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Lonavalomyces - A New Anamorphic Ascomycetes Genus reported from Lonavala, Western Ghats of India.

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ABSTRACT

During a mycological excursion to the Western Ghats of India in 2017, an interesting anamorphic fungi with catenate conidia was collected. An unusual morphological feature includes the presence of simple to branched conidiophores bearing holoblastic, simple to branched conidial chains, possessing large, spherical, brown, verrucose apical conidia and small, brown, spherical to sub spherical successive conidia. The conidia are interconnected by isthmi and are held together as a persistent chain with a continuous outer wall layers including the large apical cell. In morphology, new collection is distinct from the allied genera such as *Basipetospora, Chalara, Chalaropsis, Thielaviopsis, Gilmaniella, Chalara* state of *Ceratocystis adiposa and Thielaviopsis* state of *Ceratocystis paradoxa.* A description, illustrations, and comparison with allied taxa are presented.

Key words: Anamorphic, Ascomycetes, Isthmus, Western Ghats.

INTRODUCTION

The Western Ghats or Sahyadri is a UNESCO World Heritage Site and is one of the eight "hottest hotspots" of biological diversity in the world. It has an exceptionally high level of biological diversity and endemism and is situated in the southern west coast of Indian peninsula and covers an area of about 160,000 square kilometeres. The pristine natural forests, microhabitats, and tropical warm humid climate that prevail in the Western Ghats support many rare and new forms of fungi (Dubey and Moonambeth, 2013 a, b, c, 2014). As a part of studies of terrestrial Litter Fungi, field surveys and visits were conducted to Patches of Western Ghats in the year 2017. During this pilot investigation, along with several rare and new micro-fungi an unusual and very interesting genus was collected growing on the twigs of fallen Bamboo twig.

MATERIAL AND METHODS

Samples of dried twigs were placed in paper and aluminium foil bags, taken to the laboratory, and prepared according to Castaneda–Ruiz (2005). Mounts were prepared in PVL (polyvinyl alcohol, lactic acid, and phenol), and measurements were made at different magnification. Photomicrographs were taken with the help of Nikon eclipse 50 i Microscope connected with Nikon DS– Fi 1 camera was used. Scanning Electron microscopic images were also captured by using Zeiss Scanning Electron Microscope Model EVO 18–12 –97.

RESULTS

Lonavalomyces Dubey Gen. nov. (Fungi, Ascomycota) **(**MB 828731)

Colonies epicolous, flat, brown, branching hyphae, septate, colorless or slightly brown, roughned; Conidiophores borne laterally or terminally along the vegetative hyphae, simple or branched, brown, smooth to verrucose; Conidiogenesis is holoblastic; Reproductive structures in form of long persistent conidial chain; Conidial chains borne apically or laterally on conidiophores; conidial chains unbranched or branched, mostly stalked or sometimes sessile, having 4-8 conidia per chain with one apical large verrucose conidium and successive small conidia; Apical conidium, large, spherical, brown, with heavy walls, verrucose, normally separates from the conidial chain on maturity, sometimes produces germ tubes after detachment from the chain; successive conidia mostly spherical, but variable in shape and size, sometimes appears cup shaped as the half wall breaks up. The conidia are interconnected by isthmi and are held together as a persistent chain with a continuous outer wall layers including the large apical cell.

SPECIMEN EXAMINED: India, 18° 44' 53.0160" N and 73° 24' 25.9884" E, Lonavala, Maharashtra, 01 Nov. 2017 , on fallen Bamboo stems, Rashmi Dubey, BSI 134150, MB 82873.

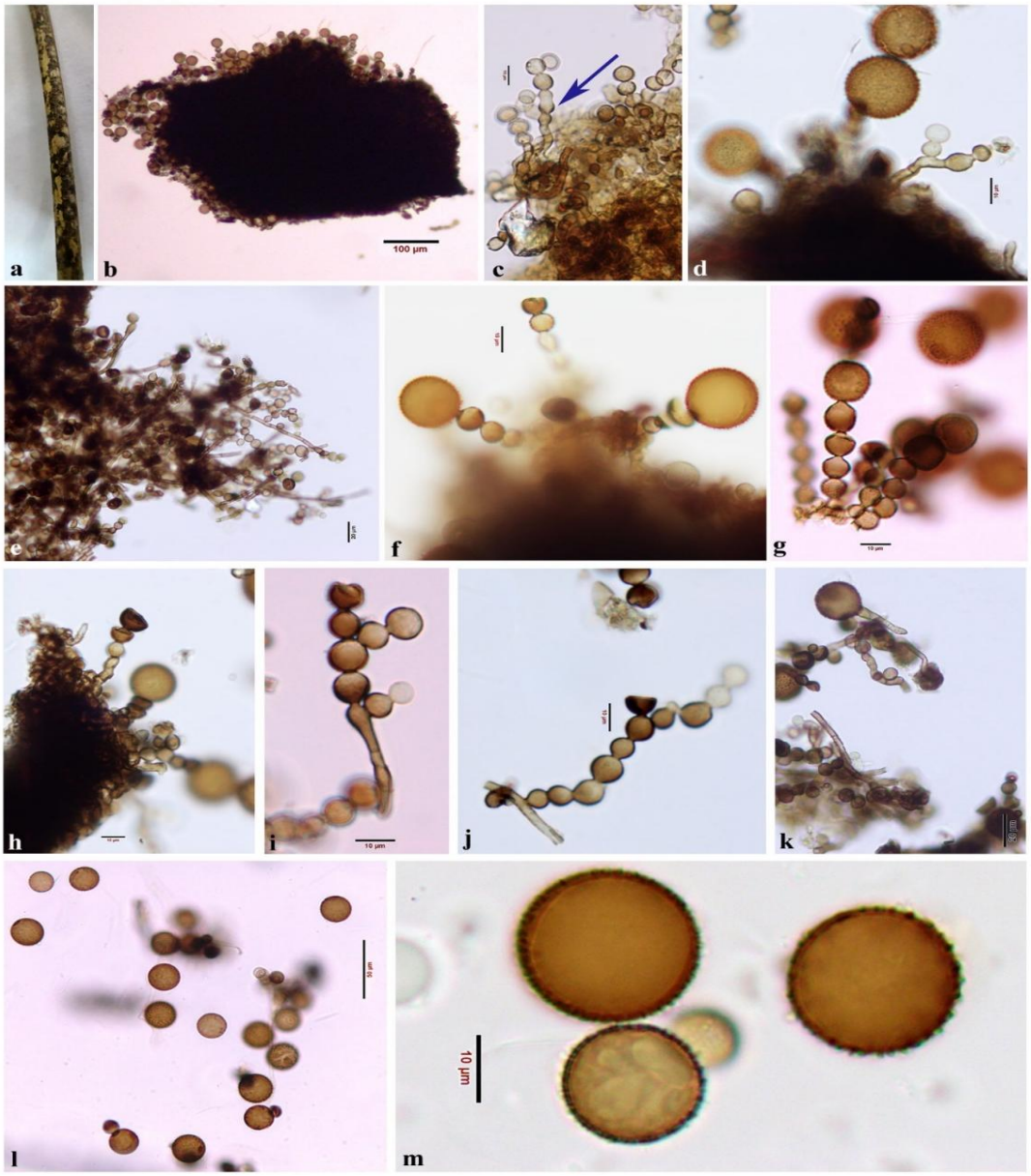

Fig.1 *Lonavalomyces indicus* Dubey Gen.et sp.nov. **a.** growth of fungal colony on bamboo stem; **b.** Colonies; **c-d.** arrow indicating holoblastic conidiogenesis; **e.** conidiophores bearing long conidial chains; **f.** Large apical conidium attached to the conidial chain; **g.** unbranched conidial chain; **h.** Cup shaped conidia; **i-j.** branched conidial chain; **k.** Mature apical conidia producing germ tube; **l-m.** Detached apical large verrucose conidia

Lonavalomyces indicus Dubey sp.nov. (MB 828732)
On PDA 30 days, no growth, On MEA and PCA, 32 days, no growth observed.

Colonies brown and 2-3 mm on natural subtrate; Hyphae, septate, colorless or slightly brown, roughned, 1-4.5 µm wide; Conidiophores, simple or branched, brown, smooth to slightlyverrucose, 20-90 µm long; Conidial chains only of one type, stalked or sessile, unbranched or branched, 4-8 conidia per chain , 40 - 80 µm long possessing one apical large sphaerical verrucose conidium and successive small conidia. Conidial development holoblastic,. Apical conidium, large, spherical, brown, verrucose, with heavy walls, verrucose, 18-20 µm in diameter, sometimes produces germ tubes after detachment from the chain. Successive conidia are light brown to brown, catenate, verrucose and sometimes smooth, mostly spherical, widely elongated or cup shaped, but variable in shape, 8.5- 13.5 µm in diam, and are interconnected by isthmi.

Etymology: The genus name has been proposed on the basis of name of place of collection.

Teleomorph: unknown /not observed

Known distribution: Found in Natural forest of North Western Ghats of India.

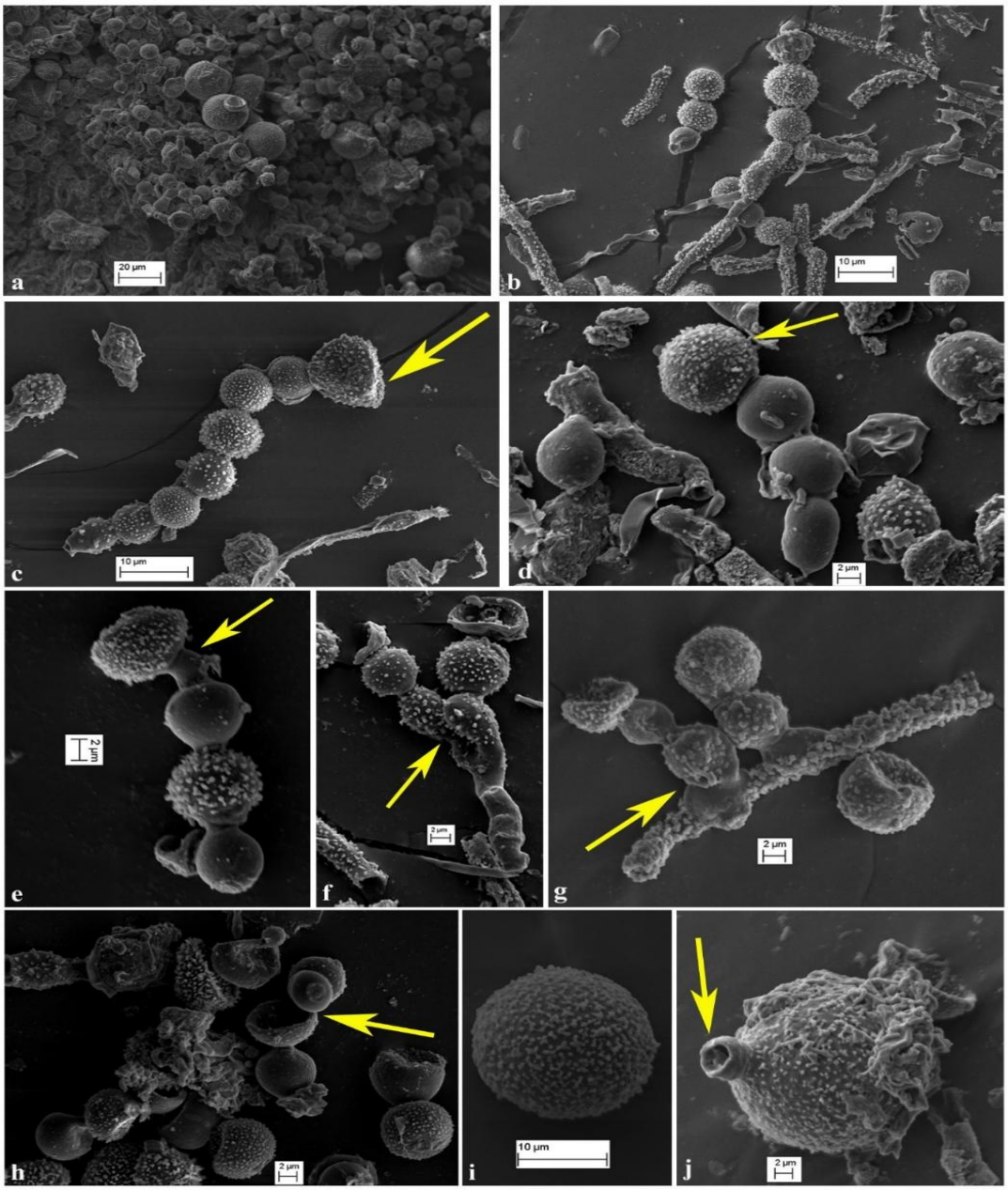

Fig. 2. Scanning Electron Microscopic images **a.** Colonies; **b.** conidiophores bearing verrucose conidial chains; **c-d.** arrow indicating large apical conidium; **e.** arrow indicating the isthmus; **f.** Branched conidiophores; **g.** conidial chainarisng laterally from conidiophores; **h.** cup shaped conidia; **i.** Mature apical verrucose conidia; **j.** Mature apical conidia with a basal pore.

DISCUSSION AND CONCLUSION

Some important features of the present collection was cleared through Scanning Electron microscopic studies, which clearly depicts that the conidiogenesis is exclusively holoblastic and are not enteroblastic and produces conidia in a basipetal succession and does not leave any collerette at the tip of phialide. The fungi were grown in Potato Dextrose Agar, Malt Extract Agar and Potato Carrot Agar for more than 30 days each, but the results were negative and no pure growth were observed in any of the media.

Detail morphological studies reveals that the newly reported collection falls close to the genera such as *Basipetospora* G.T. Cole & W.B. Kendr. 1968 , *Chalara* (Corda) Rabenh. 1844, *Chalaropsis* Peyronel 1916, *Thielaviopsis* Went 1893; *Gilmaniella* G.L. Barron 1964, *Chalara* state of *Ceratocystis adipose* Butler c. Moreau 1952 and *Thielaviopsis* state of *Ceratocystis parado*xa (Dade) Moreau 1962. In *Basipetospora*, conidiophores are simple, straight or flexous and resembling the vegetative hyphae, the conidia are borne in the short chain from simple conidiophores, the first conidium is derived from the swollen apex of the conidiophore and subsequent conidia are derived from the conidiophore in a basipetal series. The length of conidiophore shortens as the successive conidia forms is the Diagnostic feature of *Basipetospora*, whereas in the present collections, the length of conidiophores does not shortens on the formation of successive conidia and the development is holoblastic. The present collection to some extent also resembles with the *Chalara* state of *Ceratocystis adiposa* in having spherical to pyriform conidia in long chain and also in having one large, globose, pigmented apical conidia in each chain. But the *Chalara* state of *Ceratocystis adiposa* possess two types of conidial chains, out of which one chain is easily fragmented and composed of hyaline to pale brown endo- phialoconidia and the other chain is persistent and is composed of large hyaline or pigmented conidia which are enteroblastic and phialidic. Hutchinson (1939) and Bhat (1972) also claimed that the persistent conidia of *C.adiposa* are held together in a chain by a continuous outer layer, which is also in the present collection. But the existence of large globose conidia were not mentioned by Bhat. Profound studies shows that in the proposed genus the conidiophores are simple to branched, conidial chains also is branched, the conidiogenesis is exclusively holoblastic and are is not enteroblastic and produces conidia in a basipetal succession and does not leave any collerette at the tip of Phialide whereas the dark pigmented chains of *Chalara* state of *Ceratocystis adiposa* is enteroblastic in nature and leave a collerette at the tip of Phialide. In *Thielaviopsis* state of *Ceratocystis paradoxa* also two types of conidial chains are found. One chain consists of arthroconidia catenate, doliiform, ellipsoidal to ovoid, very dark brown, smooth, rather thick walled sometimes with a hyaline longitudinal slit, whereas the second chain consists of cylindrical to ellipsoidal colourless, pale to mid golden brown phialoconidia. In *Lonavalomyces* only one type of chain is present and no hyaline slits are found in the conidia. And at the same time, the Large dark apical cell is absent in *Thielaviopsis* state of *Ceratocystis paradoxa*.

In *Chalariopsis* , the aleuroconidia are produced singly, In *Thielaviopsis* the thick walled aleuroconidia are produced in chains upon specialized hyphae. Although, recently Paulin-Mahady (2002) have amended the genus *Thielaviopsis* based on phylogentic studies and have included all *Chalara* like species with *Ceratocytis* affinities with or without arthroconidia which when produced in chains or singly as in *Chalariopsis*. In *Gilmaniella* the conidia are solitary, dry, acropleurogenus, dark brown, spherical, solitary, sometimes in chain but with very distinct apical pore. To some extent it also resembles the *Gilmaniella bambusae* Umali, Goh & K.D. Hyde, 1998 in the presence of chain of conidia and large apical conidia, but in G. *bambusae* a distinct germ pore is present in every conidia, which is absent in the present collection. The present collection is a assemblage of Bhatt collection and *Chalara* state of *Ceratocystis* adiposa, but totally differs from these two in having holoblastic conidiogenesis, branched conidiophores and branched conidial chains and more over no collarettes were observed during conidiogenesis. Therefore, it evident that the present fungal collection deserves the rank of new genus.

Key to the new genus

1. Conidia produced singly or sometimes in chains on conidiophores……3
2. Conidia always produced in chains on conidiophores……...4

3a. Conidia always produced singly on conidiophores……..*Chalariopsis*

3b. Conidia with distinct apical pore always produced singly or sometimes in chain on conidiophores……*Gilmaniella*

4a. Conidial chains are of one type……....5

4b. Conidial chains are of two types……...6

5a. The conidia chain is normally attached to simple conidiophores and the length of conidiophore shortens as the successive conidia forms and all arthroconidia in chain are almost similar…….*Basipetospora*

5b. The conidial development is holoblastic and the conidial chain is normally attached to simple or branched verrucose conidiophores, and sometimes are sessile, the length of conidiophores does not shortens on the formation of successive conidia. conidial chains possessing large, spherical, brown, verrucose apical conidia and small brown successive conidia……***Lonavalomyces***

6a. Two types of conidial chains out of which, one chain consists of hyaline to pale brown endoconidial phialoconidia and the second chain consists of large enteroblastic, phialidic, sometimes holoblastic conidia..... .....……*Chalara* state of *Ceratocystis adiposa*.

6b Two types of conidial chains out of which, one chain consists of consists of cylindrical to ellipsoidal colourless, pale to mid golden brown phialoconidia and the second chain consists of catenate, doliiform, ellipsoidal to ovoid, very dark brown, smooth, thickwalled with hyaline longitudinal slit arthroconidia……*Thielaviopsis* state of *Ceratocystis paradoxa*.

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