia solitary, simple, straight or slightly curved, obclavate, rostrate, 7-9 transversely septate, not constricted at the septa, verrucose, 168-200μm long, 15-23μm in the broadest part, 8-12μm at base and 5-8μm at apex.

Specimen studied: On the living leaves of *Scleria* sp. (Family- Poaceae), Alichen, Mokokchung, Nagaland, India, T.K Jana, 20.01.2000, PCC 5102 (Holotype), ITCC 4319.2K (Isotype).

Review of literature (Bilgrami *et al.*, 1979, 1981, 1991; Ellis, 1971; Sarbhoy *et al.*, 1996) shows that this species has not been reported from India. Hence it is reported for the first time form India.

*Atractilina* Dearness & Bartholomew, 1924 *Mycologia* 16: 175.

Colonies effuse, rust brown or paler, usually with conspicuous erect synnemata. Mycelium superficial, hyperparasitic. Stroma none. Setae and hyphopodia absent. Conidiophores macronematous, mostly synnematous but occasionally mononematous or with the threads loosely aggregated in fascicles; threads flexuous, branched, splaying out to form a head, straw - coloured or pale brown, smooth. Conidiogenous cells polyblastic, integrated, terminal becoming intercalary, sympodial, denticulate; denticles conical, truncate at the tip. Conidia acropleurogenous, dry, simple, straight or slightly curved, fusiform or obclavate, truncate at the base, pluriseptate, hyaline, straw - coloured or pale brown, smooth or minutely verruculose (Ellis, 1976).

Type species: *Atractilina parasitica* (Wint.) Deighton & Pirozynski.

= *A. callicarpae* Dearn. & Barth.
Atractilina calycinae T.K.Jana, A. K. Das et S.N.Ghosh sp. nov.

Fig. 40

Colonies amphigenous, plerumque epiphyllae, tenuis vel subdesae, fuscae vel nigrae, dispersae, ad 4mm diam. et effusae. Mycelium superficiale, laevis et hyperparasiticus. Stroma nulla. Setae et hyphopodiae absentiae. Conidiophora macronemata, erecta, confertin adpressed, plerumque synnemata, pallide brunnea, recta vel flexuosa, denticulata, interdum ramosa, basi 3.5-4.5μm latae, inflatae et 7.2-10μm latae ad apicem. Synnemata conspicuus, ad 900μm longa et ad 30μm latae ad basim. Conidiogenous cellulae polyblasticae, intergratae, terminalis et intercalaris, sympodiales, denticulatae, denticulis conic vel truncatae ad apicem. Conidia sicca, simplicia, acropleurogenosa, recta vel leniter curvata, fusiformia vel obclavata, apicem versus gradatum angustus et terminari in a rostrata, recta vel curvata, nodosus terminalis absentiae, basi truncata vel subtruncata, pallide brunnea, 2-3 septata, laevia, 26-60 x 5-13μm.

Colonies amphigenous, mostly epiphyllous, thin to subdense, dark blackish brown to black, scattered, orbicular, up to 4mm. diameter and effuse. Mycelium superficial, smooth and hyperparasitic. Stroma none. Setae and hyphopodia absent. Conidiophores macronematous, erect, closely adpressed, mostly synnematous, pale brown, straight or flexuous, denticulate, occasionally branched, 3.5-4.5μm thick at the base, swelling above to 7.2-10μm thick, splaying out to form a loose head. Synnemata conspicuous, up to 900μm long and 30μm thick at the base. Conidiogenous cells polyblastic, integrated, terminal becoming intercalary, sympodial, denticulate, denticules conical to truncate at the tip. Conidia dry, simple, acropleurogenous, straight to slightly curved, fusiform to obclavate, truncate at the base, tapered towards the apex into a beak which is straight to curved, terminal knob absent, base truncate to sub truncate, pale brown, 2-3 septate, smooth, 26-60 x 5-15μm.
Fig. 40: *Atractilina calycinae*

A. Synnemata
B. Conidiophores
C. Conidia
**Specimen Studied:** On the living leaves of *Neurocalyx calycinus* (R. Br. ex. Been) Robinson (Family-Acanthaceae), near N.S.T. Colony, Mon, Nagaland, India, T.K.Jana, 15.12.2001, PCC 5166 (Holotype), ITCC 4862.01 (Isotype).

This fungus is closely similar to *Atarctilina parasitica* (Wint.) Deighton & Pirozynski (Ellis, 1976) but differs from it in having smaller synnemata, occasionally branched conidiophores with more thickened above, smaller conidia, terminal knob absent and smooth walled. A review of literature (Bilgrami et al., 1979, 1981, 1991; Ellis, 1976; Sarbhoy et al., 1996) shows that no species of *Atractilina* has yet been reported on host genus *Neurocalyx*. Hence a new species of *Atractilina* is suggested (Table-30).
Table 30. A comparative account of *Atractilina parasitica* (Wint.) Deighton & Pirozynski and *A. calycinae* sp. nov.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>Synnemata</th>
<th>Conidiophores</th>
<th>Conidia</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. parasitica</em></td>
<td>Up to 1.5mm long and lower part up to 40μm thick</td>
<td>1.5-2μm thick at the base and swelling above to 2.5-5μm, branched in the upper region</td>
<td>Mostly 3 septate, often terminates in a small knob, often minutely verruculose, 35-80 x 5-8.5μm</td>
</tr>
<tr>
<td><em>A. calycinae</em></td>
<td>Up to 900μm long and 30μm thick at the base.</td>
<td>3.5-4.5μm thick at the base and swelling above to 7-10μm, occasionally branched</td>
<td>2-3 septate, terminal knob absent, smooth, 26-60 x 5.5-13μm</td>
</tr>
</tbody>
</table>

Colonies effuse, velvety, mid to dark olivaceous brown. Mycelium immersed. Stroma, if present, composed of only a few cells in the substomatal cavity. Setae and hyphopodia absent. Conidiophores macronematous, mononematous, caespitose, unbranched or loosely branched, straight or flexuous, pale to mid brown or olivaceous brown, smooth. Conidiogenous cells polyblastic or monoblastic, integrated, terminal becoming intercalary, sympodial, cylindrical, denticulate; denticles cylindrical or conical and truncate. Conidia solitary, dry, acropleurogenous, simple, mostly curved, frequently circinate, hyaline to pale brown or olivaceous brown, smooth, with several transverse septa (Ellis, 1971).

Type species: Helicomina caperoniae Olive.
**Helicomina stahlii** (Stev.) M.B. Ellis comb. nov.


*Cercospora stahlii* (Stev.) Subram., 1956.

Fig. 41

Leafspots amphigenous, distinct, subcircular to irregular, sometimes coalescent, olivaceous brown to dark brown, without definite margin, virulent, veinlimited, 2-5mm in diameter. Caespituli amphigenous but chiefly hypophyllous, brown. Mycelium immersed. *Stroma* none or poorly developed, composed of a few cells, deep brown. Conidiophores solitary to fasciculate, with 3-9 divergent stalks in a fascicle, arising from the base of the stroma, rarely through the stomata, brown, paler and narrower towards the apex, straight to curved, simple to loosely branched, smooth, very distinctly 0-10 septate, 80-170 x 4-7µm, with prominent cylindrical or conical denticles which bear conidia. Conidia straight or slightly curved, mid pale brown, 2-4 septate, smooth, cylindrical to clavate, scar at the base, 25-35 x 5-9µm.

**Specimen studied:** On the living leaves of *Passiflora foetida* Linn. (Family-Passifloraceae), Intanki Forest, Peren, Nagaland, India, T. K. Jana, 10.02.2000, PCC 5138, ITCC 4648.01.


Colonies effuse, brown, greyish brown or blackish brown, cottony, hairy or velvety. Mycelium partly immersed, partly superficial. Stroma none. Setae and hyphopodia absent. Conidiophores macronematous, monomenatous, un-branched or occasionally loosely
Fig. 41: *Helicoma stahlii*
A-C. Conidiophore fascicles
D. Mycelial hyphae with conidiophores
E. Conidiophores
F. Conidia
branched, straight or flexuous, sometimes geniculate, pale to mid brown or olivaceous brown, smooth. Conidiogenous cells polyblastic, integrated, terminal often becoming intercalary, sympodial, cylindrical, cicatrized; scars usually small, flat. Conidia solitary, dry, acropleurogenous, simple, usually ellipsoidal or fusiform, sometimes cylindrical, rounded at the apex, truncate at the base, usually colourless, pale brown or olivaceous brown, smooth or minutely verruculose, with 0,1 or few transverse septa (Ellis,1971).

**Type species:** *Veronaea bitryosa* Cif. & Montemartini.


Fig.42

Leafspots hypophyllous, irregular, scattered to coalescent, greyish brown to blackish brown without any margin, virulent, distinct, velvety, 2-20μm in extent. Mycelium partly immersed and partly superficial; superficial hyphae subhyaline to pale olivaceous brown, branched and septate, 2-4μm wide, bearing conidiophores. Stroma none. Setae and hyphopodia absent. Conidiophores macronematous, mononematous, arising singly either terminally or laterally from the hyphae, straight or flexuous, cylindrical or subulate, smooth, simple, pleuriseptate (2-6), paler towards the apex and bearing numerous conidial scars, 32-180 x 3-6μm. Conidia solitary, dry, simple, acropleurogenous, smooth, subspherical to clavate, sometimes cylindrical, rounded at the apex, conicotruncate at the base, almost hyaline, 1-2 septate, having prominent scars at the base, 8-15 x3-8μm.

**Specimen studied:** On the living leaves of *Tectona grandis* Linn.f. (Family-Verbenaceae), New Minister Hill, Kohima, Nagaland, India, T. K. Jana, 10.02.2001, PCC 5132, ARI 6054. Review of literature (Bilgrami. *et al.*, 1979, 1981, 1991; Sarbhoy *et al.*, 1996; Ellis, 1971, 1976) shows that this species has not yet been reported from the state of Nagaland. Hence it is reported for the first time from this state.
Fig. 42: *Veronaea tectonae*
A. Mycelial hyphae with conidiophores
B. Conidiophores
C. Conidia
Cercosporidium Earle, 1901, Muhlenbergia, 1 (2): 16.


Mycelium immersed. Stroma present, usually well-developed. Setae and hyphopodia absent. Conidiophores macronematous, mononematous, usually simple, rarely branched, brown, septate or continuous, geniculate or not, densely fasciculate, the fascicles in many species incurved, particularly when old as a result of the formation of a thickened band along one side of the conidiophore. Conidiogenous cells integrated, terminal, polyblastic, sympodial, cicatrizd, conidial scars always thickened and conspicuous, usually prominent, the old scars situated on rounded shoulders or on short peg-like protrusions, but in some species lying more or less flat against the side of the conidiophore. Conidia solitary, dry, clavate, cylindrical, obclavate or broadly fusiform, with a conspicuous thickened hilum, more or less colourless or relatively pale brown, smooth to verrucose, 1-7 most frequently 1-3 septate. (Ellis, 1971).

Type species: Cercosporidium chaetomium (Cooke) Deighton

= Scolecotrichum euphorbiae Tracy & Earle.


Fig.43

Colonies hypophyllous, thin, black, circular to subcircular, up to 3mm in diameter, rarely confluent, vein limited. Fruiting hypophyllous, brown. Mycelium immersed in the host tissues, rarely superficial, smooth. Stroma moderately developed, substomatal, consists of thick walled isodiametric cells, few to many, globose to subglobose, 28μm wide and 20μm high. Conidiophores usually fasciculate, in fascicles of 2-5 divergent stalks, sometimes solitary, emerging from the stroma and through the stomata, straight to flexuous, smooth, thick
Fig. 43: *Cercosporidium compactum*

A-B. Conidiophore fascicles
C. Mycelial hyphae with conidiophore
D. Conidiophores
E. Conidia
walled, light brown and paler towards the tip, 1-3 geniculate, indistinctly septate (1-5), thickened band along the side of old conidiophores, conidial scars thickened, prominent, 1-3 μm diam, situated on rounded tip and lying more or less flat against the side of the conidiophore, 100-360 x 6-10μm. Conidia solitary, dry, obclavate, straight to slightly curved, pale brown, with a conspicuous thickened hilum, 2-7 septate, smooth, 40-90μm long, 8-12 μm thick in the broadest part.

**Specimen studied:** On the living leaves of *Arundinaria* sp. (Family- Poaceae), Ao-Kashiram, Dimapur, Nagaland, India, T.K.Jana, 2.12.2000, PCC 5170, ITCC 4451.01.


**Cercospora** Fresenius, 1863, Beitr. Mykol. 3: 91-93.


Colonies effuse, grayish, tufted. Mycelium mostly immersed. Stroma often present but not large. Setae and hyphopodia absent. Conidiophores macronematous, mononematous, caespitose, straight or flexuous, sometimes geniculate, unbranched or rarely branched, olivaceous brown or brown, paler towards the apex, smooth. Conidiogenous cells integrated, terminal, polyblastic, sympodial, cylindrical, cicatrized, scars usually conspicuous. Conidia solitary, acropleurogenous, simple, obclavate or subulate, colourless or pale, pleuriseptate, smooth.

**Type species:** *Cercospora apii* Fres.

The acknowledgement of a new taxon *Cercospora*, as was made by Fresenius (1863), to characterise a group of imperfect fungi with tail-like spores that has previously been
classed in other genera. He accommodated the hitherto undescribed species which he named *C. apii* and which he clearly indicated to be the type of the genus.

Cooke (*Grevillea* 3: 182, 1874) described the genus *Virgasporium*. But subsequently he changed his *V. maculatum* Cooke and *V. clavatum* (Gerara.) Cooke to *Cercospora resedae* and *C. clavata* respectively.

The taxonomic position of the genus *Cercospora* is almost universally accepted as being a member of the form-family Dematiaceae, under the order Hyphomycetes of the form-class Deuteromycetes (Fungi Imperfecti).

Saccardo (1880) defined *Cercospora* with brown conidiophores and vermiform conidia which are brown, olivaceous or rarely subhyaline and gave as examples *C. depazeoides* (Desm.) Sacc. and *C. ferruginea* Fuckel but did not mention the type species *C. apii*. He repeated this definition in *Syll. Fung.* 4 (1886).

Spegazzini (1910) published a new generic name *Cercosporina* to accommodate species with olivaceous conidiophores and hyaline conidia: i.e. with the characters of *C. apii*. He repeated this definition in *Syll. Fung.* 4 (1886).

Saccardo (1913) took up *Cercosporina* and later (1931) transferred 89 species from *Cercospora*, including not only species with colourless conidia (Similar to *C. apii*) but also several species with pale brown conidia. Miura (1928) actually transferred *C. apii* to *Cercosporina*.

Miura (1928) proposed a new genus *Cercosporiopsis*, distinguished from *Cercospora* by having coloured conidia, filiform, vermiform, cylindric, 2 or more septate, and conidiophores simple, denticulate-nodulate, coloured and transferred 7 species in that genus from *Cercospora* but he did not mention a type for his new genus.

Petrak (1951) redefined *Chaetotrichum* Syd. to include some species previously included in *Cercospora*. 

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Chupp (1953) made no attempt to divide *Cercospora* as done by Penze (1927) and Solheim (1930), but Chupp's monograph on *Cercospora* provides the valuable source of reference to almost all the names published up to 1953.

From time to time certain species of *Cercospora* have been transferred to more suitable genera (*Stigmina* e.g.) or to new and sometimes monotypic genera by different authors. Muntanola (1960) proposed a new genus *Phaeoramularia* into which she transferred several species from *Cercospora*. Ellis (1976) also transferred several species from *Cercospora* to *Phaeoramularia*. Deighton is still working on *Cercospora* and allied genera since 1959. He transferred several species of *Cercospora* to the genera: *Cercosporidium, Mycocentrospora, Mycovellosiella, Cercoseptoria, Pseudocercospora* and *Phaeoramularia* up to the year 1979.

Deighton (1973a, 1973b and 1974, 1976, 1979-83) laid much stress on the thickening of the scars on the conicophores of *Cercospora* like fungi. He is of opinion that they belong to two distinct taxonomic categories: a) Conidiophores with thickened conidial scars showing as rim, and b) Conidiophores with unthickened conidial scars. According to Deighton there are variations in the thickening of the scars in the first category which may allow some further taxonomic divisions, but the distinction between thickened and unthickened is unambiguous.

About 2000 species of *Cercospora* have been published of which more than about 500 species have been reduced to synonym or transferred to more suitable genera (*Pseudocercospora, Stenella, Cercoseptoria, Mycovellosiella, Phaeoramularia* etc.) by Deighton and other authors.

Perfect stage of very few species of *Cercospora* have been worked out. They have all been assigned to the genus *Mycosphaerella* belonging to the Pyrenomycetes (Ascomycetes).
Suggested key to the included species of *Cercospora* of Nagaland

A. Conidia hyaline or sometimes subhyaline

B. Conidia acicular to narrowly obclavate

C. Conidiophores unbranched

D. Stroma present

E. Conidiophores pale olivaceous brown, solitary to fasciculate, in fascicles of 2-9 divergent stalks, paler and narrower towards the tip, tip narrowly subtruncate, 27-85 x 3.5-5μm; conidia 28-128 x 5-6μm, base truncate.

..............C. achyranthina

EE. Conidiophores yellowish brown, fasciculate, usually 10-30 divergent stalks in a fascicle, uniform in colour, slightly narrower towards the tip, tip rounded to subconic, 8-40 x 3-5μm; conidia 16-92 x 2.5-4μm, base obconically truncate.

..............C. scopariae

DD. Stroma none

Conidiophores medium dark brown to light brown, fasciculate, 3-12 divergent stalks in a fascicle, tip truncate to obconically truncate, 26-146 x 3.5-6μm; conidia 27 - 190 x 3 - 5μm, base truncate to subtruncate.

..............C. capsici

CC. Conidiophores branched, medium to deep olivaceous brown, 6-18 divergent stalks in a fascicle, tip rounded to obconically truncate, 15-125 x 3.5-6μm; conidia 24-144 x 2.5-4.5μm, base truncate to subtruncate; stroma none.

..............C. zinniae
BB. Conidia obclavato-cylindric to cylindric;
   Conidia indistinctly 2-6 septate, base truncate to obconically truncate, 28-100 x 3-5 μm; conidiophores unbranched to branched, tip bluntly rounded to subtruncate, 18-70 x 3-6 μm.

...............C. physalidis

AA. Conidia subhyaline to coloured

B. Conidia acicular to narrowly obclavate or obclavato-cylindric

C. Conidia acicular to narrowly obclavate, medium olivaceous brown, distinctly multiseptate (4-9), tip acute to subobtuse, base obconically truncate, 40-112 x 4-7 μm.

...............C. adinae

CC. Conidia acicular to obclavato-cylindric, subhyaline to very faintly olivaceous, 2-15 indistinctly septate, base truncate to obconically truncate, tip acute to subacute, 25-109 x 3-6 μm.

...............C. argyreiae

BB. Conidia cylindric to obclavate

C. Conidiophores fasciculate

D. Stroma present

E. Conidial base obconically truncate

F. Conidia cylindric to obclavate, 20-65 x 4-7 μm; stroma slight to medium sized, globular to subglobular, dark brown, up to 40 μm in diam.; conidiophores 16-80 x 4-6 μm, tip rounded to obconically truncate.

...............C. manihotae
FF. Conidia narrowly obclavate, to cylindric, 40-155 x 3-6µm; stroma poorly developed, globular to irregular, pale brown, up to 30µm in extent; conidiophores 28-125 x 4-6µm, tip truncate.

...............C. cocciniae

FFF. Conidia obclavate to obclavato-cylindric, 18-80 x 3-5µm; stroma globular to subglobular, up to 50µm in diam.; conidiophores 8 – 30 x 3-5µm, tip bluntly rounded to subtruncate.

...............C. wrightiae

EE. Conidial base truncate to obconically truncate

F. Conidia obclavate, subhyaline to pale olivaceous brown, pleuriseptate (2-8), 22-75 x 3-5µm; stroma moderately developed, globular to subglobular, deep brown, up to 42 µm in diam.; conidiophores 10-66.8 x 4-5.5µm, tip subconoid to roundish.

.............C. combreti-ovalifolii

FF. Conidia obclavato-cylindric to cylindric, subhyaline to pale olivaceous, indistinctly multiseptate (3-20), 45-126 x 4-5.5µm;
stroma poorly developed, dark brown, 20-40µm in diam.;
conidiophores 35-135 x 3.5-5µm; tip usually subtruncate.

...............C. papayae

DD. Stroma none

Conidia obclavate, pale olivaceous brown, base rounded to obconically truncate, 30-95 x 4-8µm; conidiophores 45-135 x 4-6µm, tip subtruncate to rounded.

...............C. litseae-lactae
CC. Conidiophores solitary to fasciculate, 3-6 divergent stalks in a fascicle, tip roundish, 50-145 x 4-6μm; conidia cylindro-obclavate, subhyaline to pale olivaceous, base obconically truncate, 30-95 x 4-9μm.

.................... *C. mikaniacola*


Fig.44

Leaf spots amphigenous, mostly epiphyllous, few, circular to subcircular, scattered, sometimes coalescent, greyish brown centre surrounded by reddish brown to dark brown margin, 0.5-3mm in diameter. Caespituli amphigenous, better on the dorsal surface, evenly distributed over the spots. Stroma few, small, sometimes lacking, globular, medium brown to dark brown in mass, 6-22μm in diam. Conidiophores solitary to fasciculate, in fascicles of 2-9 divergent stalks, emerging through the stomata, pale olivaceous brown, paler and narrower towards the tip, 1-5 septate, straight to curved, sometimes 0-3 geniculate, unbranched, conidial scars (1-3) present, lying at the tip or at the point of geniculations of the conidiophores, conidial scars 2-3 μm in diam., tip narrowly subtruncate with scar, 27-85 x 3-5.5μm. Conidia acicular to narrowly obclavate, hyaline to subhyaline, multisepctate (2-13), straight to curved, base truncate, tip acute to subacute, 28-128 x 3-5μm.

**Specimen studied:** On the living leaves of *Achyranthus aspera* Linn. (Family-Amaranthaceae), St.John School Campus, Diphu Road, Dimapur, Nagaland, India, T.K. Jana, 10.04.2001, PCC 5125.

Fig. 44: *Cercospora achyranthina*

A-C. Conidiophore fascicles
D. Solitary conidiophores
E. Conidiophores
F. Conidia

Fig. 45

Leaf spots amphigenous, distinct on dorsal surface, pale yellow, scattered to coalescent at maturity, circular to subcircular, homogeneous, 2-8μm in diameter. Caespituli amphigenous, chiefly epiphyllous. Stroma small, brown, globular to slightly elongated, 10-25 μm wide. Conidiophores emerging through the stomata, fasciculate, fascicles somewhat dense, usually 10-30 divergent stalks in a fascicle, yellowish brown, straight to flexuous, uniform in colour, slightly narrower towards the tip, sparingly septate (0-4), unbranched, sometimes 1-2 geniculate, conidial scars (1-3) minute and indistinct, tip rounded to subconic with scar, 8-40 x 3-5μm. Conidia hyaline, narrowly obclavate, straight to mildly curved, 2-9 septate, base obconically truncate, tip acute, 16-92 x 2.5-4μm.

Specimen studied: On the living leaves of *Scoparia dulcis* Linn. (Family-Scrophulariaceae), Diphu Road, Dimapur, Nagaland, India, T.K. Jana, 14.4.2001, PCC 5134, ITCC 4870.01.


Fig. 46

Leaf spots amphigenous, circular to subcircular, few to numerous, scattered, mostly with three zones, centre white, then brown and a third of dark margin, sometimes coalescent, necrotic, sometimes bearing a shot-hole appearance, 1-8mm in diameter. Caespituli amphigenous, evenly distributed over the spots, dark brown. Stroma none or not well developed, consisting of a few deep brown hyphal cells. Conidiophores fasciculate, 3-12
Fig. 46: *Cercospora capsici*

A-C. Conidiophore fascicles

D. Conidiophores

E. Conidia
Fig. 45: *Cercospora scopariae*

A-C. Conidiophore fascicles
D. Conidiophores
E. Conidia
divergent stalks in a fascicle, emerging through the stomata, sometimes more, medium dark olivaceous brown to light brown, gradually paler and slightly narrower towards the apex, straight to curved, simple, pleuriseptate (2-8), smooth, thick walled, geniculate (0-4), conidial scar lying at the tip or at the point of geniculation of the conidiophores, tip truncate to obconically truncate, 26-146 x 3.5 - 6μm. Conidia hyaline, thin walled, acicular to narrowly obclavate, straight to mildly curved, smooth, indistinctly pleuriseptate (2-16), base truncate to subtruncate, tip acute to subobtuse, 27-190 x 3-5μm.

**Specimen studied**: On the living leaves of *Capsicum frutescens* Linn. (Family- Solanaceae), Ao-Kashiram, Dimapur, Nagaland, India, T.K. Jana, 10.11.2001, PCC 65183.


Fig.47

Leaf spots amphigenous, distinct, circular to irregular, numerous, scattered to coalescent, white to grey centre with wide dark brown margin, sometimes leaving a shot-hole, 1-5mm in extent. Caespituli amphigenous, mostly epiphyllous, deep brown. Stroma none or poorly developed, composed of a few dark brown cells. Conidiophores usually fasciculate, 6-18 divergent stalks in a fascicle, straight to curved, medium to deep olivaceous brown, slightly paler and narrower towards the apex, pleuriseptate (1-8), simple to branched, sometimes 1-3 mildly geniculate, smooth, thick walled, conidial scars (1-4) distinct, lying by the side wall or at the tip of the conidiophores, tip rounded to obconically truncate, 15-125 x 3.5-6μm.
Fig. 47: Cercospora zinniae
A-C. Conidiophore fascicles
D. Conidiophores
E. Conidia

Fig. 47: *Cercospora zinniae*
A-C. Conidiophore fascicles
D. Conidiophores
E. Conidia
Conidia acicular to obclavate, straight to slightly curved, indistinctly multiseptate (3-16), base truncate to subtruncate, tip acute to subacute, 24-144 x 2.5-4.5μm.

Specimen studied: On the living leaves of *Zinnia elegans* Jacq. (Family-Asteraceae), Rottomi Village, Zunheboto, Nagaland, India, T. K. Jana, 10.4.2000, PCC 5126, ITCC 4863.01.

A review of literature (Ellis, 1971, 1976; Chupp, C., 1953; Bilgrami. *et al.*, 1979, 1981, 1991; Sarbhoy *et al.*, 1996; Singh, S.N. *et al.*, 1974) shows that this species has not yet been reported from the state of Nagaland. Hence it is reported for the first time from this state.


Fig.48

Leaf spots amphigenous, scattered, sometimes coalescent, circular to subcircular, greyish brown centre surrounded by yellow margin, 2-8mm in diameter. Caespituli amphigenous, usually stromatic. Stroma small, globular to irregular, brown, 12-30μm in extent. Conidiophores mostly fasciculate, 2-10 divergent stalks in a fascicle, olivaceous brown, almost uniform in colour and width, sometimes slightly irregular being wider or swollen elsewhere, distinctly 0-8 septate, straight to curved, sometimes 1-2 geniculate, unbranched to occasionally branched, conidial scars (1-6) distinct, tip bluntly rounded to subtrunacte with scar, 18-70 x 3-6μm. Conidia hyaline, obclavato-cylindric to cylindric, indistinctly 2-6 septate, straight to slightly curved, base truncate to obconically truncate, tip subobtuse to obtuse, 28-100 x 3-5μm.

Specimen studied: On the living leaves of *Physalis minima* Linn. (Family-Solanaceae), Diphu Road, Dimapur, Nagaland, India, T.K. Jana, 12.4.2000, PCC 5124, ITCC 4862.01.
Fig. 48: *Cercospora physalidis*

A-C. Conidiophore fascicles
D. Stroma
E. Conidiophores
F. Conidia
Review of literature (Chupp, C., 1953; Bilgrami. et al., 1979, 1981, 1991; Sarbhoy et al., 1996; Singh, S.N. et al., 1974; Ellis, 1971, 1976) shows that this species has not been reported from the state of Nagaland. Hence it is reported for the first time from this state.


Fig.49

Leaf spots amphigenous, circular to subcircular, scattered, sometimes coalescent, numerous, on upper surface greyish brown to rusty brown centre with dark to almost black zone, on lower surface uniformly dull brown, sometimes leaving a shot-hole, 1-7mm in diameter. Caespituli chiefly hypophyllous evenly distributed over the spots, dark brown. Stroma poorly developed, globular to slightly irregular, deep brown, 14-30 μm in diam. Conidiophores fasciculate, fascicles dense, usually emerging through stomata, pale brown to medium brown, paler and narrower towards the tip, slightly irregular in width, straigh to curved, unbranched, occasionally branched, smooth, thick walled, distinctly multiseptate (0-5), geniculate (up to 3) near the apex, conspicuous scars (1-5) lying at the tip or at the point of geniculation of the conidiophores, tip rounded to subconic, 16-55 x 4-6.5μm. Conidia subhyaline to medium olivaceous, straight to mildly curved, multiseptate (4-9), tip acute to subobtuse, base obconically truncate with a prominent hilum, 40-112 x 4-7μm.

*Specimen studied:* On the living leaves of *Adina cordifolia* (Roxb.) Hook.f., Tiyi Mountain, near Wokha Town, Wokha, Nagaland, India, , T.K. Jana, 11.8. 2000, PCC 5140, ITCC 4440.01

Review of literature (Chupp, C., 1953; Bilgrami. et al., 1979, 1981, 1991; Sarbhoy *et al.,* 1996) shows that that this species has yet not been reported from the state of Nagaland. Hence it is reported for the first time from this state.
Fig. 49: *Cercospora adinae*

A-C. Conidiophore fascicles

D. Conidiophores

E. Conidia

**Fig. 50**

Leaf spots amphigenous, prominent on dorsal surface, older leaves more affected; circular to subcircular, scattered, sometimes coalescent, dark reddish brown centre with narrow yellowish brown margin, vein limited, and 1-5mm in diameter. Caespituli amphigenous, chiefly epiphyllous, dark brown, unevenly distributed over the spots. Stroma poorly developed, globular to subglobular, composed of compact mass of isodiametric deep brown cells. Conidiophores usually fasciculate, fascicles not dense, 3-10 divergent stalks in a fascicle, pale to medium olivaceous brown, slightly paler towards the tip, almost uniform in width, pleuriseptate (1-5), straight to curved, sometimes 1-3 geniculate, simple to occasionally branched, conidial scars (0-4) distinct, tip rounded to subconic with scar, 20-125 x 3.5-5μm. Conidia subhyaline to very faintly olivaceous, acicular to obclavato-cylindric, 2-15 indistinctly septate, straight to slightly curved, base truncate to obconically truncate, tip acute to subacute, 25-109 x 3-6μm.

**Specimen Studied:** On the living leaves of *Argyreia hookeri* Clarke. (Family-Convolvulaceae), South point Colony, Zunheboto, Nagaland, India, T. K. Jana, 24.02.2001, ITCC 4926.01, PCC 5183.

Review of literature literature (Chupp, C., 1953; Bilgrami. *et al.*, 1979, 1981, 1991; Sarbhoy *et al.*, 1996) shows that this species has not yet been reported from the state of Nagaland. Hence it is reported for the first time from this state.
Fig. 50: *Cercospora argyreiae*
A-C. Conidiophore fascicles
D. Conidiophores
E. Conidia

Fig. 51

Leaf spots amphigenous, distinct on dorsal surface, few, scattered, circular to subcircular, whitish to greyish centre, occasionally with a wide yellowish brown to reddish brown margin, sometimes coalescent, vein limited, 3-12 mm in diameter. Caespituli amphigenous, but more abundant on the upper surface, evenly distributed over the spots, black. Stroma slight to medium sized, globular to subglobular, consisting of compactly arranged isodiametric, dark brown hyphal cells, up to 40 μm in diam. Conidiophores fasciculate, 3-15 (sometimes more) divergent stalks in a fascicle, arising from the stroma, straight to curved, unbranched, medium olivaceous brown to brown, uniform in colour, slightly irregular in width, pleuriseptate (2-5), thick walled, geniculate (0-3), conspicuous conidial scars lying at the point of geniculation or at the tip of conidiophores, tip rounded to obconically truncate, 16-80 x 4-6 μm. Conidia cylindrical to obclavate, straight to slightly curved, subhyaline to pale olivaceous, multisepate (3-6), smooth, thin, base obconically truncate, tip subacute to obtuse, 20-65 x 4-7 μm.

Specimen studied: On the living leaves of Manihot sp. (Family-Euphorbiaceae), Sakraba Village, Phek, Nagaland, India, T.K. Jana, 12.02.2001, PCC 5179.

Review of literature literature (Bilgrami. et al., 1979, 1981, 1991; Sarbhoy et al., 1996; Chupp, C., 1953; Ellis, 1971, 1976) reveals that this species is reported for the first time from Nagaland


Fig. 52

Leaf spots amphigenous, distinct on upper surface, few, scattered, rarely coalescent, circular to subcircular, grey to white in the center surrounded by raised dark brown margin,
Fig. 51: *Cercospora manihotae*

A-D. Conidiophore fascicles
E. Conidiophores
F. Conidia
Fig. 52: *Cercospora cocciniae*

A-B. Conidiophore fascicles
C. Conidiophores
D. Conidia
sometimes leaving a shot hole, 1-4mm indiameter. Caespituli amphigenous, mostly epiphyllous, densely and evenly distributed over the spots. Stroma poorly developed, subglobose to irregular, pale brown, 9-30µm in extent. Conidiophores fasciculate, fascicles rarely dense, 5-20 divergent stalks in a fascicle, coming out through the stomata, medium olivaceous brown, straight or undulate, almost uniform colour and width, distinctly multisepitate (2-6), 1-4 geniculate, thick walled, smooth, conspicuous conidial scar lying at the tip or point of geniculation of the conidiophores, tip truncate, terminated with scar, 28-125 x 4-6µm. Conidia narrowly obclvate, cylindric, straight to mildly curved, indistinctly plerisepitate (3-10), smooth, thin walled, subhyaline to pale olivaceous, base obconically truncate, tip acute to subobtuse, 40-155 x 3-6µm.

Specimen studied: On the living leaves of *Coccinia grandis* (Linn.) Voigt. (Family-Cucurbitaceae), Rail Colony, Dimapur, Nagaland, India, T.K Jana, 14.30.2000, ITCC 4866.01, PCC 5129.

Review of literature literature (Chupp, C., 1953; Bilgrami. et al., 1979, 1981, 1991; Sarbhoy et al., 1996; Singh, S.N. et al., 1974) shows that this species has yet not been reported from the state of Nagaland. Hence it is reported for the first time from this state.


Fig.53

Leaf spots amphigenous, circular to subcircular, scattered, sometimes coalescent, pale brown to dullgrey centre with yellowish brown margin, lesions occasionally developing a shot hole appearance, 0.5-5µm in diameter. Caespituli amphigenous, evenly distributed over the spots. Stroma globular to subglobular, dark brown, small to medium sized, 15-50µm in diam. Conidiophores emerging through the stomata, fasciculate, fascicles dense, 10-15 divergent stalks, pale to medium olivaceous brown, paler toward the tip, uniform to slightly irregular in
Fig. 53: *Cercospora wrightiae*

A-C. Conidiophore fascicles
D. Conidiophores
E. Conidia
width, distinctly 1-5 septate, unbranched, straight to curved, rarely 0-2 mildly geniculate, conidial scars distinct, medium sized, number of spore scars 1-3, tip bluntly rounded to subtruncate with spore scar, 8-30 x 3-5μm. Conidia obclavate to obclavato-cylindric, pale olivaceous brown, straight to midly curved, 1-9 septate, base short obconically truncate, tip subobtuse, 18-80 x 3-5μm.

**Specimen studied:** On the living leaves of *wrightia tomentosa* Roem & Schult. (Family-Apocynaceae), Diphu Road, Dimapur, Nagaland, India, T.K. Jana, 11.2.2000, ITCC 4927.01, PCC 5184.

Review of literature literature (Chupp, C., 1953; Bilgrami. *et al.*, 1979, 1981, 1991; Sarbhoy *et al.*, 1996; Singh, S.N. *et al.*, 1974) shows that this species has yet not been reported from the state of Nagaland Hence it is reported for the first time from this state.


**Fig.54**

Leaf spots amphigenous, scattered, circular to subcircular, reddish brown at early stage but whitish centre with reddish brown margin at maturity, distinct on dorsal surface, indistinct on ventral surface, scattered, vein limited, 1-7mm in diam. Caespituli amphigenous, chiefly epiphyllous, brown, irregularly distributed over the spots. Stroma moderately developed, globular to subglobular, deep brown, 11-42μm in diam. Conidiophores fasciculate, fascicles somewhat dense, 1-23 divergent stalks, straight to bent, simple, pale brown, paler towards the apex, smooth, thick walled, multiseptate (1-4), slightly irregular in width, 0-2 geniculate with lateral scars, no. of scar 1-3 and diam. of 1-2μm, apex subconic to roundish with prominent and distinct conidial scar, 10-66.8 x 4-5.5μm. Conidia subhyaline to pale olivaceous brown, obclavate, straight to curved, smooth, pleuriseptate (2-8), base truncate to obconically truncate, apex obtuse, 22-75 x 3-5μm.
Fig. 54: *Cercospora combreti-ovalifolii*

A-C. Conidiophore fascicles.

D. Conidiophores

E. Conidia

20µm
Specimen studied: On the living leaves of *Combretum grandiflorum* Roxb. (Family-Combretaceae), Midland Colony, Wokha, Nagaland, India, T.K. Jana, 25.11.2000, ITCC 4449.01,. PCC 5169.

Review of literature (Chupp, C., 1953; Bilgrami. *et al.*, 1979, 1981, 1991; Sarbhoy *et al.*, 1996; Singh, S.N. *et al.*, 1974; Ellis, 1971, 1976) shows that this species has yet not been reported from the state of Nagaland. Hence it is reported for the first time from this state.


Fig.55

Leaf spots amphigenous, distinct on upper surface, numerous, subcircular to irregular, scattered to coalescent, older leaves more affected, mostly along the margin of lamina, uniformly brown or with greyish centre and pale brown margin, necrotic, sometimes developing a shot-hole, 1-6mm in exzent. Caespituli amphigenous, chiefly epiphyllous, evenly distributed over the spots, blackish brown, usually stromatic. Stroma few to many, poorly developed, consisting of dark brown, isodiametric hyphal cells, 20-40μm in diam. Conidiophores usually fasciculate, 5-30 divergent stalks in a fascicle, arising from the base of the stroma and rarely through the stomata, straight to curved, medium brown, somewhat paler and slightly narrower towards the tip, longer ones slightly irregular in width, thick walled, pleuriseptate (2-10), sometimes 0-4 geniculate, simple, conspicuous conidial scar lying at the tip or against the side wall of the conidiophores, tip usually subtruncate, 35-135 x 3.5-5μm. Conidia obclavate cylindric to cylindric, subhyaline to pale olivaceous, indistinctly multiseptate (3-20), smooth, thin walled, base truncate to obconically truncate with a thickened hilum, 45-126 x 4-5.5μm.

Specimen studied: On the living leaves of *Carica papaya* Linn. (Family-Caricaceae), Diphu Road, Dimapur, Nagaland, India, T.K. Jana, 14.02.2003, PCC 5998.
Fig. 55: *Cercospora papayae*
A. Conidiophore fascicles
B. Conidiophores
C. Conidia
Review of literature (Chupp, C., 1953; Bilgrami. et al., 1979, 1981, 1991; Sarbhoy et al., 1996; Singh, S.N. et al., 1974; Ellis, 1971, 1976) shows that this species has not been reported from the state of Nagaland. Hence it is reported for the first time from this state.

_Cercospora litsea-lactae_: T.K. Jana, A.K. Das et. S.N. Ghosh sp. nov.

Fig. 56

Maculae amphigenae, distinctae, paucae, dispersae, subcircularis vel irregulares, interdum aggregatae, venas limitatae, atridenique atro-brunneae centro, zonula lata pallide brunneae cinctae, 1-4mm diam. Caespituli paecipue epiphylli, inaequaliter disseminati. Stroma nulla vel minuta, atrobrunnea. Conidiophora laxe fasciculata, 2-8 in fasciculo, moderate flavo-brunnea, sursum pallidiora, simplicia, recta vel undulata, plerumque aequalis vel leniter irregulares latae, 2-7 distincte septata, crasse tunicata, laevia, 0-3 leniter geniculata, distincte cicatrices conidiales (1-5), 2-3μm diam., apicem subtruncata vel rotundata, 45-135 x 3.5-6μm. Conidia pallide olivaceo-brunnea, obclavata, recta vel curvata, parieta tenui, laevia, pleuriseptata (2-12), basim subtruncata, apice acuta vel subacuta, 30-95 x 4-5μm.

Leaf spots amphigenous, distinct, few, scattered, subcircular to irregular, occasionally coalescent, vein limited, older leaves more affected, black, becoming blackish brown centre with pale brown border, often leaving a shot hole, 1-4 mm in diameter. Caespituli chiefly epiphyllous, unevenly distributed over the spots. Stroma none or poorly developed, composed of a few dark brown cells; conidiophores fasciculate, fascicles not dense, consisting of 2-8 divergent stalks, medium yellowish brown, paler towards the apex, not branched, straight to undulate, almost uniform to slightly irregular in width, very distinctly 2-7 septate, thick walled, smooth, 0-3 mildly geniculate, distinct conidial scar (1-5) situated at subtruncate tip or at the junction of the geniculation of conidiophores, sometimes
Fig. 56: *Cercospora litseae-lactae*

A-B. Conidiophore fascicles
C. Conidiophores
D. Conidia
along the sides without geniculation, scar 2-3 \( \mu m \) diam., tip subtruncate to rounded, 45-135 x 3.5-6\( \mu m \). Conidia pale olivaceous brown, obclavate, straight to curved, thin walled, smooth, pleurisepate (2-12), base rounded to obconically truncate, tip acute to subacute, 30-95 x 4-8\( \mu m \).

**Specimen studied:** On the living leaves of *Litsea lacta* Wall. (Family: Lauraceae), Rottomi Village, Zunheboto, Nagaland, India, T.K.Jana, 25.09.2000, PCC 5167 (Holotype), ITCC 4859. 01 (Isotype).

**Etymology:** From the name of the host genus.

A review of literature (Bilgrami et al., 1979, 1981, 1991; Chupp, 1953; Deighton, 1976, 1979, 1985; Ellis, 1971, 1976; Kar and Mandal, 1969; Das, 1989; Sarbhoy et al., 1996; Sutton, 1996) shows that only one species of *Cercospora* viz. *C. litseae-glutinosae* H. & P. Sydow is reported on *Litsea* sp. from Phillipines. The new species *C. litseae-lactae* is compared with the above mentioned species (Table-31).

From the comparative account it can be concluded that *C. litseae-lactae* sp.nov. differs from already reported species of *C. lactae-glutinosae* H.& P. Sydow by its vein limited leaf spots, epiphyllous caespituli, poorly developed stroma, longer, simple, distinctly septate and subtruncate conidiophores, longer obclavate conidia with rounded base and acute to subacute tip. These striking characters suggest separate identity of species. Hence *Cercospora listseae-lactae* demands its description as a new species.
Table 31. Comparative account of *Cercospora litseae-glutiosae* H. & P. Sydow with *C. litseae-lactae* sp. nov.

<table>
<thead>
<tr>
<th>Character</th>
<th>Proposed species (<em>C. litseae-lactae</em>)</th>
<th><em>C. litseae-glutinosae</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf spots</td>
<td>Amphigenous, distinct, subcircular to irregular, vein limited, few, scattered, black, becoming blackish brown centre with pale brown border, often leaving a shot hole</td>
<td>Dark brown to black on upper surface with paler centre, on lower surface indistinct</td>
</tr>
<tr>
<td>Caespituli</td>
<td>Chiefly epiphyllous</td>
<td>Hypophyllous</td>
</tr>
<tr>
<td>Stroma</td>
<td>None or poorly developed</td>
<td>Lacking</td>
</tr>
<tr>
<td>Conidiophores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td>Medium yellowish brown</td>
<td>Pale brown</td>
</tr>
<tr>
<td>Branching pattern</td>
<td>Not branched</td>
<td>Branched</td>
</tr>
<tr>
<td>Septation</td>
<td>2-7 distinctly septate</td>
<td>Sparingly sepaate</td>
</tr>
<tr>
<td>Tip</td>
<td>Subtruncate to rounded</td>
<td>Rounded to conic</td>
</tr>
<tr>
<td>Size</td>
<td>45-135 x 4-6μm</td>
<td>10-35 x 3-5μm</td>
</tr>
<tr>
<td>Conidia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td>Pale olivaceous brown</td>
<td>Pale to very pale olivaceous</td>
</tr>
<tr>
<td>Shape</td>
<td>Obclavate</td>
<td>Obclavato-cylindric, shorter one distinctly cylindrical</td>
</tr>
<tr>
<td>Septation</td>
<td>2-12 septate</td>
<td>1-8 septate</td>
</tr>
<tr>
<td>Base and tip</td>
<td>Base rounded to obconically truncate and tip acute to subacute</td>
<td>Base obconically truncate and tip obtuse</td>
</tr>
<tr>
<td>Size</td>
<td>30-95 x 4-8μm</td>
<td>20-70 x 3-5μm</td>
</tr>
</tbody>
</table>

Fig.57

Leaf spots amphigenous, distinct, circular to irregular, greyish white centre surrounded by raised dark brown border, scattered to coalescent, necrotic, sometimes leaving a shot-hole, 1-3mm in extent. Caespituli amphigenous, chiefly hypophyllous. Stroma lacking or poorly developed. *Conidiophores* solitary to fasciculate, in fascicles of 3-6 divergent stalks, coming out through the stomata, midbrown, uniform in colour and diameter, multiseptate (4-8), smooth and thick walled, 1-5 abruptly geniculate, distinct conidial scars lying at the tip or at the point of geniculation of the canidiophores, tip rounded with scar, 50-145 x 4-6|µm. Conidia cylindro-obclavate, straight to slightly curved, multiseptate (5-10), subhyaline to pale olivaceous, tip obtuse to subobtuse, base obconically truncate, 30-95 x 4-9|µm.

**Specimen studied:** On the living leaves of *Mikania* sp. (Family-Asterinaceae), St. John School Campus, Dimapur, Nagaland, India, 10.03.2000, T. K. Jana, PCC 5123.


**Synonym:** *Biharia* Thirumalachar & Mishra, 1953, *Sydowia* 7:79-80.

Colonies effuse olive, olivaceous brown or brown, velvety or cottony. Mycelium mostly superficial; hyphae usually verruculose. Stroma often present, generally small, mostly superficial. Setae and hyphopodia absent. Conidiophores macronematous, mononematous, solitary on hyphae and caespitose on stromata, unbranched or occasionally loosely branched,
Fig. 57: *Cercospora mikaniacola*

A-B. Conidiophore fascicles

C. Solitary conidiophores

D. Conidia
straight or flexuous, olivaceous or brown, smooth. Conidiogenous cells polyblastic, integrated, terminal, sometimes becoming intercalary, sympodial, cylindrical, sometimes geniculate, cicatrized; scars usually conspicuous. Conidia mostly in simple or branched acropetal chains, but sometimes solitary, dry, fusiform or obclavate, pale to mid olive, olivaceous brown or brown, smooth, rugulose or verruculose, with 0,1 or several transverse septa.

**Type species:** *Stenella araguata* Syd.

The genus *Stenella* was first established by Sydow in 1930 and cited *Stenella araguata* Syd. as the type species. The genus and its type species have been redescribed and figured by Ellis (1971). Thirumalachar and Mishra (1953) described a *Cercospora*-like fungus and named it as a new genus *Biharia* with the type species *Biharia vangueriae*. Deighton in 1979 transferred *Biharia vangueriae* to *Stenella vangueriae*.

Mudler (1975) held the genus *Stenella* bears some relationship with the genera: *Cercospora, Cercosporidium* and *Helminthosporium*. But the main distinguishing characters of *Stenella* from the above genera are the narrow rod-like conidia which are in most cases catenate and verruculose, the conidial scars are thickened but lie flat against the spore wall and are not raised.

Deighton (1979) was of opinion that the genus *Stenella* has similarities with the genera *Mycovellosiella* Deighton (1965), *Cladosporium* Link ex Fries: Link (1815). But it differs from *Mycovellosiella* in having rough walled external mycelial hyphae (the cell subtending a conidiophores is usually smooth) and usually rough walled conidia which are brown, usually catenate sub-cylindric or narrowly obclavate cylindric and more than two septate. Again the genus *Stenella* can be differentiated from *Cladosporium* in possessing rough walled external mycelial hyphae and more *Cercospora*-like conidia.
Deighton (1979) transferred some species of *Cercospora*: *C. adeniae*, *C. cercestidis* and *C. gongronematis* (described by Yen and Gilles in 1975a and b) to the genus *Stenella*.

It appears from the above that there is a possibility that in course of further study some species of *Cercospora* and *Cercospora*-like fungi may be transferred to the genus *Stenella*.


Fig.58

Leaf spots amphigenous, distinct, olive to olivaceous brown, older leaves more affected, irregular, scattered, sometimes coalescent covering the major portion of the leaves. Mycelium mostly superficial; hyphae pale olivaceous brown, thinwalled, septate, minutely verruculose producing conidiophores laterally and terminally, 1-3.5µm in wide; conidiophores developed from external mycelial hyphae, brown, paler towards the apex, straigh to flexuous, smooth, unbranched or loosely branched, thickwalled, sometimes geniculate near the apex, 1-6 septate, 16-125 x 3.5-8µm. Conidia solitary, straigh or flexuous, cylindrical to narrowly obclavate, pale olivaceous, thin walled, verruculose, multisepate (1-11), septa distinct, tip subobtuse to subacute, base obconically truncate, 25-158 x 3-5µm.

**Specimen studied**: On the living leaves of *Aegle marmelos* Corr. (Family-Rutaceae), Tinali, Dimapur, Nagaland, India, T.K. Jana, 20.01.2002, PCC 6131, ITCC 4646.01.

Review of literature (Bilgrami et al., 1979, 1981, 1991; Sarbhoy et al., 1996; Ellis, 1971, 1976; Sarbajna, K.K. and Chattopadhay., B.K., 1991; Kumar, P. et al., 1980) shows that this species has not yet been reported from the state of Nagaland. Hence it is reported for the first time from this state.
Fig. 58: *Stenella aegles*

A&B. Mycelial hyphae with conidiophores

C. Conidia

Colonies effuse, grey, olivaceous brown, brown, dark blackish brown or black, often hairy or velvety. Mycelium immersed or superficial. Stroma present in some species. Setae and hyphopodia absent. Conidiophores macronematous, mononematous, straight or flexuous, unbranched, brown or olivaceous brown, smooth. Conidiogenous cells monotretic, integrated, terminal, percurrent, cylindrical or doliiform. Conidia solitary or catenate, dry, acrogenous, simple, oblate in most species, cylindrical in a few, subhyaline, pale to dark brown or olivaceous brown or straw-colour, septate or pseudoseptate, smooth in most species; verrucose in only a few (Ellis, 1971).

Type species: Corynespora cassiicola (Berk. & Curt.) Wei.

= C. mazei Güsow.


Fig. 59


= Corynespora melonis (Cooke) Lindau, 1910. in Rabenhorst's Kryptogamenfl. 2(1), 9: 805.


Fig. 59: *Corynespora cassiicola*

A&B. Conidiophore fascicles
C. Solitary conidiophores
D. Conidia


Leaf spots amphigenous, black, circular to subcircular, scattered to coalescent, few, mostly marginal, velvety, 2-6 mm in diameter. Caespituli mostly epiphyllous, black, slightly effuse, well developed, unevenly distributed over the spots. Mycelium both immersed and superficial; superficial hyphae pale brown to mid olivaceous brown, branched, thin walled, septate, 3-5 μm wide. Stroma none. Conidiophores solitary to fasciculate, with 3-6 divergent stalks in a fascicle, straight to flexuous, mid brown, with up to 5 successive cylindrical proliferations, simple, smooth, thick walled, sometimes swollen at the base of the cylindrical proliferations, tip bluntly rounded, 70-350 x 6-9 μm. Conidia usually solitary, rarely catenate (up to 2 in a chain), simple, obclavate to cylindrical, straight to curved, pale olivaceous brown, smooth, thick walled, with 3-15 pseudoseptate, thickened scar present either at one or both the ends, base truncate, apex rounded, 40-170 μm in length and 9-16 μm thick at the broadest part.

**Specimen studied:** On the living leaves of *Corchorus aestuans* Linn. (Family: Tiliaceae), Suren Colony, Wokha, Nagaland, India, T.K. Jana, 20.03.2001, ITCC 4865.01, PCC 5128. Review of literature (Bilgrami *et al.*, 1979, 1981, 1991; Sarbhoy *et al.*, 1996; Ellis, 1971, 1976; Jain, R.K. *et al.*, 1976; Leite, R.S. and Barreto, R.W., 2000) shows that this species has not yet been reported from the state of Nagaland. Hence it is reported for the first time from this state.


Colonies effuse, usually grey, dark, blackish brown or black. Mycelium all immersed or partly superficial; hyphae colourless, olivaceous brown or brown. Stroma rarely formed. Setae and Hyphopodia absent. Conidiophores macronematous, mononematous, simple or irregularly and loosely branched, pale brown or brown, solitary or in fascicles. Conidiogenous cells integrated, terminal becoming intercalary, polytretic, sympodial, or sometimes monotretic, cicatrized. Conidia catenate or solitary, dry, typically ovoid or obclavate, often rostrate, pale or mid olivaceous brown, or brown, smooth or verrucose, with transverse and frequently also oblique or longitudinal septa (Ellis, 1971).

**Type species:** *Alternaria alternata* (Fries) Keissler,

synonym: *A. tenuis* Nees ex Pers.

The genus *Alternaria* was founded by Nees in 1817 on the single species *Alternaria tenuis*, the type of the genus. Fries (1932) did not recognise the genus in his *Systema Mycologicum* but cited the Nees species as synonym of *Torula alternata*. Chevalier (1836) said that *Alternaria* differs from *Torula* in having very marked and filiform intervals separating the articulations.

Montagne (1846) erected the genus *Rhopalidium*. Von Hohnel (1910) studying the type specimen of the genus *Rhopalidium* and concluded that there could be no reasonable doubt that *R. brassicae* Mont. & Fr. = *A. brassicae* (Berk.) Sacc. var. *macrospora* Sacc. (= *M. brassicae* Berk.).

The name *Alternaria* has come into vogue as the result of the work of Elliot (1917) followed by that of Bolle (1924), Mason (1928), Wiltshire (1933) but Angell (1929) gave good reasons for his preference for *Macrosporium* Fr., which name, however, Bolle would use in an entirely different sense.
The foundation species of *Alternaria* and *Macrosporium* was studied afresh by Wiltshire (1933) who proposed that the genus *Macrosporium* should be suppressed as a nomen ambiguum in favour of the genus *Alternaria*, typified by *Alternaria tenuis* Nees, the type specimen of which Wiltshire was unable to locate for examination.

He (1933) transferred *Macrosporium tenuissima* (Nees) Fr., to *Alternaria tenuissima* (Fries) Wiltshire as a new combination. At the same time he concluded that both the genera appear to be based on material belonging to the same genus *Alternaria* as now generally used. Jolly (1964) in his survey of *Alternaria*, differentiated *Stemphylium* Wallroth in its original sense (and in the sense of Wiltshire section *Eustemphylium*) and disposed in *Alternaria* several taxa similar to *S. lanuginosum* which have been considered controversial by earlier students of the group. The genus *Pleospora* is described as the perfect state of several species of *Alternaria*.

**Suggested key to the included species of *Alternaria* of Nagaland**

A. Leaf spots amphigenous; conidiophores 25-120 x 6-10μm; conidia solitary, obclavate, Transverse septation 4-14, longitudinal and oblique septation 0-4, unbranched, 70-240 x 15-25μm.

On *Brassica* sp.

----------*A. brassicace*

AA. Leaf spots amphigenous; conidiophores 30-125 x 4-7μm; conidia solitary or in short chain (2-3), obclavate to ellipsoidal, Transverse septation 3-8, longitudinal and oblique septation 0-3, 33-55 x 12-18μm.

On *Amaranthus viridis* Linn.

----------*A. compacta*

(Combination made while citing *A. brassicae* (Berk.) Sacc. v. *minor* Sacc.)


*Rhopalidium brassicae* Mont. & Fr. 1856. in Montagne’s *Syll. Crypt.* p.297.


*Cercospora lepidii* Peck, 1884. 35th *Rept. N. Y. State Mus.* 1884: 140.


Alternaria hercula (Ellis & Mart.) Elliott, 1917. Amer. J. Bot. 4: 472.


Alternaria exitiosa (Kuehn) Jorstad, 1945. Melding fra Statens Plantepatologiske Institute No. 1, P. C 94.

Fig. 60

Leafspots amphigenous, circular to subcircular, sometimes irregular, scattered to coalescent virulent, initially dark brown becoming grey centre with darkbrown margine, necrotic, often leaving a shot-hole, 1-6mm extent. Caespituli amphigenous, non-stromatic. Conidiophores solitary or in groups of 2-6, emerging through stomata, mid-pale greyish olive, smooth, usually unbranched, erect or ascending, straight or flexuous, thick walled, multispetate (2-4), frequently geniculate with prominent scar at geniculation, scar also
Fig. 60: *Alternaria brassicae*
A&B. Conidiophore fascicles
C. Solitary conidiophores
D. Conidiophores
E. Conidia
present on the side wall of the conidiophores, more or less cylindrical, slightly swollen at the base, apex rounded with large conidial scar, 25-120 x 6-10µm. Conidia solitary, straight or slightly curved, obclavate, tapering to long beak, very pale olive or greyish olive, smooth, basal cell rounded with hilum, transverse septation 4-14, longitudinal and oblique septation 0-4, slightly constricted at the septa, beak septate, not branched, paler than the body of the conidium measuring 30-100 x 4-8µm, conidia with beak, 70-240 x 15-25µm.

Specimen studied: On the living leaves of *Brassica* sp. (Family- Brassicaceae), Leric Colony, Kohima, Nagaland, India, T. K. Jana, 25.02.2001, PCC 6136.

Review of literature (Bilgrami *et al.*, 1979, 1981, 1991; Sarbhoy *et al.*, 1996; Ellis, 1971, 1976; Narain, Udit, 1983; Rao, V.G., 1963, Singh, S.R. and Singh, R.I., 1990) shows that this species has not yet been reported from the state of Nagaland. Hence it is reported for the first time from this state.


Fig. 61

Leafspots amphigenous, circular to subcircular, few, greyish brown, scattered, mostly marginal, sometimes necrotic, 2-7mm in diameter. Caespituli amphigenous, non-stromatic; mycelium partly immersed and partly superficial, superficial mycelium usually branched, septate, brown, 3-6µm wide bearing conidiophores both laterally and terminally. Conidiophores arising usually singly, rarely in small groups of 2-3, simple or occasionally branched, straight or flexuous, multispetate (2-5), pale to mid olivaceous or golden brown, smooth, geniculate with lateral scars, base slightly swollen, apex rounded with single conidial scar, 30-125 x 4-7µm. Conidia solitary or in short chain (2-3), obclavate, sometimes
Fig. 61: *Alternaria compacta*

A&B. Mycelial hyphae with conidiophores
C. Conidiophores
D. Conidia
ellipsoidal, mid olivaceous brown, usually smooth, transverse septation 3-8, longitudinal and oblique septation 0-3, slightly constricted at the septa, beak short, unbranched, smooth, paler, indistinctly septate, 7-25μm long and 5-7μm thick, conidia with beak, 33-55 x 12-18μm.


### HOST INDEX

*(Prepared based on the present work)*

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