

Four new reports of resupinate non-poroid fungi from India

Ellu Ram, Avneet Pal Singh* and Gurpaul Singh Dhingra

Department of Botany, Punjabi University, Patiala, 147 002, Punjab, India

Corresponding author Email: avneetbot@gmail.com

(Submitted on October 28, 2021; Accepted on December 18, 2021)

ABSTRACT

Four species of resupinate, non-poroid fungi i.e. *Chaetodermella incrassata* (Malençon) K.H. Larss. & Ryvardeen, *Cylindrobasidium torrendii* (Bres.) Hjortstam, *Dendrothele amygdalispora* Hjortstam and *Sistotrema oblongisporum* M.P. Christ. & Hauerslev are described as new to India based on the material collected from Kullu district of Himachal Pradesh (India).

Keywords: Agaricomycetes, Basidiomycota, Fungi, Himalaya, Wood rot

INTRODUCTION

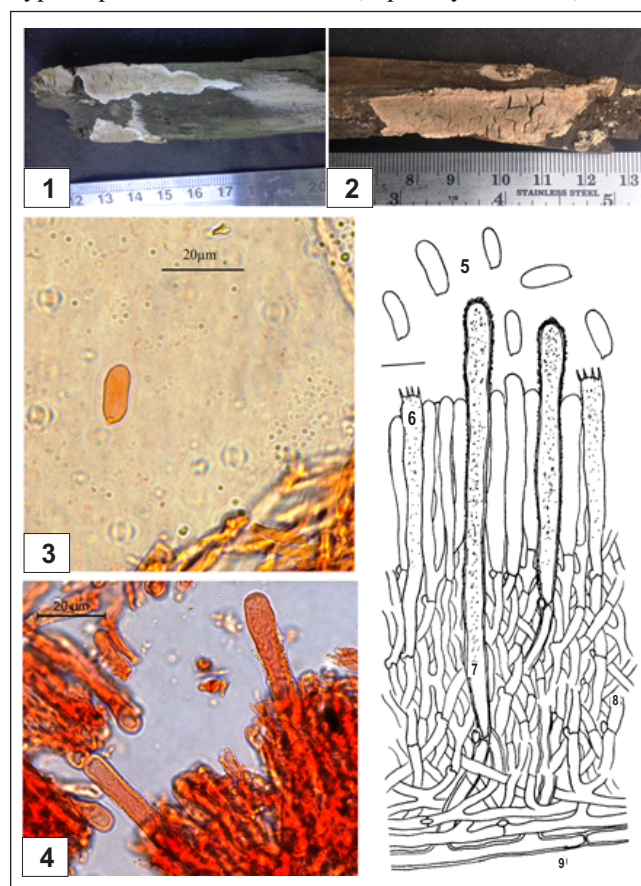
The resupinate, nonporoid fungi (*Basidiomycota*, *Agaricomycetes*) are characteristic in having annual to perennial, resupinate to effusedreflexed basidiocarps with exposed hymenium. These basidiocarps grow in the form of thin or thick sheets on the substrate and play an important role in the recycling of carbon by virtue of their ability to secrete lignin/cellulose decaying enzymes. These fungi have been classified in 12 orders of the class *Agaricomycetes*. Kullu, one of the 12 districts of Himachal Pradesh (India), is mainly having the subtropical and temperate climatic conditions. The vegetation of the district is broadly classified into montane subtropical forests, montane temperate forests, west himalayan sub-alpine birch/fir forests, and alpine scrubs (Champion and Seth, 1968). The unique combination of climate and vegetation provides optimum environmental conditions for the growth of resupinate, non-poroid fungi. The review of literature provides an account of 162 taxa of resupinate, non-poroid fungi described from various localities of the district (Rattan, 1977; Sharma, 2012; Prashar and Ashok, 2013; Dhingra *et al.*, 2014; Ram *et al.*, 2019).

During the fungal forays conducted in the different localities of district Kullu some interesting specimens of the resupinate, non-poroid fungi were collected. The specimens were identified as *Chaetodermella incrassata* (Malençon) K.H. Larss. and Ryvardeen, *Cylindrobasidium torrendii* (Bres.) Hjortstam, *Dendrothele amygdalispora* Hjortstam and *Sistotrema oblongisporum* M.P. Christ. and Hauerslev, based on morphotaxonomic details and comparison with the literature (Rattan, 1977; Natarajan and Kolandavelu, 1998; Bernicchia and Gorjón 2010; Ranadive *et al.*, 2011; Sharma, 2012; Dhingra, 2014; Dhingra *et al.*, 2014; Kaur, *et al.*, 2017, 2018, 2019, 2020; Mycobank, 2021). All the four species described in the present studies are new to India. The colour standards used are according to Kornerup and Wanscher (1978). The collected specimens were dried and deposited at the Herbarium, Department of Botany, Punjabi University, Patiala (PUN).

TAXONOMIC DESCRIPTIONS

Chaetodermella incrassata (Malençon) K.H. Larss. & Ryvardeen, *Synopsis Fungorum* 40: 114 (2020). *Peniophora incrassata* Malençon, *Bulletin de la Société Mycologique de France* 68 (3): 316, 1952. (Figs. 10-9).

Basidiocarp resupinate, adnate, effused, initially develop in the form of small patches, become confluent with age; hymenial surface smooth, cracked after drying, chalky white (1A1) to yellowish white (1A2) when fresh, orange white (6A2) to reddish white (7A2) after drying; up to 350 µm thick in section. Margins adnate, determinate, loosening with age, paler concolorous in fresh basidiocarp, concolorous after drying. Hyphal system monomitic. Generative hyphae septate, clamped, up to 6 µm wide, thin- to thick-walled; basal hyphae parallel to the substrate, sparsely branched, thick-



Figs. 1-9: *Chaetodermella incrassata*: 1 Basidiocarp showing hymenial surface (fresh). 2 Basidiocarp showing hymenial surface (dry). 3 Photo-micrograph showing a basidiospore. 4 Photomicrograph showing portion of hymenium with cystidia. 5 Basidiospores. 6 Basidium. 7 Cystidium. 8 subhymenial generative hyphae. 9 Basal generative hyphae. (Bar = 10 µm).

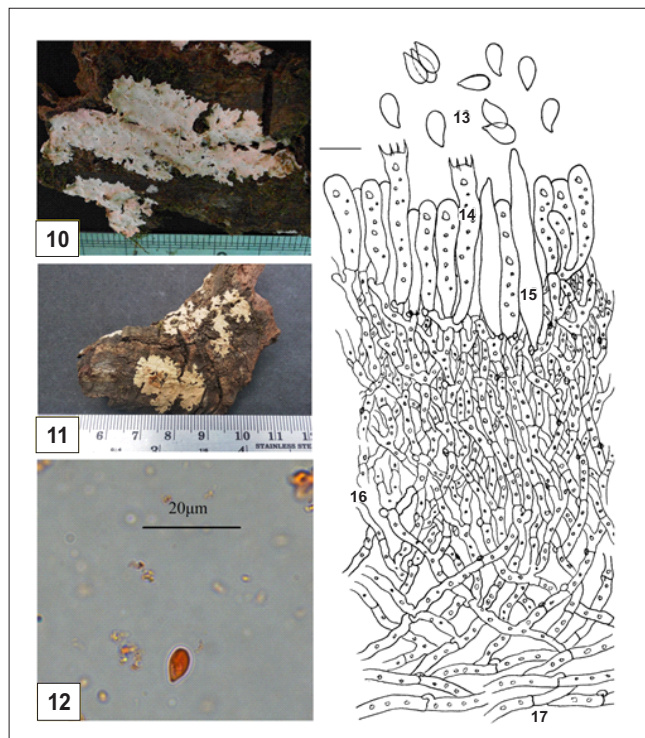
walled; subhymenial hyphae vertical, richly branched, thin-walled. Cystidia 60-93 × 6-7, clavate, basally clamped, granular contents that turns yellowish in KOH solution; projecting up to 20 µm out of the hymenium. Basidia 42-55 × 4-5 µm, clavate to cylindrical, basally clamped, with 4 sterigmata; length of sterigmata up to 5 µm. Basidiospores 9-12.5 × 5-6 µm, cylindrical to sub-allantoid, thin-walled, smooth, spore wall not stained in cotton blue and Melzer's reagent.

Material examined: Himachal Pradesh, Kullu, Banjar, Tandi, on *Cedrus deodara* stump, Ellu 11189 (PUN), August 16, 2017.

Notes: *Chaetodermella incrassata* is marked by resupinate, effused basidiocarp organized in patches that become confluent with age, clamped generative hyphae, clavate cystidia with yellowish granular contents and cylindrical to sub-allantoid, thin-walled basidiospores. Earlier this species is reported from France (Bernicchia and Gorjón, 2010) as *Chaetoderma incrassatum*. Larsson *et al.* (2020), described it as *Chaetodermella incrassata*.

Cylindrobasidium torrendii (Bres.) Hjortstam, *Mycotaxon* 17: 571, 1983 - *Peniophora torrendii* Bres., *Brotéria Série Botânica* 11: 77, 1913. (Figs. 10-17).

Basidiocarp resupinate, adnate, effused; hymenial surface smooth, yellowish white (4A2) to orange white (5A2) when fresh, orange white (5A2) to pinkish white (7A2) after drying;



Figs. 10-17: *Cylindrobasidium torrendii*: 10. Basidiocarp showing hymenial surface (fresh), 11. Basidiocarp showing hymenial surface (dry), 12. Photomicrograph showing a basidiospore, 13. Basidiospores, 14. Basidium, 15. Cystidium, 16. Subhymenial generative hyphae and 17. Basal generative hyphae. (Bar = 10 µm).

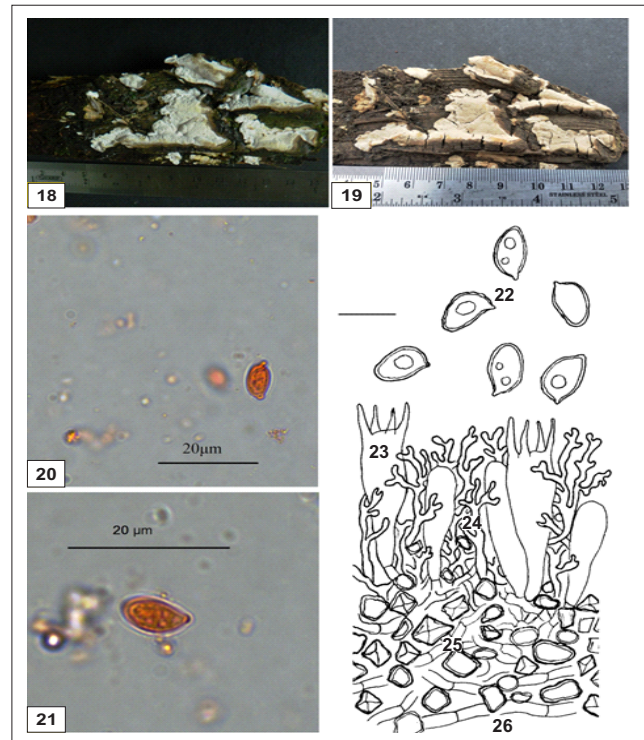
up to 300 µm thick in section. Margins pruinose, concolorous. Hyphal system Monomitic. Generative hyphae septate, clamped, up to 4 µm in width, thin-walled, with oily contents; basal hyphae parallel to the substrate, sparsely branched; subhymenial hyphae vertical, richly branched. Cystidia 37-48 × 5-6 µm, subfusiform, clamped, thin-walled, smooth; enclosed to slightly projecting out of the hymenium. Basidia 35-38 × 5-6 µm, narrowly clavate, with basal clamp, with 4 sterigmata; length of sterigmata up to 3 µm. Basidiospores 7-8.5 × 4-5 µm, obliquely ellipsoid to lacrymoid, thin-walled, spore wall not stained in cotton blue and Melzer's reagent

Material examined: Himachal Pradesh, Kullu, Banjar, Jalori Paas, on the bark of *Taxus baccata*, Ellu 11192 (PUN), September 4, 2016.

Notes: This species is peculiar in having subfusiform leptocystidia and obliquely ellipsoid to lacrymoid basidiospores. This is earlier reported by Bates *et al.* (2017) from Indiana (North America) and Bernicchia and Gorjón (2010) from Europe.

Dendrothele amygdalispora Hjortstam, *Windahlia* 17: 56, 1987. (Figs. 18-26).

Basidiocarp resupinate, adnate, effused, organized in small patches, later become confluent; hymenial surface smooth, chalky white when fresh (1A1), yellowish white (1A2) after drying; up to 330 µm thick in section. Margins confluent, determinate, concolorous. Hyphal system monomitic.



Figs. 18-26: *Dendrothele amygdalispora*: 18. Basidiocarp showing hymenial surface (fresh), 19. Basidiocarp showing hymenial surface (dry), 20-21. Photomicrographs showing basidiospores, 22. Basidiospores, 23. Basidium, 24. Dendrohyphidia, 25. Subhymenial generative hyphae and 26. Basal generative hyphae. (Bar = 10 µm).

generative hyphae simple-septate, up to 3 μm in width, thin-walled, difficult to discern; basal hyphae parallel to the substrate, sparsely branched, densely covered by crystalline encrustation; subhymenial hyphae vertical, richly branched. Dendrohyphidia up to 2 μm wide, richly branched, encrusted by crystalline material. Basidia 27-30 \times 7-9 μm , clavate, without basal clamp, with 4 sterigmata; length of sterigmata up to 8 μm , stout and blunt. Basidiospores 8-11 \times 6-7 μm , amygdaliform, somewhat ovoid, thick-walled, smooth, spore wall not stained in cotton blue and Melzer's reagent.

Material examined: Himachal Pradesh, Kullu, Banjar, Paldi, on *Cedrus deodara* stump, Ellu 11196 (PUN), August 16, 2017.

Notes: *Dendrothele amygdalispora* is marked by resupinate, effused basidiocarp, simple-septate generative hyphae, irregularly branched dendrohyphidia and amygdaliform to somewhat ovoid thick-walled basidiospores. Earlier this species is reported from northern Belarus in Eastern Europe (Yurchenko and Kotiranta, 2007; Bernicchia and Gorjón, 2010).

Sistotrema oblongisporum M.P. Christ. and Hauerselev, *Dansk botanisk Arkiv* **19** (2): 82, 19-60. (Figs. 27-34).

Basidiocarp resupinate, adnate, effused inconspicuous; hymenial surface pruinose, greyish white (1B1) when fresh, greyish yellow (1B5) after drying; up to 200 μm thick in

section. Margins thinning, undifferentiated, concolorous. Hyphal system monomitic. Generative hyphae septate, clamped, up to 4 μm wide, thin-walled; basal hyphae parallel to the substrate, sparsely branched; subhymenial hyphae vertical, richly branched. Basidia 18-25 \times 7-9 μm , uniform, with somewhat rounded swollen base and cylindrical towards apical region, with basal clamp, with 6-8 sterigmata; length of sterigmata up to 6 μm . Basidiospores 6-8 \times 2-3 μm , sub-allantoid, smooth, spore wall not stained in cotton blue and Melzer's reagent.

Material examined: Himachal Pradesh, Kullu, Banjar, Kalwari, on *Juglans regia* fallen sticks, Ellu 11198 (PUN), July 28, 2017.

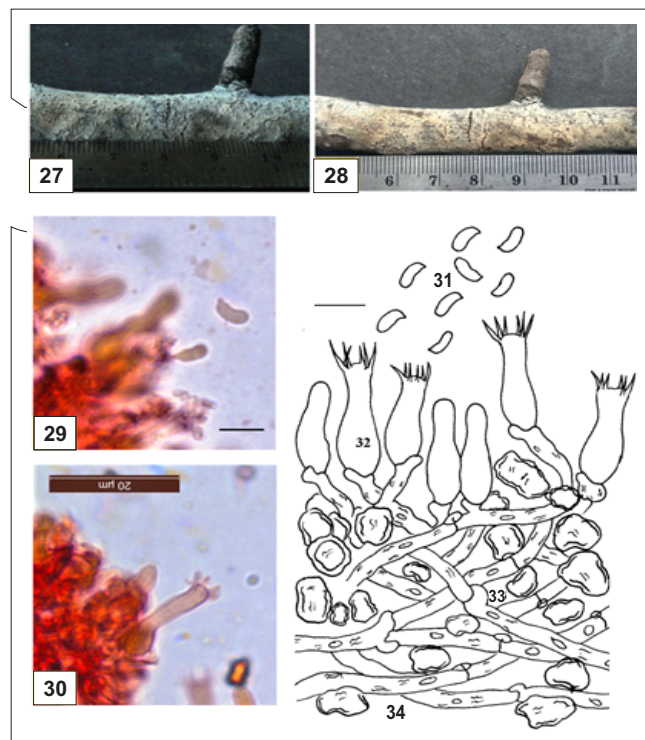
Notes: It is peculiar in having urniform basidia with 6-8 sterigmata and sub-allantoid basidiospores. The earlier records of *S. oblongisporum* are from Russia, Turkey, Estonia, France, Germany, Sweden, Italy, Belgium, Denmark, Norway and Spain (Bernicchia and Gorjón, 2010).

CONCLUSION

Among the four genera reported in the present studies, genus *Chaetodermella* is being recorded for the first time based on *C. incrassata*. The genus *Cylindrobasidium* is earlier known from India with two species i.e. *C. evolvens* (Rattan, 1977; Sharma, 2012; Dhingra *et al.*, 2011, 2014) and *C. indicus* (Dhingra, 2014). The earlier account of genus *Dendrothele* from India includes 9 species i.e. *D. papillosa* (Natarajan and Kolandavelu, 1998), *D. incrustans* (Natarajan and Kolandavelu, 1998; Ranadive 2013; Dhingra *et al.*, 2014), *D. acerina* (Ranadive *et al.*, 2011), *D. alliacea*, *D. mexicana* and *D. strumosa* (Dhingra, 2014), *D. seriata* (Dhingra *et al.*, 2014), *D. commixta* (Kaur *et al.*, 2017) and *D. minima* (Kaur *et al.*, 2020). Among these *D. papillosa* has been renamed as *D. griseocana* (Mycobank, 2021). As many as 13 species of the genus *Sistotrema* have earlier been reported from various parts of India. These include *S. lachrymisporum* (Rattan, 1977; Dhingra *et al.*, 2014), *S. confluens* (Sharma, 2012), *S. binucleosporum* (Dhingra *et al.*, 2014), *S. porulosum* (Dhingra *et al.*, 2014; Kaur *et al.*, 2018), *S. angustispora* (Dhingra, 2014), *S. Brinkmanni* (Dhingra *et al.*, 2009; Kaur *et al.*, 2018), *S. sernandari*, *S. subtrigonospermum* (Dhingra *et al.*, 2009), *S. heteronemum* (Dhingra, 2014), *S. octosporum* (Dhingra, 2014), *S. diademiferum*, *S. Kirghizicum*, and *S. macrosporum* (Kaur *et al.*, 2018). The present account has added one species each to the existing account of the genus *Chaetodermella*, *Cylindrobasidium*, *Dendrothele* and *Sistotrema* from India.

ACKNOWLEDGEMENTS

The authors are grateful to the Head, Department of Botany, Punjabi University, Patiala for providing necessary laboratory facilities; UGC DSA I and DST FIST level I for financial assistance. Mr. Ellu Ram is thankful to the University Grants Commission for the award of fellowship vide UGC Ref. No. : 2679/CSIR-UGC NET DEC, 2018.



Figs. 27-34: *Sistotrema oblongisporum* 27. Basidiocarp showing hymenial surface (fresh), 28. Basidiocarp showing hymenial surface (dry), 29. Photomicrograph showing basidiospores, 30. Photomicrograph showing a basidium, 31. Basidiospores, 32. Basidium, 33. Subhymenial generative hyphae and 34. Basal generative hyphae. (Bar = 10 μm).

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