

Noteworthy additions to the genus *Hyphoderma* Wallr. from district Shimla (Himachal Pradesh)Maninder Kaur¹, Ramandeep Kaur², Avneet Pal Singh^{3*} and Gurbpaul Singh Dhingra³¹PG Department of Botany, Dev Samaj College for Women, Ferozepur-152 002, Punjab, India²Department of Botany, Baba Farid College, Bathinda-151 001, Punjab, India³Department of Botany, Punjabi University, Patiala-147 002, Punjab, India

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ABSTRACT

This paper provides an account of 20 taxa (19 species and 1 variety) of the corticioid genus *Hyphoderma* (Agaricomycetes, Polyporales, *Hyphodermataceae*) based on specimens collected from different localities of Shimla district of Himachal Pradesh. Among these 20 taxa, *Hyphoderma anthracophilum* and *H. incrustatum* are recorded as new to India; *H. definitum*, *H. hjoorstamii* and *H. incrustatissimum* as new to Himachal Pradesh and *H. orphanellum*, *H. pallidum*, *H. setigerum* var. *bicystidium*, *H. sibiricum* and *H. tsugae* as new to Shimla district. The remaining 10 taxa (*H. argillaceum*, *H. cremeoalbum*, *H. hallenbergii*, *H. macedonicum*, *H. medioburiense*, *H. obtusum*, *H. occidentale*, *H. praetermissum*, *H. puberum* and *H. setigerum*) have been rereported from the study area. All the new records have been described and illustrated while the re-reported taxa are provided with brief remarks only. A key to all the taxa reported from Shimla district has also been provided.

Keywords: Basidiomycota, Corticioid Fungi, Himalaya, Taxonomy, White Rot

INTRODUCTION

Genus *Hyphoderma* Wallr. (*Hyphodermataceae*, *Polyporales*, *Agaricomycetes*, *Basidiomycota*) is characteristic in having annual, crust-like, ceraceous, white or yellow, grey, orange or brown basidiocarps with smooth, tuberculate to grandinoid to odontoid hymenophore. The basidiocarps are constituted of clamped generative hyphae; different types of cystidial elements; clavate to subclavate, basally clamped basidia and large, smooth, ellipsoid to cylindrical to allantoid, smooth, thin-walled, inamyloid, acyanophilous basidiospores. It is a large, heterogenous and widely distributed genus (Bernicchia and Gorjón, 2010) with 98 taxa listed in Mycobank (2022). The genus is recorded with 44 taxa from different parts of the India (Rattan, 1977; Bhosle *et al.*, 2005; Dhingra *et al.*, 2011, 2014; Ranadive *et al.*, 2011; Sharma, 2012; Hakimi *et al.*, 2013; Ranadive, 2013; Kaur *et al.*, 2014). Shimla, one of the 12 districts and summer capital of Himachal Pradesh, offers congenial climate and vegetation for the growth of wood rotting corticioid fungi. The earlier reports of the genus from India described only 8 taxa of the genus from Shimla district (Himachal Pradesh).

During the fungal forays conducted in the district Shimla in the monsoon months of 2011-2015, several interesting specimens of the genus *Hyphoderma* were collected. These specimens were identified as *H. anthracophilum* (Bourdot) Jülich, *H. argillaceum* (Bresadola) Donk, *H. cremeoalbum* (Höhnelt & Litschauer) Jülich, *H. definitum* (Jackson) Donk, *H. hallenbergii* Man. Kaur, Avneet P. Singh & Dhingra, *H. hjoorstamii* Sheng H. Wu, *H. incrustatissimum* Boidin & Gilles, *H. incrustatum* Larsson, *H. macedonicum* (Litschauer) Donk, *H. medioburiense* (Burt) Donk, *H. obtusum* Eriksson, *H. occidentale* (Rogers) Boidin & Gilles, *H. orphanellum* (Bourdot & Galzin) Donk, *H. pallidum* (Bresadola) Donk, *H. praetermissum* (Karsten) Eriksson & Strid, *H. puberum* (Fr.) Wallr., *H. setigerum* (Fr.) Donk, *H. setigerum* var. *bicystidium* Dhingra & Singla, *H. sibiricum* (Parmasto) Eriksson & Strid, and *H. tsugae* (Burt) Eriksson & Strid on the basis of morphological features and comparison

with the literature (Rattan, 1977; Dhingra, 1989; Bernicchia and Gorjón, 2010; Sharma, 2012; Dhingra *et al.*, 2014; Kaur *et al.*, 2014; Sanyal *et al.*, 2017; Kaur, 2020). Of these, *H. anthracophilum*, *H. definitum*, *H. hjoorstamii*, *H. incrustatissimum*, *H. incrustatum*, *H. orphanellum*, *H. pallidum*, *H. setigerum* var. *bicystidium*, *H. sibiricum* and *H. tsugae* are being described for the first time from district Shimla (Himachal Pradesh). It is pertinent to mention here that *H. anthracophilum* and *H. incrustatum* are new to India and *H. incrustatissimum*, *H. definitum* and *H. hjoorstamii* are being reported for the first time from Himachal Pradesh. All the specimens have been deposited at the Herbarium, Department of Botany, Punjabi University, Patiala (PUN). The colour standards used are as per Kernerup and Wanscher (1978). A key to the species of genus *Hyphoderma* from Shimla district is also provided.

TAXONOMY**Key to the species:**

1. Cystidial elements absent	2
1. Cystidial elements present	4
2. Basidia large, $\leq 52 \mu\text{m}$ long	<i>H. anthracophilum</i>
2. Basidia small, $\leq 31 \mu\text{m}$ long	3
3. Hymenial surface cracked, pale orange to greyish orange to brownish orange	<i>H. sibiricum</i>
3. Hymenial surface smooth, whitish to yellowish white to pale yellow	<i>H. cremeoalbum</i>
4. Sterile elements of one type	5
4. Sterile elements of more than one type	14
5. Cystidia septate, clamped	<i>H. setigerum</i>
5. Cystidia not as above	6
6. Cystidia fusiform, tapering towards apex	<i>H. pallidum</i>
6. Cystidia not as above	7
7. Cystidia conical with crystalline encrustation	<i>H. puberum</i>
7. Cystidia with or without resinous encrustation	8
8. Cystidia capitate, with an apical globule of amorphous matter	<i>H. orphanellum</i>
8. Cystidia cylindrical	9

9. Cystidia long, basally widened	10
9. Cystidia not as above	11
10. Basidiospores ellipsoid	<i>H. argillaceum</i>
10. Basidiospores allantoid to suballantoid	<i>H. macedonicum</i>
11. Basidiospores more than 11 µm long	<i>H. occidentale</i>
11. Basidiospores ≤11 µm long	12
12. Basidiospores narrowly ellipsoid to ellipsoid	13
12. Basidiospores allantoid	14
13. Basidiospores 8-11 × 3-5.3, narrowly ellipsoid	<i>H. obtusum</i>
13. Basidiospores 7.5-9 × 4-4.5, ellipsoid	<i>H. medioburiense</i>
14. Basidioma yellowish white to pale yellow	<i>H. hjoerstamii</i>
14. Basidioma greyish white	<i>H. definitum</i>
15. Sterile elements of three types	<i>H. praetermissum</i>
15. Sterile elements of two types	16
16. Septate, clamped cystidia along with cylindrical cystidia	<i>H. setigerum</i> var. <i>bicyctidium</i>
16. Septate, clamped cystidia absent but other types present	17
17. Moniliform cystidia along with capitate cystidia present	<i>H. hallenbergii</i>
17. Moniliform cystidia absent but other types present	18
18. Lamprocystidia along with gloeocystidia	<i>H. incrustissimum</i>
18. Lamprocystidia absent but other types present	19
19. Tubular cystidia along with capitate cystidia	<i>H. incrustatum</i>
19. Fusiform cystidia along with capitate cystidia	<i>H. tsugae</i>

1. *Hyphoderma anthracophilum* (Bourdot) Jülich, *Persoonia* **8** (1): 80, 1974. (Figs. 1-5)

-*Corticium anthracophilum* Bourdot, *Revue Scientifique du Bourbonnais et du Centre de la France* **23**: 7, 1910.

Basidiocarp resupinate, effused, adnate, ≤ 210 µm thick in section; hymenial surface smooth, pale yellow to greyish yellow to pale orange when fresh, brownish orange on drying; margins pruinose, paler concolorous, or indeterminate. Generative hyphae ≤ 2.8 µm wide, clamped, branched, thin-walled. Subicular hyphae horizontal, loosely interwoven. Subhymenial hyphae vertical, compact. Cystidia absent. Basidia clavate to subclavate, 18-52 × 5-6.2 µm, sinuous, clamped at the base; sterigmata 4, ≤ 5.2 µm long. Basidiospores ellipsoid to subcylindrical, 5.5-7.7 × 3.4-4 µm, smooth, thin-walled, with oily contents, inamyloid, acyanophilous.

Material examined: India, Himachal Pradesh, Shimla, Chambi, on stump of *Cedrus deodara*, Maninder 8987 (PUN), August 18, 2012.

Remarks: *Hyphoderma anthracophilum* is peculiar in having longer basidia and absence of cystidia. It is being described for the first time from India. The earlier reports of this species are from France, Spain and Italy (Mycobank, 2022).

2. *Hyphoderma argillaceum* (Bresadola) Donk, *Fungus* **27**: 14, 1957.

- *Corticium argillaceum* Bresadola, *Fungi Tridentini* **2** (11-13): 63, 1898.

Material examined: India, Himachal Pradesh, Shimla, Chaupal, on bark of *Cedrus deodara*, Dhingra 7481 (PUN), August 16, 2012.

Remarks: *H. argillaceum* differs from *H. anthracophilum* in having basally widened cystidia and ellipsoid, larger (7.3-10 × 4-5 µm) basidiospores. It is a re-reported species of the genus and has been earlier reported by Dhingra *et al.* (2014) from Shimla, Chamba, Kullu districts of Himachal Pradesh.

3. *Hyphoderma cremeoalbum* (Höhnelt & Litschauer) Jülich, *Persoonia* **8** (1): 80, 1974.

-*Corticium cremeoalbum* Höhnelt & Litschauer, *Wiesner Festschrift*: 63, 1908.

Material examined: India, Himachal Pradesh, Shimla, Chaupal, on sticks of *Cedrus deodara*, Maninder 9313 (PUN), August 12, 2012.



Figs. 1-5: *Hyphoderma anthracophilum*: 1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry); 3-5. Line diagrams showing 3. basidiospores 4. reconstruction of V.S. of basidiocarp showing hymenium and subhymenium 5. basal hyphae.

Remarks: *H. cremeoalbum* is unique in having smaller basidia, larger, ellipsoid basidiospores (8-13 × 3.7-6.3 µm) and lack of cystidia. This species is being re-described from district Shimla as Dhingra *et al.* (2014) listed from Shimla and Solan districts of Himachal Pradesh.

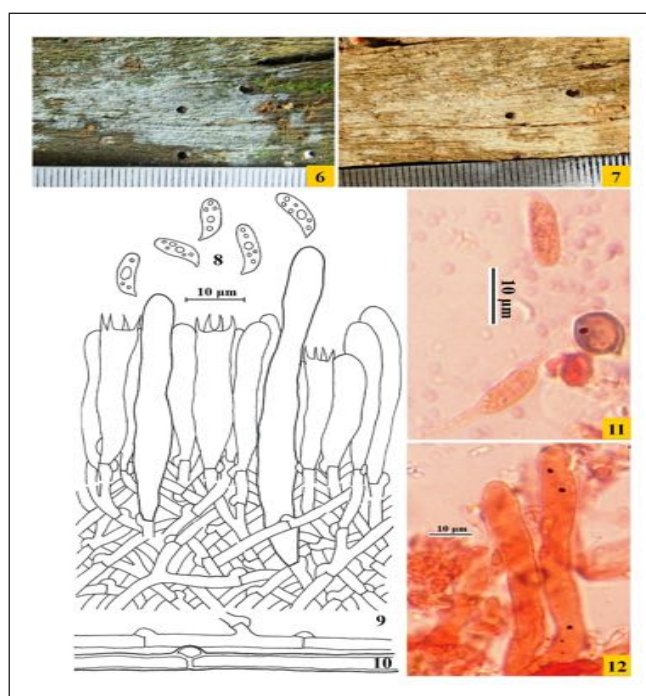
4. *Hyphoderma definitum* (Jackson) Donk, *Fungus* **27**: 15, 1957.

-*Corticium definitum* Jackson, *Canadian Journal of Research* **26** (2): 149, 1948. (Figs. 6-12)

Basidiocarp resupinate, effused, adnate, ≤ 200 µm in section; hymenial surface smooth, greyish white when fresh,

brownish grey on drying; margins pruinose, paler concolorous, or indeterminate. Generative hyphae clamped, branched. Subicular hyphae $\leq 4.3 \mu\text{m}$ wide, thick-walled, horizontal, forming a loose texture. Subhymenial hyphae $\leq 2.8 \mu\text{m}$ wide, thin-walled, vertical, compact. Cystidia subcylindrical, $50-71 \times 3.4-4 \mu\text{m}$, sinuous, thin-walled, clamped at the base. Basidia clavate, $23-31 \times 5.9-6.9 \mu\text{m}$, generally sinuous, clamped at the base; sterigmata 4, $\leq 6 \mu\text{m}$ long. Basidiospores subcylindrical to allantoid, $9.6-11.5 \times 3.4-4 \mu\text{m}$, smooth, thin-walled, with oily contents, inamyloid, acyanophilous.

Material examined: India, Himachal Pradesh, Shimla, Chaupal, on bark of *Cedrus deodara*, Maninder 8989 (PUN), August 16, 2012.



Figs. 6-12: *Hyphoderma definitum*: 6-7. Basidiocarp showing hymenial surface (6. fresh 7. dry); 8-10. Line diagrams showing 8. basidiospores, 9. reconstruction of V.S. of basidiocarp showing hymenium and subhymenium, 10. basal hyphae; 11-12. Photomicrographs showing basidiospores and cystidia

Remarks: *H. definitum* is characteristic in having subcylindrical cystidia; subcylindrical to allantoid basidiospores and is being described for the first time from Himachal Pradesh. The only previous report from India is from Uttarakhand (Sanyal *et al.*, 2017).

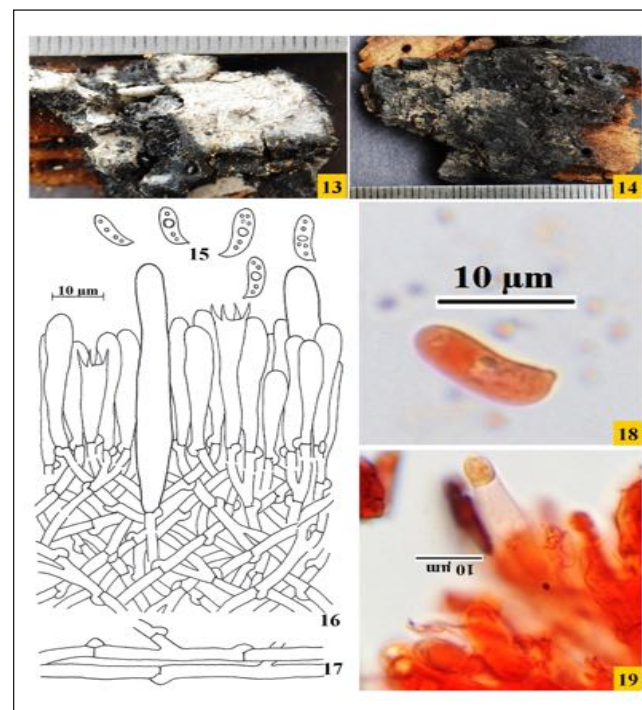
5. *Hyphoderma hallenbergii* Man. Kaur, Avneet P. Singh & Dhingra, *Mycotaxon* **130**: 223, 2015.

Material examined: India, Himachal Pradesh, Shimla, Narkanda, on Baghi road, on the bark of decaying wood of *Cedrus deodara*, Maninder & Avneet 6962 (PUN), August 19, 2012.

Remarks: Kaur *et al.* (2015) described this new species on the basis of presence of 2 types of cystidial elements (capitate cystidia and moniliform cystidia) and ellipsoid basidiospores. It differs from closely related *H. nemorale* and *H. incrustatum* in having smaller ($6.2-7.5 \times 3.4-4.6 \mu\text{m}$) and ellipsoid basidiospores.

6. *Hyphoderma hjortstamii* Sheng H. Wu, *Acta Botanica Fennica* **142**: 65, 1990. **(Figs. 13-19)**

Basidiocarp resupinate, effused, adnate, $\leq 280 \mu\text{m}$ in section; hymenial surface smooth, yellowish white to pale yellow when fresh, brownish grey on drying; margins fibrous, paler concolorous, or indeterminate. Generative hyphae $\leq 2.5 \mu\text{m}$ wide, clamped, branched, thin-walled. Subicular hyphae horizontal, loosely interwoven. Subhymenial hyphae vertical, denser. Cystidia subcylindrical, $40-55 \times 5.6-6.8 \mu\text{m}$, thin-walled, clamped at the base. Basidia clavate, $17-26 \times 5-6.8 \mu\text{m}$, clamped at the base; sterigmata 4, $\leq 4.3 \mu\text{m}$ long. Basidiospores suballantoid to allantoid, $8-11 \times 3.1-4.4 \mu\text{m}$, smooth, thin-walled, with oily contents, inamyloid, acyanophilous.



Figs. 13-19: *Hyphoderma hjortstamii*: 13-14. Basidiocarp showing hymenial surface (13. fresh, 14. dry); 15-17. Line diagrams showing 15. basidiospores, 16. reconstruction of V.S. of basidiocarp showing hymenium and sub-hymenium, 17. basal hyphae; 18. Photomicrographs showing basidiospore, and 19. a cystidium

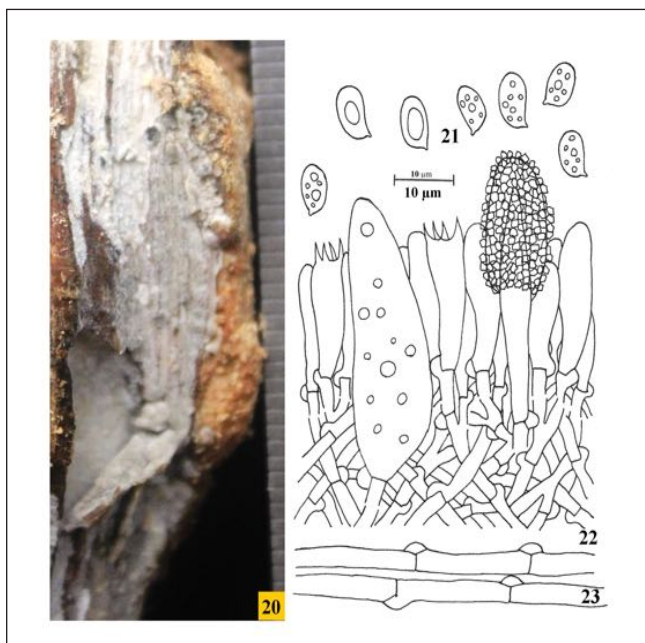
Material examined: India, Himachal Pradesh, Shimla, Chaupal, on stump of *Pinus wallichiana*, Maninder 8990 (PUN), August 16, 2012.

Remarks: *H. hjortstamii*, a new record for Himachal Pradesh, is marked by the presence of thin-walled,

subcylindrical cystidia and suballantoid to allantoid basidiospores. The only previous report from India is by Sharma (2017) from Jammu and Kashmir.

7. *Hyphoderma incrustatissimum* Boidin & Gilles, *Cryptogamie Mycologie* **12** (2): 111, 1991. (Figs. 20-23)

Basidiocarp resupinate, effused, adnate, ≤ 200 μm thick in section; hymenial surface smooth, greyish white to pale orange when fresh, no noticeable change on drying; margins pruinose, paler concolorous, or indeterminate. Generative hyphae clamped, branched, thin-walled. Subicular hyphae ≤ 4.3 μm wide, forming a loose texture, horizontal. Subhymenial hyphae ≤ 3.7 μm wide, compact, vertical. Gloeocystidia subfusiform, $27-45 \times 12-13.6$ μm , basally widened, apex obtuse, thin-walled, with oily contents not stained in sulphovanillin, clamped at the base. Encrusted cystidia cylindrical to subcylindrical, $38-46 \times 4-5$ μm , thin-walled, apically encrusted, clamped at the base. Basidia clavate, $18-23 \times 6.7-7.4$ μm , sinuous, clamped at the base; sterigmata 4, ≤ 4.3 μm long. Basidiospores ellipsoid to subcylindrical, $7.4-8.4 \times 4.3-5$ μm , smooth, thin-walled, with oily contents, inamyloid, acyanophilous.



Figs. 20-23: *Hyphoderma incrustatissimum*: 20. Basidiocarp showing hymenial surface; 21-23. Line diagrams showing 21. basidiospores, 22. reconstruction of V.S. of basidiocarp showing hymenium and subhymenium, 23. basal hyphae

Material examined: India, Himachal Pradesh, Shimla, about 23 km from Shimla towards Bilaspur, on bark of *Pinus roxburghii*, Maninder 8992 (PUN), August 1, 2015.

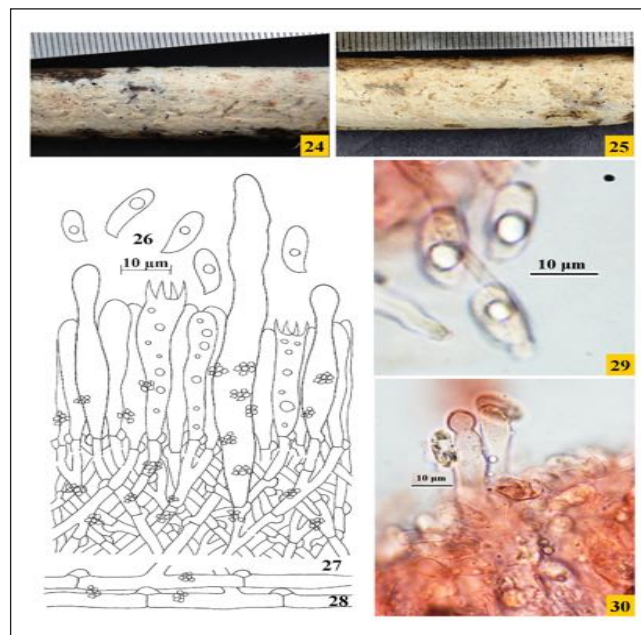
Remarks: This species is characteristic in having encrusted cystidia along with gloeocystidia and ellipsoid to subcylindrical basidiospores. It is being described for the first time from Himachal Pradesh as previously it has been reported from Punjab and Jammu and Kashmir (Kaur, 2017 ;

Sharma, 2017).

8. *Hyphoderma incrustatum* Larsson, *Nordic Journal of Botany* **18** (1): 125, 1998. (Figs. 24-30)

Basidiocarp resupinate, effused, adnate, ≤ 300 μm in section; hymenial surface smooth to tuberculate (under lens), pale orange to greyish orange to greyish red when fresh, orange white to pale orange on drying; margins fibrillose, paler concolorous, or indeterminate. Generative hyphae ≤ 3.7 μm wide, clamped, branched, thin-walled, with crystalline encrustation. Subicular hyphae horizontal, forming a loose texture. Subhymenial hyphae vertical, compact. Tubular cystidia $76-90 \times 7-8$ μm , thin-walled, sinuous, encrusted, clamped at the base; projecting ≤ 20 μm out of the hymenium. Capitulate cystidia hyphoid with globose head, $33-43 \times 4.6-11.7$ μm , basally widened, slightly constricted at the neck, encrusted, clamped at the base. Basidia clavate, $27-39 \times 6.2-8.7$ μm , sinuous, with oily contents, clamped at the base; sterigmata 4, ≤ 4.3 μm long. Basidiospores ellipsoid to suballantoid, $10.8-16 \times 4.3-5.2$ μm , smooth, thin-walled, with oily contents, inamyloid, acyanophilous.

Material examined: India, Himachal Pradesh, Shimla, about 2 km from Chaupal towards Khirki, on sticks of *Berberis vulgaris*, Maninder 8991 (PUN), August 18, 2012.



Figs. 24-30: *Hyphoderma incrustatum*: 24-25. Basidiocarp showing hymenial surface (24. fresh, 25. dry); 26-28. Line diagrams showing 26. basidiospores 27. reconstruction of V.S. of basidiocarp showing hymenium and subhymenium 28. basal hyphae; 29-30. Photomicrographs showing basidiospores and cystidia.

Remarks: *H. incrustatum* is characteristic in having tubular cystidia along with capitulate cystidia and being described for the first time from India. The earlier reports are from Austria,

Estonia, France, Germany, Italy, Norway, Sweden, Switzerland and Finland (Mycobank, 2022).

9. *Hyphoderma macedonicum* (Litschauer) Donk, *Fungus* **27**: 15, 1957.

-*Gloeocystidium macedonicum* Litschauer, *Glansik Skopskog Naucnog Drustva* **18**: 181, 1938.

Material examined: India, Himachal Pradesh, Shimla, Kandiyali, on decaying stump of *Cedrus deodara*, Maninder 9095 (PUN), August 11, 2011.

Remarks: *H. macedonicum* differs from *H. incrustatum* in having thin-walled, basally widened cystidia with tapering apex and allantoid to suballantoid basidiospores. Previously, Dhingra *et al.* (2014) recorded it from district Shimla of Himachal Pradesh.

10. *Hyphoderma medioburiense* (Burt) Donk, *Fungus* **27**: 15, 1957.

-*Peniophora medioburiensis* Burt, *Annals of the Missouri Botanical Garden* **12**(3): 328, 1926.

Material examined: India, Himachal Pradesh, Shimla, Chaupal, on sticks of *Cedrus deodara*, Avneet 8993 (PUN), August 16, 2012.

Remarks: *H. medioburiense* is characteristic in having cylindrical, sinuous cystidia in combination with ellipsoid to suballantoid basidiospores and is being redescribed from district Shimla. Earlier, Dhingra *et al.* (2014) reported it from the study area.

11. *Hyphoderma obtusum* Eriksson, *Symbolae Botanicae Upsalienses* **16**(1): 97, 1958.

Material examined: India, Himachal Pradesh, Shimla, Hattu Peak, on bark of *Pinus wallichiana*, Maninder 9310 (PUN), September 2, 2014.

Remarks: *H. obtusum* is typical in having subcylindrical to subfusiform cystidia and ellipsoid basidiospores. Previously it was reported by Dhingra *et al.* (2014) from the study area.

12. *Hyphoderma occidentale* (Rogers) Boidin and Gilles, *Cryptogamie Mycologie* **15**(2): 138, 1994.

-*Galzinia occidentalis* Rogers, *Mycologia* **36**(1): 102, 1944.

Material examined: India, Himachal Pradesh, Shimla, Seoni, on angiospermous log, Maninder 9309 (PUN), July 30, 2013.

Remarks: This species differs from *H. obtusum* in having cylindrical cystidia and ellipsoid to subcylindrical basidiospores. It is a re-report for the study area. The previous report is by Dhingra *et al.* (2014).

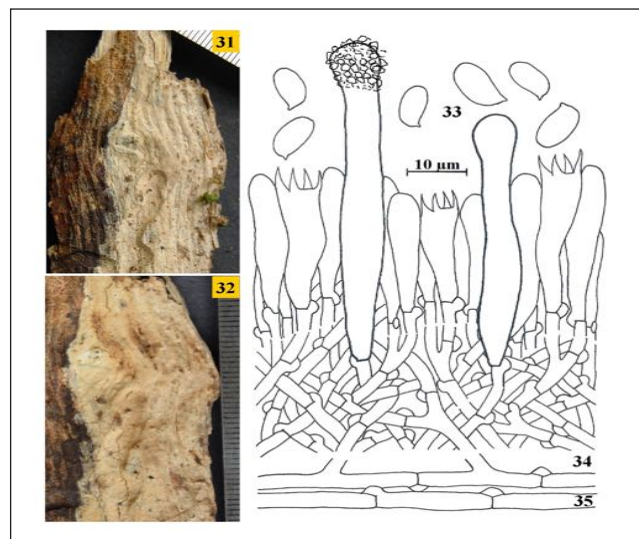
13. *Hyphoderma orphanellum* (Bourdot & Galzin) Donk, *Fungus* **27**: 15, 1957.

-*Peniophora orphanella* Bourdot & Galzin, *Bulletin de la Société Mycologique de France* **28** (4): 381, 1912.

(Figs. 31-35)

Basidiocarp resupinate, effused, adnate, ≤ 270 μm thick in section; hymenial surface smooth, pale orange to greyish orange when fresh, greyish orange to brownish orange on drying; margins pruinose, paler concolorous, or indeterminate. Generative hyphae ≤ 3.4 μm wide, clamped, branched, thin-walled. Subicular hyphae horizontal, loosely interwoven. Subhymenial hyphae vertical, compact. Cystidia cylindrical with globose head, having resinous encrustation, $49\text{-}63 \times 6.2\text{-}8$ μm , sinuous, thin- to somewhat thick-walled, clamped at the base. Basidia clavate, $19\text{-}28 \times 5.6\text{-}7$ μm , sinuous, clamped at the base; sterigmata 4, ≤ 4 μm long. Basidiospores ellipsoid, $6.8\text{-}9.9 \times 4.6\text{-}5.2$ μm , smooth, thin-walled, inamyloid, acyanophilous.

Material examined: India, Himachal Pradesh, Shimla, Tara Devi guest house road, on angiospermous log, Maninder 8994 (PUN), August 1, 2013.



Figs. 31-35. *Hyphoderma orphanellum*: 31-32. Basidiocarp showing hymenial surface (31. fresh 32. dry); 33-35. Line diagrams showing 33. basidiospores 34. reconstruction of V.S. of basidiocarp showing hymenium and subhymenium, 35. basal hyphae

Remarks: It is peculiar in having cylindrical cystidia with globose head having resinous encrustation and ellipsoid basidiospores. It is a new report for the study area. Previously it was described by Dhingra *et al.* (2014) from district Kullu of Himachal Pradesh.

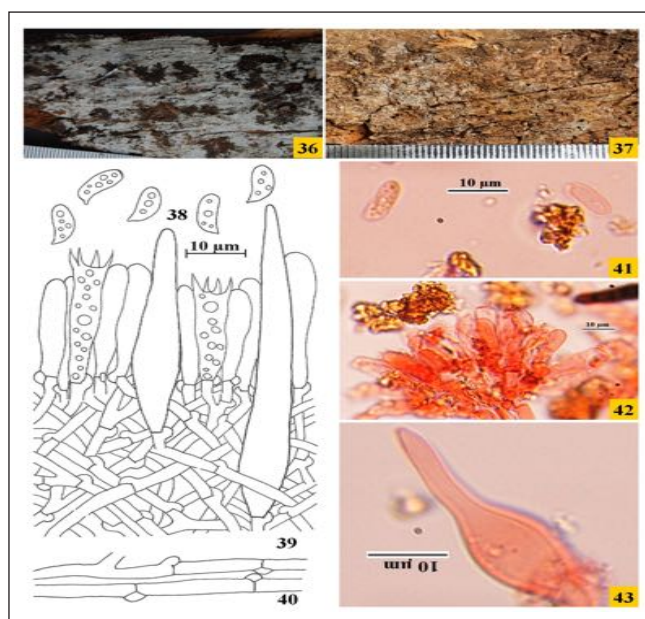
14. *Hyphoderma pallidum* (Bresadola) Donk, *Fungus* **27**: 15, 1957.

-*Corticium pallidum* Bresadola, *Fungi Tridentini* 2 (1113): 59, 1898. (Figs. 36-43)

Basidiocarp resupinate, effused, adnate, ≤ 220 μm thick in section; hymenial surface smooth to tuberculate (under lens), greyish white to orange white when fresh, brownish grey on drying; margins pruinose, paler concolorous, or indeterminate. Generative hyphae ≤ 3.1 μm wide, clamped, branched, thin-walled. Subicular hyphae horizontal, loosely

interwoven. Subhymenial hyphae vertical, compact. Cystidia fusiform to subfusiform, tapering towards apex, $49-75 \times 7-8 \mu\text{m}$, thin-walled, clamped at the base. Basidia clavate, $20-28 \times 5-6 \mu\text{m}$, sinuous, with oily contents, clamped at the base; sterigmata 4, $\leq 4 \mu\text{m}$ long. Basidiospores ellipsoid to suballantoid, $8.3-9.3 \times 3-3.7 \mu\text{m}$, smooth, thin-walled, with oily contents, inamyloid, acyanophilous.

Material examined: India, Himachal Pradesh, Shimla, Chaupal village, on stump of *Cedrus deodara*, Dhingra 7298 (PUN), August 16, 2012; near Forest Guest House, on bark of *C. deodara*, Maninder 7299 (PUN), August 16, 2012; on bark of *Pinus walllichiana*, Maninder 7552 (PUN), August 16, 2012.



Figs. 36-43. *Hyphoderma pallidum*: 36-37. Basidiocarp showing hymenial surface (36. fresh 37. dry); 38-40. Line diagrams showing 38. basidiospores, 39. reconstruction of V. S. of basidiocarp showing hymenium and subhymenium, 40. basal hyphae; 41. Photomicrograph showing basidiospores; 42. Photomicrograph showing basidia; 43. Photomicrograph showing a cystidium.

Remarks: *H. pallidum* differs from *H. orphnolum* in having fusiform to subfusiform cystidia and ellipsoid to allantoid basidiospores. This species is being described for the first time from the study area. Previously it was known from Chamba, Kullu, Sirmaur and Solan districts (Rattan, 1977; Dhingra *et al.*, 2014).

15. *Hyphoderma praetermissum* (Karsten) Eriksson & Strid, in Eriksson & Ryvarden, *The Corticiaceae of North Europe* **3**: 505, 1975.

-*Peniophora praetermissa* Karsten, *Bidrag till Kännedom av Finlands Naturoch Folk* **48**: 423, 1889.

Material examined: India, Himachal Pradesh, Shimla, Chaupal, on stump of *Cedrus deodara*, Maninder 7639 (PUN), August 16, 2012.

Remarks: This is a commonly encountered species and is peculiar in having three types of sterile structures i.e. capitate cystidia, gloecystidia and stephanocysts along with ellipsoid, larger ($8-11 \times 3.6-5.6 \mu\text{m}$) basidiospores. It is distributed in districts Chamba, Kullu, Shimla, Sirmaur and Solan of Himachal Pradesh (Rattan, 1977; Dhingra *et al.*, 2014).

16. *Hyphoderma puberum* (Fr.) Wallr., *Flora Cryptogamica Germaniae* **2**: 576, 1833.

-*Thelephora pubera* Fr., *Elenchus Fungorum* **1**: 215, 1828.

Material examined: India, Himachal Pradesh, Shimla, Karyal, on bark of *Cedrus deodara*, Maninder 7269 (PUN), October 10, 2011.

Remarks: *H. puberum* is a frequently collected species of the genus and is characterized by thick-walled, strongly encrusted, conical cystidia. The previous account of this species from Himachal Pradesh is based on specimens collected from district Chamba, Kullu, Shimla and Sirmaur (Thind and Rattan, 1970; Rattan, 1977; Dhingra *et al.*, 2014).

17. *Hyphoderma setigerum* (Fr.) Donk, **27**: 15, 1957.

-*Thelephora setigera* Fr., *Elenchus Fungorum* **1**: 208, 1828.

Material examined: India, Himachal Pradesh, Shimla, Kufri, on stump of *Cedrus deodara*, Avneet 7413 (PUN), August 1, 2013.

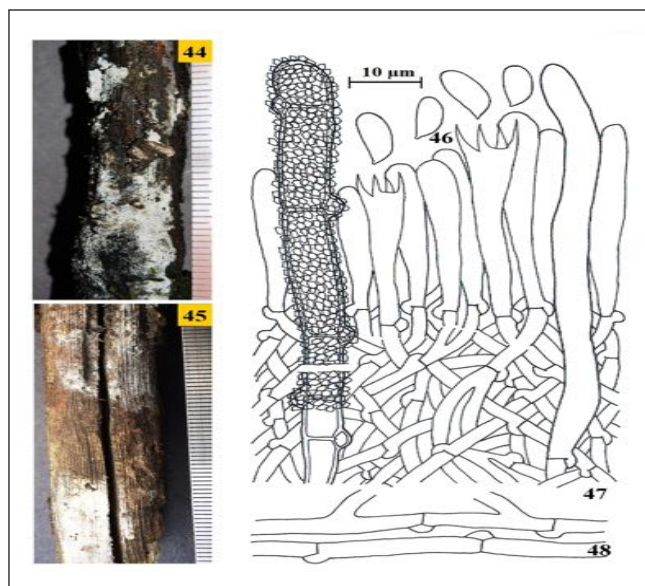
Remarks: *H. setigerum* is marked by the presence of septocystidia and is being redescribed from district Shimla. Previously, it was described by Rattan (1977) from district Shimla, Solan; Dhingra *et al.* (2014) from Kullu, Sirmaur, Shimla and Solan and Kaur (2020) from Sirmaur.

18. *Hyphoderma setigerum* var. *bicystidium* Dhingra & Singla, *Journal Indian Botanical Society* **72**: 31, 1993.

(Figs. 44-48)

Basidiocarp resupinate, effused, adnate, $\leq 180 \mu\text{m}$ thick in section; hymenial surface hypochnoid to smooth, tuberculate (under lens), greyish white to orangish white when fresh, no noticeable change on drying; margins pruinose, paler concolorous, or indeterminate. Generative hyphae $\leq 3.7 \mu\text{m}$ wide, clamped, branched, thin-walled. Subicular hyphae horizontal, loosely interwoven. Subhymenial hyphae vertical, compact. Septocystidia hyphoid, septate, clamped, $90-160 \times 5.7-7.3 \mu\text{m}$, thick-walled, encrusted. Leptocystidia tubular, $69-91 \times 5-5.7 \mu\text{m}$, thin-walled, clamped at the base. Basidia clavate, $30-36 \times 4.7-6 \mu\text{m}$, clamped at the base; sterigmata 4, $\leq 8 \mu\text{m}$ long. Basidiospores narrowly ellipsoid to subcylindrical, $7.3-11.3 \times 3.7-4.6 \mu\text{m}$, smooth, thin-walled, inamyloid, acyanophilous.

Material examined: India, Himachal Pradesh, Shimla, Kufri, on stump of *Cedrus deodara*, Maninder 8096 (PUN), August 1, 2013.



Figs. 44-48: *Hyphoderma setigerum* var. *bicystidium*: 44-45. Basidiocarp showing hymenial surface (44. fresh, 45. dry); 46-48. Line diagrams showing 46. basidiospores, 47. reconstruction of V.S. of basidiocarp showing hymenium and subhymenium, 48. basal hyphae.

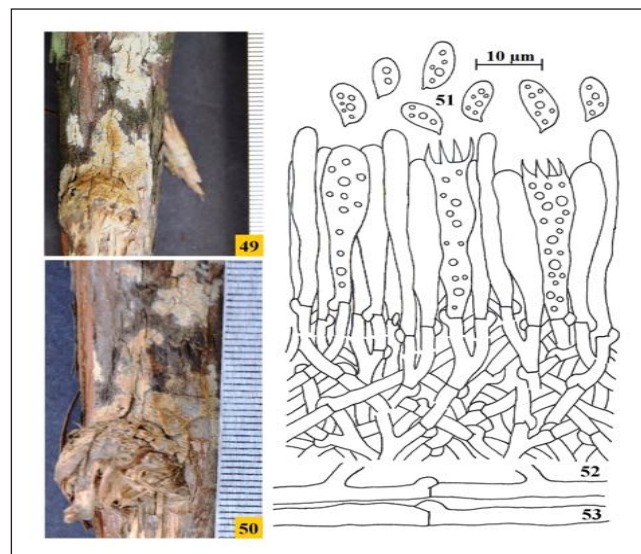
Remarks: *H. setigerum* var. *bicystidium* is being described for the first time from the study area. It is characterized by two types of cystidia i.e. septocystidia and leptocystidia. It was originally described by Dhingra and Singla (1993) from district Chamba of Himachal Pradesh followed by Dhingra *et al.* (2014) from Solan, Kinnaur and Kangra districts of Himachal Pradesh.

19. *Hyphoderma sibiricum* (Parmasto) Eriksson and Strid, *The Corticiaceae of North Europe* 3: 535, 1975.

-*Radulomyces sibiricus* Parmasto, *Conspectus Systematis Corticiacerum (Tartu)*: 223, 1968. (Figs. 49-53)

Basidiocarp resupinate, effused, adnate, ≤ 230 μm thick in section; hymenial surface cracked, pale orange to greyish orange to brownish orange when fresh, greyish orange to brownish orange on drying; margins fibrillose, paler concolorous, or indeterminate. Generative hyphae ≤ 2.8 μm wide, clamped, branched, thin-walled. Subicular hyphae horizontal, loosely interwoven. Subhymenial hyphae vertical, compact. Basidia clavate to subclavate, 19-31 \times 4-6 μm , constricted to somewhat sinuous, with oily contents, clamped at the base; sterigmata 4, ≤ 5 μm long. Basidiospores ellipsoid to subcylindrical to suballantoid, 6.8-10 \times 3.4-4.3 μm , smooth, thin-walled, with oily contents, inamyloid, acyanophilous.

Material examined: India, Himachal Pradesh, Shimla, about 4 km from Chail towards Kufri, on bark of *Cedrus deodara*, Maninder 7883 (PUN), August 3, 2013.



Figs. 49-53: *Hyphoderma sibiricum*: 49-50. Basidiocarp showing hymenial surface (49. fresh, 50. dry); 51-53. Line diagrams showing 51. basidiospores, 52. reconstruction of V.S. of basidiocarp showing hymenium and subhymenium, 53. basal hyphae.

Remarks: A new record for the study area, *H. sibiricum* is peculiar in lack of cystidia and presence of subcylindrical to suballantoid basidiospores. The species is being described for the first time from district Shimla. In Himachal Pradesh it was previously recorded by Dhingra *et al.* (2014) from Solan district of Himachal Pradesh.

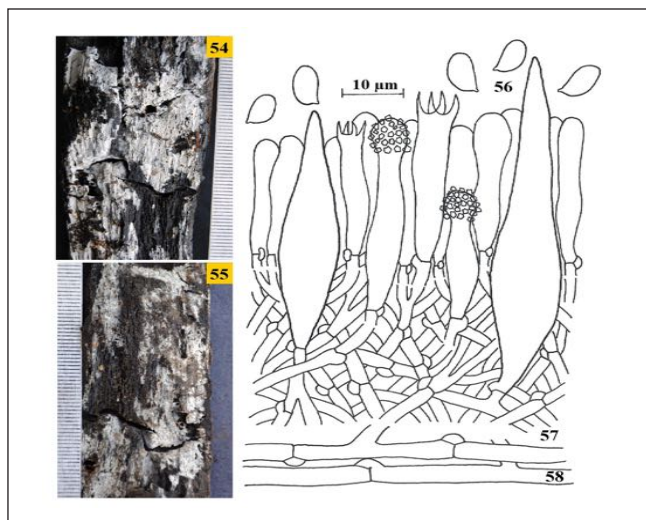
20. *Hyphoderma tsugae* (Burt) Eriksson & Strid, *The Corticiaceae of North Europe* 3: 541, 1975.

-*Corticium tsugae* Burt, *Annals of the Missouri Botanical Garden* 13(3): 276, 1926. (Figs. 54-58)

Basidiocarp resupinate, effused, adnate, ≤ 200 μm thick in section; hymenial surface smooth, orange grey when fresh, no noticeable change on drying; margins pruinose, paler concolorous, or indeterminate. Generative hyphae ≤ 3.8 μm wide, clamped, branched, thin-walled. Subicular hyphae horizontal, loosely interwoven. Subhymenial hyphae vertical, compact. Leptocystidia fusiform, 35-39 \times 8.4-14 μm , thin-walled, clamped at the base; projecting ≤ 12 μm out of the hymenium. Capitulate cystidia 23-32 \times 4-5 μm , having light brown crystalline matter at the apex, clamped at the base. Basidia clavate, 28-38 \times 5.6-6.3 μm , clamped at the base; sterigmata 4, ≤ 3.1 μm long. Basidiospores ellipsoid, 5.9-8.1 \times 3.7-5.9 μm , smooth, thin-walled, inamyloid, acyanophilous.

Material examined: India, Himachal Pradesh, Shimla, about 4 km from Chaupal towards Khirki, on bark of *Cedrus deodara*, Maninder 7902 (PUN), August 18, 2012.

Remarks: *H. tsugae* is typical in having combination of leptocystidia and capitulate cystidia along with ellipsoid basidiospores. It is being described for the first time from the study area. The previous account of this species from Himachal Pradesh includes reports from district Kullu and Solan (Dhingra and Singla, 1993; Dhingra *et al.*, 2014).



Figs. 54-58: *Hyphoderma tsugae*: 54-55. Basidiocarp showing hymenial surface (54. fresh, 55. dry); 56-58. Line diagrams showing 56. basidiospores, 57. Reconstruction of V.S. of basidiocarp showing hymenium and subhymenium, 58. basal hyphae.

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