

Contributions towards our knowledge of Indian Discomycetes. II.

Two new operculate Discomycetes.

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With 1 Textfig.

In a previous paper of this series, the writer reported on some new species and new records of operculate *Discomycetes* from India. The present paper treats of two species and a new genus of the same group.

Discomycetella Sanwal gen. nov.

Apothecia glabrous, disc shaped, with a convex hymenium which is intensely gelatinous. Hymenium restricted to the upper surface only. Asci very long and tapering to a stem like base and opening by means of an apical lid. Spores hyaline, elliptical and smooth. Vegetative mycelium external, snow white in colour.

Apothecia glabra, discoidea, hymenio convexo, valde gelatinoso. Hymenium in pagina superiore tantum evolutum. Asci longissimi, in stipitem attenuati, operculo apicali dehiscentes. Sporae hyalinae, ellipsoideae leves. Mycelium vegetativum superficiale, niveum.

Discomycetella aquatica Sanwal sp. nov.

Apothecia sessile, gregarious or scattered, reddish in colour, externally gelatinous, smooth and glabrous, reaching a diameter of 0.6 cm. Hymenium strongly convex, smooth and restricted to the upper surface only. Asci cylindric or sub-cylindric, 8-spored, tapering gradually to a stem-like base, measuring $22 \approx 360 \mu$. Ascospores ellipsoid smooth, hyaline with a central guttula, measuring $20 \mu \times 12 \mu$. Paraphyses septate, as long as the asci, tips very slightly swollen and filled with dirty greenish granules. Mycelium snow white on solid medium, but dirty white in liquid cultures. Accessory or asexual spores not known.

Apothecia sessilia, gregaria vel dispersa, pallide rubescentia, valde gelatinosa, levia, glabra, usque ad 0.6 cm. diam.; hymenium convexum, leve, in superiore pagina tantum evolutum. Asci cylindracei vel subcylindranei 8-spores, paulatim in stipitem attenuati, $360 \approx 22 \mu$. Sporae ellipsoideae, leves, hyalinae, guttula centrali praeditae $20 \approx 12 \mu$. Paraphyses septatae, ascos aequantes supra inflatae et granulis sordide viridulis farctae.

Habitat: on the surface of submerged rotten wood, under running water, towards the river bank.

Locality: River Ganga, Lachman Jhoola, Hardwar. leg., B. D. Sanwal and Kartar Singh, January 13, 1952. **Distribution:** only known from the type locality.

During a survey of the Hardwar area, this fungus was collected in the hope that it would eventually turn out to be some species of the alga *Nostoc*. The gelatinous disc of the fungus resemble to a

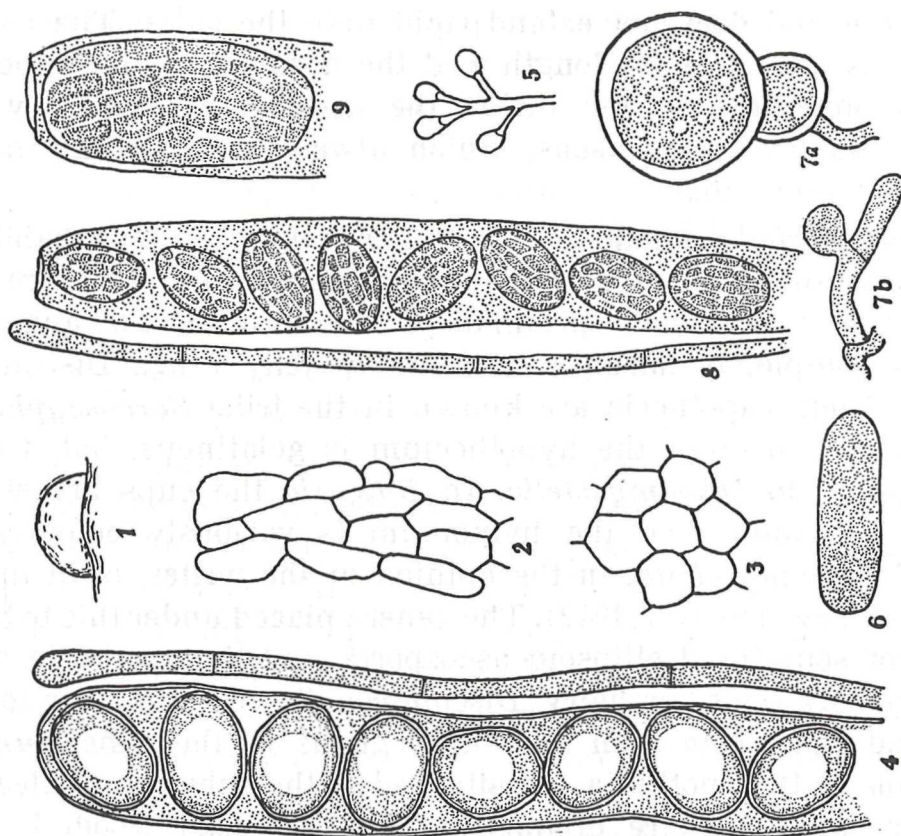


Fig. 1—4. *Discomycetella aquatica*. Fig. 1, Habit $\times 5$. Fig. 2, Subhymenial cells $\times 480$. Fig. 3, Hypothecial cells $\times 480$. Fig. 4, a single ascus with ascospores $\times 480$. Fig. 5—9, *Ascobolus indicus*. Fig. 5, oidiophores (diagrammatic) $\times 10$ (approx.). Fig. 6, a single oidium $\times 480$. Fig. 7 a, b, chlamydospores $\times 480$. Fig. 8, a single ascus with ascospores $\times 315$. Fig. 9, a single abnormal spore $\times 315$.

great extent old *Nostoc* balls (fig. 1). The vegetative mycelium is external like in *Pyronema*. It was from such mycelia that a sterile culture of the fungus was obtained on solid medium. The ascospores fail to germinate either in water or on agar surface. Apothecia are freely produced in sterile water to which a little sterilised straw is added. The fungus, however, quickly loses its fertility in artificial cultures and on solid media apothecia are never produced. The hyphal cells are densely studded with fat globules, which the mycelium has a slimy appearance.

The disc like apothecium is differentiated into three parts. The basal or sub-hymenial part constitutes the bigger, bulk and this is firmly glued over the surface of the rotting wood. The cells of the sub-hymenium are broad, polygonal in shape and closely compressed together. Towards the sides of the apothecium the sub-hymenial cells become stretched in a longitudinal direction (fig. 2). The hypothecium is constituted of very small cells, mostly polygonal, arranged in two or three rows (fig. 3). They are half as small as the sub-hymenial cells. The hymenium occupies the convex side of the apothecium and does not extend right upto the sides. The asci and paraphyses are of equal length and the ascospores are disposed in a single longitudinal row inside the ascus (fig. 4). They occur towards the tip of the ascus, which alway opens by means of a terminal operculum.

Discomycetella aquatica is peculiar not only in its habitat but also in certain other respects. The intensely gelatinous nature of the apothecium is one such peculiarity. When dried the apothecium becomes completely shrunk as in many jelly fungi. Discomycetes with gelatinous apothecia are known in the tribe *Sarcoscyphae*. In *Bulgaria*, for instance the hypothecium is gelatinous, but it cannot be compared to *Discomycetella*. In *Bulgaria* the cups are stipitate, densely tomentose and the hymenium is variously coloured. The place of *Discomycetella*, in the opinion of the writer, is in the tribe *Humariae* (sensu Seaver, 1942). The genera placed under this tribe have smooth or sculptured ellipsoid ascospores and the apothecia are not conspicuously setose or hairy. *Discomycetella* comes nearer to *Psilopezia* and *Pyronema* than any other genus in the tribe *Humariae*. In *Psilopezia* the apothecia are attached to the substratum clear upto the edges and they are produced mostly on dead wood. However, all known species in *Psilopezia* are exclusively terrestrial. The genus *Pyronema* is very much akin to *Psilopezia* and in practise it is very difficult to distinguish the two genera. The only difference perhaps is the superficial nature of mycelium in *Pyronema*. Vegetative mycelium in the case of *Discomycetella* is also superficial and gelatinous. It is related on the one hand with *Psilopezia* and on the other with *Pyronema*, but it is unique in being gelatinous and aquatic. Certain other minor differences are the shape and the colour of the apothecium.

***Ascobolus indicus* Sanwal sp. nov.**

Apothecia gregarious or scattered, externally pale green in colour, glabrous and sessile. Hymenium usually slightly oncave, olive green in colour when young, latter dotted with black due to the protruding asci. Ascus hyaline, thin-walled, cylindric or sub-cylindric-gradually tapering to a stem-like base, measuring 230—250 μ ×

$\times 17 \mu$. Ascospores uniseriate, hyaline when young, then changing into violet and finally dark-brown at maturity, ellipsoid, thick walled, reticulated, reticulations running in the form of anastomosing ridges and furrows, measuring $10 \mu \times 17 \mu$. Paraphyses with olive green pigments, septate, apex rounded, scarcely broader at the tip, about 3μ wide. Asexual reproduction by means of oidia borne on oidiophores. Perennation by means of rounded, thick-walled chlamydospores.

Apothecia gregaria vel dispersa, extus pallide viridia, glabra, sessilia; hymenium subconcauum primo olivaceum, postea ob ascos protrudentes, nigrescens; asci, cylindranei vel subcylindranei, paulatim in stipitem attenuati, tenuiter tunicati, $230-250 \Rightarrow 17 \mu$. Sporae monostichae, primum hyalinae postea violaceae, in maturitate fusco-brunneae, ellipsoideae, episporio crasso, reticulato, $10 \Rightarrow 17 \mu$. Paraphyses olivaceo-viridulae, septatae, supra rotundatae, vix inflatae, ca. 3μ latae.

Habitat: cow dung.

Locality: Delhi, India. August 17, 1951. — Distribution: only known from the type locality.

Ascobolus indicus appeared in cow dung cultures kept in laboratory under humid conditions. What attracted the writer's attention with regard to this culture was the fact that no apothecia developed directly on the surface of the dung, but after a long time the greenish apothecia started appearing on the glass walls of the jar in which the cow dung was kept. This peculiarity was at first instance correlated with the presence, perhaps, of some staling products produced in culture by other coprophilous fungi. However, when the fungus was cultured on sterile solid media and then grown on sterilised dung the apothecia even then matured only towards the sides of the glass dish. Apothecial rudiments appearing over the surface of the dung gradually aborted out, and not one of them reached maturity. This behaviour of the fungus can perhaps be correlated with the greater amount of oxygen available towards the sides.

On the surface of the sterilised soil apothecia appear and reach maturity in about eight days time.

While the fungus resembles many other species of *Ascobolus* with regard to the size, shape and wall characters of ascospores, yet the nature of the oidiophores is different from any other species. Oidia are known in many other species of *Ascobolus* like, *A. carbonarius*, *A. stercorarius* etc. In all these cases the oidia arise on an erect oidiophore by a fragmentation of the latter from the top downwards. In *Ascobolus indicus*, on the other hand, the oidiophores get aggregated in cylindric coremia and this coremium emerges out from the substratum in the form of a column. In most of the cases,

however, it is variously branched (fig. 5). The whole structure is thus visible macroscopically as a very minute tree with a number of branches. This dendroid habit is only known in *Ascobolus indicus*. At the ultimate tips of the coremia a big, dirty white drop of liquid accumulates and in this shining drop the oidia lie for a very long time. Ultimately this drop with the oidia turns pale green and then shrinks. The oidia measure $28 \pm 8 \mu$ (average). They have got a dense cytoplasm and are invariably one celled (fig. 6). When placed in a drop of sterile water or a drop of nutrient medium in van Tieghem cells, they germinate readily. During germination the oidium gets fairly enlarged and from one side a small germ tube arises which ultimately gives rise to the whole mycelium.

Apart from oidia, certain thick walled chlamydospores are known which no doubt serve for perennation. Very few, if at all, operculate Discomycetes have chlamydospores. These chlamydospores arise either from the tips of the growing hyphae or from the sides of the old hyphal cells (fig. 7). In both the cases a small papilla arises to one side near the septum which becomes thick-walled. The exosporium becomes very thick and develops a golden yellow colour. They average 24μ . Ordinarily they do not germinate at room temperatures, but when subjected to a temperature of about 60°C ., they germinate after a few days. These chlamydospores are very resistant to the extremes of the temperature. In one experiment, cultures of *Ascobolus indicus* were grown on nutrient agar and when the plate was filled with hyphal growth on all sides, the dish was kept at a temperature of 60°C ., for two or three days. The mycelium was killed, but the chlamydospores, when separated and placed in nutrient agar germinated readily.

The ascospores of this fungus are of particular interest. The normal spores are violet and the reticulations are very close (fig. 8). Apart from these more frequent normal spores, there are others which show a great amount of difference from the normal ones. They differ in being much bigger than the normal spores in size. The bigger spores are more or less oval in size, with abruptly sharp ends (fig. 9), while in the normal ones the shape is decidedly completely elliptical. The reticulations also are very sparse in the bigger spores. The greatest difference, however, is in germination. The bigger spores germinate immediately when placed on nutrient agar. These two types of spores either occur individually in separate asci or in the same ascus in varying numbers. The duality of spore size and character is very unique in the fungus under consideration. As far as the writer is aware, such duality is not known except perhaps in the case of *Ascobolus pusillus* Boud., which occurs commonly on old burnt ground. This fungus shows a great variation as regards

the size and aspect of the spores, as was noted by Boudier in *Icones Mycol.* (pl. 412 f. a—i). The spores of this fungus also do not germinate after heat treatment. However, *A. indicus* is completely different from *A. pusillus*. The spores of the latter are ovoid and are much smaller, measuring about $10\text{--}11\ \mu \times 6\text{--}8\ \mu$. Besides this chlamydospores are not known in *A. pusillus*.

Saccobolus kerverni (Crouan) Boud., in *Ann. Sci. Nat.* 10: 229, 1869.

Syn. *Ascobolus kerverni* Crouan in *Ann. Sci. Nat.* 4: 193, 1858.

Habitat: on cow dung, Delhi, August 15. 1951.

Type locality: Europe.

Distribution: America, Bermuda, Porto Rico, Europe and India.

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