

Contributions towards our knowledge of the Indian *Discomycetes*. I.

Some new records and new species of operculate *Discomycetes*.

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With 1 Textfig.

The Indian *Discomycetes* are very little understood at present. Butler and Bisby (1931) in their 'Fungi of India' give only 19 records of the operculate *Discomycetes*. Mundkur (1938) and Mundkur and Ahmad (1946) record twelve more species in the same group, all of which are coprophilous. Cash (1948) adds six more humicolous species to this list. So far, therefore, only 37 operculate *Discomycetes* are known. At the suggestion of Dr. P. Rogers of the New York Botanical Gardens, U.S.A., the writer started a collection of *Discomycetes* from various parts of India. The present contribution is the outcome of the study of such collection made mostly in the temperate regions of the country at an altitude of 4,000—8,000 ft. above sea level. It treats of two new species in the operculate *Discomycetes* and some new records from India. All the specimens have been deposited in the mycological herbarium of the Delhi University.

1. *Pseudoplectania kumaonensis* Sanwal sp. nov.

Apothecia aggregated or scattered, black in colour, sessile or subsessile, attached to the substratum by means of brown, septate rhizoids. Mature apothecia cup shaped, deeply concave, reaching a diameter of 0.7 cm., covered on the outside with very small, almost inconspicuous hairs. Colour of the hymenium black; asci cylindrical or sub-cylindric, reaching a length of 120 μ and a diameter of 14 μ ; spores definitely one-seriate, hyaline or sub-hyaline, smooth, reaching a diameter of 12 μ ; paraphyses much longer than the asci, filiform, septate, pale brownish, reaching a diameter of about 200 μ and a breadth of 2.5 μ ; tips of the paraphyses variously shaped, closely pressed and glued together by means of a semi-gelatinous substance.

Apothecia aggregata vel dispersa, atra, sessilia vel subsessilia, hyphis septatis, quasi rhizoideis, brunneis matrici affixa, in maturitate calyciformia, profunde concava, usque ad 0.7 cm. diam., extus capillis minutissimis fere inconspicuis oblecta; disco nigro; asci cylindracei vel subcylindracei, usque ad 120 μ \cong 12 μ ; sporae omnino

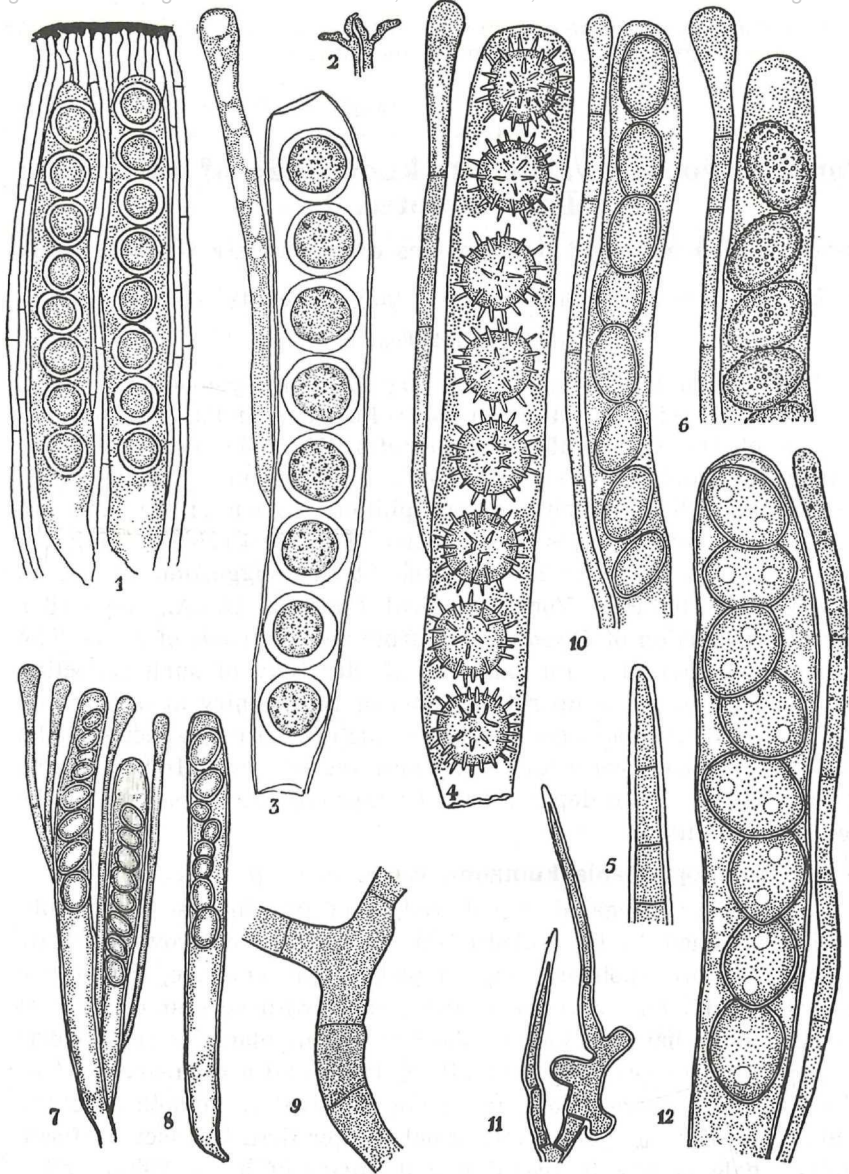


Fig. 1. *Pseudoptectania kumaonensis*, part of the hymenium showing the asci, ascospores and paraphyses which are glued at the apex $\times 480$. Fig. 2. branched paraphyses of *P. kumaonensis* $\times 480$. Fig. 3, 4 *Boudiera seaveri*, 3, upper part of a single ascus, showing the eight echinulate ascospores and paraphyses. $\times 480$. 4, young ascospores disposed in a single longitudinal row inside the ascus. $\times 480$. Fig. 5—8, *Patella scutellata*. Fig. 5, a marginal seta. $\times 480$. Fig. 6, part of an ascus with ascospores. $\times 480$. Fig. 7, asci with smaller, bigger and normal spores. $\times 315$. Fig. 8, ascus showing four small spores in the middle and two bigger

uniseriatae, hyalinae vel subhyalinae, leves, usque ad 12 μ diam. Paraphyses ascos multo superantes, filiformes, septatae, pallide brunneae, usque ad 200 μ longae, 2.5 μ latae, superne subgelatinoso-conglutinatae.

Habitat: On dead and rotting *Quercus* wood, on the ground, under dense shade.

Locality: Lohaghat (Kumaon), India. (elevation 6,000 ft.); June 2, 1951. — Distribution: known only from the type locality.

The genus *Pseudoplectania* was erected by Fuckel. At that time only two species, *P. nigrella* and *P. fulgens*, were included in this genus. *P. fulgens* was later removed by Saccardo to a new genus *Otidella*. In this genus he included two more species, *P. melania* and *P. stygia*. Seaver (1913, 1942), however, does not recognise the genus *Otidella* and makes *P. stygia* a synonym of *P. nigrella*. If we leave out *P. melania*, which is a doubtful species, at present only three genuine species are known in the genus *Pseudoplectania*, as interpreted by Seaver in his study of the North American cup-fungi.

Pseudoplectania kumaonensis is different from other species of this genus. It differs from *P. fulgens* in some respects, specially the colour of the apothecium, which is black in *P. kumaonensis* but orange in *P. fulgens*. From *P. vogesiaca* it again differs in the nature of the apothecium. In the former the apothecium is stipitate, while in the latter the cups are sessile or at most sub-sessile. Besides this, *P. vogesiaca* is of very large dimensions as compared to *P. kumaonensis*. However, it comes very close to *P. nigrella* (Syn. *Peziza nigrella*), but even here there are marked differences. The paraphyses are much enlarged at the apex in *P. nigrella* and filled with dark colouring matter, and externally the apothecium is clothed with dense hairs. In the present species, however, there are no coiled hairs on the outside, in fact, the hairs are very small and at most of the nature of excrescences. The nature of the paraphyses shown in figures 1 and 2 is strikingly different from those of any other species so far known. Paraphyses have been described as curved in *P. vogesiaca* but again they are never glued together as in *P. kumaonensis* (figs. 1 and 2). In the latter case a branching of the paraphyses is also common (fig. 2).

At the time this species was found under the shade of thick forests, it was very warm and dry. Very few cups were available and only the adult stage was represented in the one collection made.

ones on either side. $\times 315$. Fig. 9, 10, *Patella gilva*. Fig. 10 *P. gilva*, upper part of an ascus showing ascospores and paraphyses. $\times 480$. Fig. 11, *P. ricciophila*, marginal hairs showing branching and swollen bases $\times 315$. Fig. 12, *P. ricciophila*, upper part of an ascus with ovoid ascospores $\times 480$.

This species, however, seems to be very rare. A careful and protracted search was again made in July and September, but it could not be found.

2. ***Boudiera seaveri*** Sanwal sp. nov.

Apothecia mostly gregarious, but sometimes scattered, brightly coloured, orange or orange red in colour but never turning brown, sessile, 0.2—0.5 cm. in diameter. Hymenium restricted to the upper surface and sides; the lower surface attached to the substratum by delicate rhizoids. Hymenium, at maturity, covering the exposed surface of the plant, soft and velvety in appearance, composed of large asci and paraphyses. Asci clavate, smooth, thin walled, measuring $22 \rightleftharpoons 245 \mu$. Ascospore eight in number, disposed in a single longitudinal row, globose and hyaline; exospore smooth in the beginning but later becoming covered with spines (fig. 3). Ascospores, excluding the spines 14—15.6 μ including the spines 20—21 μ . Paraphyses large, clavate, extending above the asci, septate, swollen at the apex, measuring about 10 μ above and 4 μ below.

Apothecia gregaria, raro dispersa, aurantiaca vel rubro-aurantiaca, sessilia, 0.2—0.5 cm. diam., subtus hyphis mycelii tenuibus substrato affixa; hymenium maturum molliter velutinum; asci clavati, tenuiter tunicati, 8-spori $22 \rightleftharpoons 245 \mu$. Sporae monostichae, globosae, hyalinae, 14—15.6 μ diam., episporio primum levi, in maturitate dense spinuloso, spinulis ca. 5 μ longis; paraphyses clavatae, ascosuperantes, septatae, apice inflatae.

Habitat: on the surface of damp soil amidst mosses, in a shady place under a tree, on the raised margins of a small stream.

Locality: Kalika (Kumaon), India. (elevation 6,200 ft.); June 17, 1951. — Distribution: known only from the type locality.

The genus *Boudiera* was established by M. C. Cooke (1877) with *B. areolata* Cooke and Phillips from New Wales, as the type species. The diagnostic features of the genus, however, were not properly established and the name of the type species was also misleading. The spores are never areolate, as the name suggests, but echinulate. The true characters of *Boudiera*, as it is understood at present, were described by Seaver (1914) after a study of some authentic specimens. Since then *Sphaerosoma echinulatum* Seaver has also been transferred to this genus. As understood at present, the genus *Boudiera* has three species; *B. areolata* and *B. echinulata* are both coloured and *B. walkerae* is white.

Boudiera seaveri, named in honour of Dr. F. J. Seaver, one of the greatest students of *Discomycetes*, is different from all the species so far described in various characters. To facilitate comparison of the various species, table I is inserted below, summarising the principle characters:

Table I
Some characters of four species of *Boudiera*

Name	colour	habitat	size of asci	size of ascospores
<i>B. areolata</i> Cooke & Phil.	brown 2—3 mm.	soil	—	30—35 μ
<i>B. echinulata</i> (Seaver) Seaver	brown 2—8 mms.	soil	40—50 \Rightarrow 300—500 μ	35 μ
<i>B. walkerae</i> Seaver	white	soil	40 \Rightarrow 225 μ	25—30 μ
<i>B. seaveri</i> Sanwal	orange red	soil	22 \Rightarrow 245 μ	20—22 μ

B. seaveri differs from *B. walkerae* primarily in the colour of the apothecium, the colour being white in the case of the latter, and orange or orange red in the case of the former. In *B. walkerae* the apothecia are very much aggregated together and smaller. Spore measurements, however, are similar. Our species comes very close to the other two species, *B. areolata* and *B. echinulata*, but here also there are many differences. The main difference is the colour of the apothecium. While in the above two species the colour is orange in the beginning, it changes to dark brown in the mature cups. In *B. seaveri*, however, even the oldest cups do not show any change in the colour. They remain uniformly orange red. The measurements of the asci and ascospores, as will be evident from the table, are so dissimilar in *B. areolata* and *B. echinulata* on the one hand, and *B. seaveri* on the other, that this character alone could serve for the separation of the latter species from the former two species. The asci of *B. seaveri* are much smaller in length and half as much in breadth as those of *B. echinulata* and *B. areolata*. Besides this the ascospores are never scattered inside the ascus, when young, as in *B. echinulata*, but are disposed in a single longitudinal row from the very beginning (fig. 4). A comparison between *B. areolata* and *B. echinulata* shows that there is very little difference between the two. Eventually it might become necessary to unite them. The writer has refrained from doing so because of the non-availability of the type specimens.

B. seaveri was collected about the middle of July and it was found to occupy only a small patch of ground on a raised piece, at the bottom of which ran a small stream. Since then the writer has searched for the plant elsewhere but has never been able to find it, although it was available in good number throughout the year at the original site of collection. The species, therefore, seems to have a limited distribution and is very rare.

The plant is attached to the substratum by means of very delicate rhizoids which are inevitably broken when the plant is lifted from

the soil. The colour is due to the presence of an orange pigment in the paraphyses. These project much above the asci and give the plant a roughened appearance.

3. **Patella scutellata* (L.) Morgan in J. Mycol. 8: 187, 1902.

Syn. *Peziza scutellata* L. Sp. Pl. 1181, 1753. — *Elvela ciliata* Schaeff., Fung. Bavar. 4: 112, 1774. — *Patella ciliata* Weber, Wiggers, Fl. Hols. 106, 1780. — *Peziza aurantiaca* Bull., Herb. Fr. Pl. 10, 1780. — *Octospora scutellata* Hedw., Descr. 2: 10, 1788. — *Peziza ciliata* Hoffm., Veg. Crypt. 2: 25, 1790. — *Humaria scutellata* Fuck., Symb. Mycol. 321, 1869. — ?*Peziza laeticolor* Karst., Myc. Fenn. 1: 66, 1871. — *Scutellinia scutellata* Kuntze, Rev. Gen. Pl. 2: 869, 1891. — ?*Scutellinia laeticolor* Kuntze, Rev. Gen. Pl. 2: 869, 1891. — *Humariella scutellata* Schröt. Krypt. Fl. Schles. 3: 37, 1893. — *Ciliaria scutellata* Boud., Hist. Class. Discom. Eu. 61, 1907.

Type locality: Europe.

Distribution: North America, Mexico, Europe and India.

Habitat: On rotten wood or more rarely on soil. Collected at Kalika (Kumaon) during May-June, 1951 on small pieces of much decayed wood of *Rhododendron* (?) submerged in running water in a small stream amidst forest glades.

The plant is bright orange red in colour coming close to vermilion. The cups reach a diameter of 1 cm. or in very rare cases 1.5 cms. On the rims of the cups are present a number of stiff setae, which are pointed, brown and septate. The septa are very close (fig. 5). When the plant was collected in September from the same locality it was found growing on soil adjoining the banks of the stream, associated with the roots of certain annual Dicotyledons.

The general characters of the plant tally very well with the description given for *P. scutellata*. However, there are certain characteristics which need a little closer attention. The outer coat of the spores in this cases is covered with small, rounded and uniform warts which give it a roughened appearance (fig. 6). The colour of the hymenium is very variable. When the plant occurs on the soil in shady places the colour is orange, but when in full sunshine the colour is orange red tending towards vermilion. Another fact of some importance is the variability of the spores. The normal spores measure on the average $17 \pm 12 \mu$, while the bigger spores measure $12 \pm 22 \mu$ and the smallest ones measure about $11 \pm 13 \mu$. One single ascus either contains all normal spores or it has four larger spores and four smaller ones. Sometimes, the first four spores of an ascus are smaller and these are followed by four larger spores arranged in a single row (fig. 7). At other places the asci show a different arrangement. There are two larger spores, followed by four smaller and again two larger spores (fig. 8). The smaller spores are some-

* According to Kanouse (Mycologia 39: 655, 1947), the valid name for this genus is *Humaria* and this has been accepted by Cash (1948).

what more hyaline than the normal spores. A similar spore dimorphism is also known for *Bulgaria inquinans* Fr. (Syn. *Phaeobulgaria inquinans* (Fr.) Nannf.). The ascus is very long, sub-cylindric, measuring about $232 \mu \times 16 \mu$. The septate paraphyses exceed the asci in length (fig. 6) and become inflated at the tip. They are filled with an orange red pigment. They differ in some ways from those of *P. scutellata* but in the writer's opinion such small differences may be ignored and these may be treated merely as ecological variations.

4. *Patella gilva* (Boud.) Seaver in North American cup-fungi supplementary ed., 166, 1942.

Syn. *Peziza gilva* Boud., Cooke. Mycographia 240, 1879. — *Trichiarina gilva* Boud., Hist. Class. Discom. Eu. 57, 1907. — *Lachnea gilva* Sacc., Syll. Fungorum 8: 184, 1889. — *Scutellinia gilva* Kuntze, Rev. Gen. Pl. 2: 869, 1891.

Type locality: Europe.

Distribution: New York, Europe, India.

Habitat: on damp walls overgrown with mosses and liverworts. Nainital (Kumaon); September 18, 1951 and Mossy falls (Mussorie); January 13, 1952.

This species, as occurring in India, varies slightly from the European and North American forms. The writer collected it on damp soil from a wall, which was overgrown during the rains with mosses and liverworts. The original habitat of the fungus is burnt ground. However, the writer does not attach much importance to the habitat, although it can sometimes be a factor in the distribution of the species. Whatever variations there are have been considered as ecological.

The orange brown cups are surrounded by numerous marginal hairs, which are of two kinds. One kind is present all over the exterior of the cup. They are very long, branched, septate and pale brown (fig. 9). The other kind is more or less limited to the rim of the cup. These are short, septate and sharply pointed and arise from the outer layer of the subhymenial cells.

The spores are of two sizes. The normal spores are $11 \mu \times 16 \mu$ (fig. 10) while the larger ones are about $11 \mu \times 20-22 \mu$. All are perfectly smooth, without any oil drops. The septate paraphyses are slightly enlarged at the apex.

5. *Patella ricciophila* Seaver in North American cup-fungi, supplementary ed., 165, 1942.

Type locality: North America (Texas).

Distribution: North America and India.

Habitat: Associated with the thallus of a species of *Riccia* apparently as an epiphyte. Very rarely present on the soil also. Nainital (Kumaon); November 23, 1951.

This peculiar fungus was collected by the author on a small patch of soil, associated with a species of *Riccia*. The cups are barely visible to the naked eye as pale orange bodies with a light border, densely surrounded by hyaline hairs, which are mostly unbranched but are frequently lobed below towards the sides (fig. 11). The erect hairs are stiff and very thick walled with a solid apex. The cross septa, however, are very thin. The asci are very long and tapering towards the base and they are filled with eight ovoid ascospores (fig. 12). which are perfectly smooth. Frequently, there are less than eight ascospores due to an abortion of some of the spores in the ascus.

6. *Ascobolus immersus* Pers., Obs. Myc. 1: 35, 1795.

Syn. *A. macrosporus* Crouan, Ann. Sci. Nat. IV, 7: 173, 1857. — *A. gigasporus* De Not., Comm. Critt. Ital. 1: 360, 1863.

Type locality: Europe, America, Bermuda.

Distribution: World wide.

Habitat: on horse dung, Delhi, September 8, 1951.

7. *Pyronema ophthalmodes* (Bull.) Fuck., Symb. Myc. 319, 1869.

Type locality: Europe.

Distribution: Europe, America, Bermuda, Bahamas, Dutch East Indies, China, India.

Habitat: on burnt, denuded ground. Majkhali (Kumaon); June 22, 1951.

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