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DIVERSITY OF GENUS *HYPHODONTIA* ERIKSS. FROM JAMMU DIVISION (J&K)

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ABSTRACT

An account of ten taxa of genus *Hyphodontia* (*H. alutaria*, *H. arguta*, *H. aspera*, *H. breviseta*, *H. microspora*, *H. pallidula*, *H. pruni*, *H. sambuci*, *H. spathulata* and *H. tetraspora*) of family *Tubulicrinaceae* (Class-*Agaricomycetes*, Phylum-*Basidiomycota*) has been given. All these, except *H. arguta*, *H. pallidula* and *H. spathulata*, are new reports for Jammu division in the state of Jammu and Kashmir. Of the 10 species described in the present work, 5 i.e. *H. aspera*, *H. breviseta*, *H. microspora*, *H. microspora* and *H. tetraspora*, are also first reports from the state of Jammu and Kashmir.

Key words: *Hyphodontia*, Jammu and Kashmir, Jammu division.

INTRODUCTION

The members of genus *Hyphodontia* are characterized by resupinate, adnate, effused fruitbodies, smooth to tuberculate to odontoid hymenial surface, branched, septate, with or without clamps generative hyphae, presence of sterile structures, subclavate to clavate to subcylindrical, 4-sterigmate basidia, usually with a median suburniform constriction and narrowly ellipsoid to ellipsoid to broadly ellipsoid to subcylindrical, thin-walled, apiculate, smooth, inamyloid, acyanophilous basidiospores. Earlier from Jammu division (J&K), 5 species of this genus have been reported by Thind and Khara (1968), Rattan (1977) and Sharma (2012).

MATERIAL AND METHODS

Collection of samples: Present studies are based on fifty one collections made from different localities of Jammu division (J&K) during the monsoon months (July-September) of the years 2012-16.

Macroscopic and microscopic evaluation: The specimens were identified on the basis of macroscopic and microscopic characters (Dhingra, 2005). Voucher specimens of all the specimens have been deposited at the herbarium of the Department of Botany, Punjabi University, Patiala (PUN).

AREA OF INVESTIGATION

Jammu division is one of the three administrative divisions within the state of Jammu and Kashmir. It has been divided into ten districts (Jammu, Doda, Kathua, Ramban, Reasi, Kishtwar, Poonch, Rajouri, Udhampur and Samba). The altitudinal range of the study area varies from 1000 ft to 28,250 ft above the mean sea level. It occupies a total area of 26,293 sq. km with forest cover of 12,066 sq. km (45.8% of the total geographical area) and of the total forest cover of 20,230 sq. km in Jammu and Kashmir, 12,066 km² (59.64%) falls in Jammu division. The climate of Jammu division varies greatly owing to its rugged topography with extreme hot and cold conditions with average

temperature ranging between 46° C in summers to less than 0° C in winters. The average annual rainfall is 1100 mm/annum. The division experiences 3 seasons: Winter season (October to March), Summer season (April to June) and Rainy season (July to September).

Champion and Seth (1968) have categorized the forests of Jammu division (J&K) into six types: Subtropical Dry Evergreen Forests, Subtropical Pine Forests, Himalayan Moist Temperate Forests, Himalayan Dry Temperate Forests, Subalpine Forests and Alpine Forests. These forest regions comprises of *Acacia catechu*, *Dalbergia sissoo*,

Acacia modesta, *Albizia* sp., *Eucalyptus* sp., *Dendrocalamus strictus*, *Pinus roxburghii*, *Olea cuspidata*, *Emblica officinalis*, *Murraya indica*, *Rosa moschata*, *Cedrus deodara*, *Pinus walllichiana*, *Picea smithiana*, *Pinus gerardiana*, *Abies pindrow*, *Juglans regia*, *Populus ciliata*, *Prunus padus*, *Aesculus indicus*, *Fraxinus floribunda*, *Quercus leucotrichophora*, *Acer* sp., *Hippophae salicifolia*, *Salix elegans*, *Betula utilis*, *Rhododendron arboreum*, *Berberis*, *Polygonum*, *Viburnum*, *Potentilla*, *Geranium*, *Lonicera*, *Cotoneaster*, *Astragalus* etc.

RESULTS AND DISCUSSION

Key to the species:

1. Cystidia when present of one type, but hyphal ends or cystidioles may be of one or more than one type... 2
1. Cystidia of more than one type.....10
2. Hyphae simple-septate.....*H. tetraspora*
2. Hyphae nodose-septate.....3
3. Cystidia hyphoid, 4 to 5-celled.....*H. pallidula*
3. Cystidia not as above.....4
4. Cystidia tubular, apically obtuse, thick-walled through out the length except at the apex.....*H. microspora*
4. Cystidia not as above, but cystidioles present..... 5
5. Cystidioles of one type.....6
5. Cystidioles of more than one type.....*H. spathulata*
6. Cystidioles with encrustation.....7
6. Cystidioles with or without encrustation.....8
7. Spores ellipsoid to subcylindrical.....*H. papillosa**
7. Spores ellipsoid.....*H. rimosissima**
8. Basidiocarp smooth to grandinioid.....*H. sambuci*
8. Basidiocarp not as above.....9
9. Hyphal ends obtuse to capitate, smooth.....*H. aspera*
9. Hyphal ends obtuse to somewhat capitate, encrusted.....*H. pruni*
10. Cystidia along with lagenocystidia present.....11
10. Cystidia along with torulose gloeocystidia present.....*H. breviseta*
11. Spores broadly ellipsoid.....*H. alutaria*
11. Spores broadly ellipsoid to subglobose..... *H. arguta*

1. *Hyphodontia alutaria* (Burt) Erikss., Symbolae Botanicae Upsalienses 16 (1): 104, 1958. – *Peniophora alutaria* Burt, Annals of the Missouri Botanical Garden. 12: 231, 1926. **Figs. 1-7**

Fruitbodies resupinate, ≤ 200 μm thick in section, adnate, effused. **Hymenial surface** smooth to grandinioid under lens, color varies from orangish white to pale orange to grayish orange when collected. **Margins** pruinose, paler concolorous, or indistinct. **Hyphal system** monomitic. Generative hyphae nodose-septate; subicular hyphae less branched, horizontal, thick-walled, ≤ 4.9 μm wide; subhymenial hyphae more branched, vertical, thin-walled, ≤ 3.3 μm wide. **Sterile structures of 2 types:** **I. Cystidia** subcylindrical, capitate, sometimes septate, clamped, thick-walled, 53–68 \times

4.2–5.6 μm ; projecting ≤ 20 μm out of the hymenium. **II. Lagenocystidia** consisting of hyphal ends abruptly ending into a needle like part, apically encrusted, thin-walled, 24–32 \times 3–4.2 μm ; usually immersed to somewhat projecting out of the hymenium. **Basidia** subclavate to clavate, often with median suburniform constriction, 4-sterigmate, with basal clamp, 11–21 \times 4.6–6 μm ; sterigmata ≤ 4.2 μm long. **Basidiospores** broadly ellipsoid, thin-walled, apiculate, smooth, inamyloid, acyanophilous, 5–7.6 \times 3.2–4 μm .

Specimens examined– India: J&K, Jammu, Doda, Bhadarwah, Duggi, on bark of *C. deodara*, Jyoti 8048 (PUN), September 27, 2014; Udhampur, about 16 km from Patnitop towards Sanasar, on burnt gymnospermous stump, Jyoti 8278 (PUN); October 05, 2014.

* Taxa reported earlier from the study area but not encountered during the present studies

Remarks: It is the first report of this species from Jammu division (J&K). Earlier reports from India were by Rattan (1977) from Kashmir division (J&K) and Himachal Pradesh; Dhingra (2005) and Dhingra et al. (2011) from Arunachal Pradesh; Singh (2007), Kaur (2012), Prashar & Ashok (2013), Kaur et al. (2014) and Dhingra et al. (2014) from Himachal Pradesh; Sharma (2012) and Samita (2014) from Uttarakhand and Ranadive (2013) from Maharashtra.

2. *Hyphodontia arguta* (Fr.) Erikss., *Symbolae Botanicae Upsalienses* 16 (1): 104, 1958. – *Hydnum argutum* Fr., *Systema Mycologicum* 1: 424, 1821. **Figs. 8-14**

Fruitbodies resupinate, ≤ 150 μm thick in section, adnate, effused. **Hymenial surface** smooth to odontoid, color changes from grayish white in fresh state to yellowish white to pale yellow in dry state. Margins pruinose, paler concolorous, or indistinct. **Hyphal system** monomitic. Generative hyphae nodose-septate, ≤ 3.9 μm wide; subicular hyphae less branched, horizontal, thick-walled; subhymenial hyphae more branched, vertical, thin-walled. **Sterile structures of two types: I. Cystidia** subcylindrical to hyphoid, 2 to 3-celled due to 1-2 nodose septa, thin-walled, with basal clamp, $57\text{--}87 \times 4.5\text{--}4.9$ μm ; projecting ≤ 35 μm out of the hymenium. **II. Lagenocystidia** consisting of hyphal ends abruptly ending into a needle like part, apically encrusted, thin-walled, $25\text{--}43 \times 3.9\text{--}5.2$ μm ; usually immersed or somewhat projecting out of the hymenium. **Basidia** clavate to subclavate, 4-sterigmate, with suburniform constriction to sinuous, with basal clamp, $18\text{--}28 \times 5.2\text{--}5.5$ μm ; sterigmata ≤ 5.2 μm long. **Basidiospores** broadly ellipsoid to subglobose, thin-walled, apiculate, smooth, inamyloid, acyanophilous, $5.2\text{--}6.5 \times 4.2\text{--}5.5$ μm .

Specimens examined– India: J&K, Jammu, Doda, Bhadarwah, Nalthi, on stump of *C. deodara*, Brij 8075 (PUN), September 26, 2014; Doda, Bhadarwah, Nalthi, on stump of *C. deodara*, Dhingra 8088 (PUN), September 26, 2014; Doda, Bhadarwah, Duggi, on bark of *B. aristata*, Dhingra 7999 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on stump of *C. deodara*, Jyoti 8000 (PUN), September 27, 2014; Doda, Bhadarwah, Nalthi, on stump of *C. deodara*, Jyoti 8168 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on bark of *B. aristata*, Jyoti 8186 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on stump of *C. deodara*, Jyoti 8224 (PUN), September 27, 2014.

Remarks: This species differs from *H. alutaria* in having smooth to odontoid hymenial surface and broadly ellipsoid to subglobose basidiospores. It was first reported from India by Thind and Khara (1968) from district Ramban (J&K) and Himachal Pradesh, followed by Rattan (1977) from district

Baramula (J&K) and Uttarakhand; Kaur (2012), Prashar & Ashok (2013), Kaur et al. (2014) and Dhingra et al. (2014) from Himachal Pradesh; Sharma (2012), Prashar & Lalita (2013) and Samita (2014) from Uttarakhand; Ranadive (2013) from Maharashtra.

3. *Hyphodontia aspera* (Fr.) Erikss., *Symbolae Botanicae Upsalienses* 16 (1): 104, 1958. – *Grandinia aspera* Fr., *Hymenomyces europaei*: 627, 1874. **Figs. 15-20**

Fruitbody resupinate, ≤ 200 μm thick in section, adnate, effused. **Hymenial surface** odontoid, aculei ≥ 2 mm long, color varies from orangish white to pale orange to grayish orange in fresh state, grayish orange to brownish orange in dry state. **Margins** fibrous, paler concolorous, or indistinct. **Hyphal system** monomitic. Generative hyphae nodose-septate, ≤ 4.4 μm wide; subicular hyphae less branched, horizontal, thick-walled; subhymenial hyphae more branched, vertical, thin-walled. **Sterile structures** absent, but thin-walled, smooth, basally nodose-septate, without encrustation, obtuse to capitate hyphal ends present in the hymenium, $43\text{--}50 \times 4.4\text{--}6.2$ μm . **Basidia** clavate, usually with median suburniform constriction, 4-sterigmate, with basal clamp, $24\text{--}35 \times 3.4\text{--}4.6$ μm ; sterigmata ≤ 5.9 μm long. **Basidiospores** broadly ellipsoid, thin-walled, apiculate, smooth, inamyloid, acyanophilous, $4.4\text{--}6.2 \times 3.6\text{--}4.6$ μm .

Specimen examined– India: J&K, Jammu, Doda, Bhadarwah, Nalthi, on stump of *C. deodara*, Jyoti 8182 (PUN), September 26, 2014.

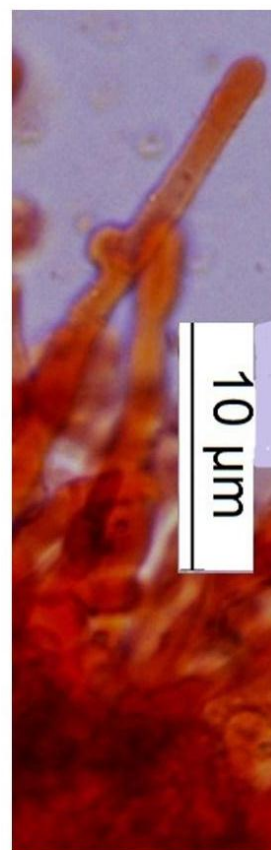
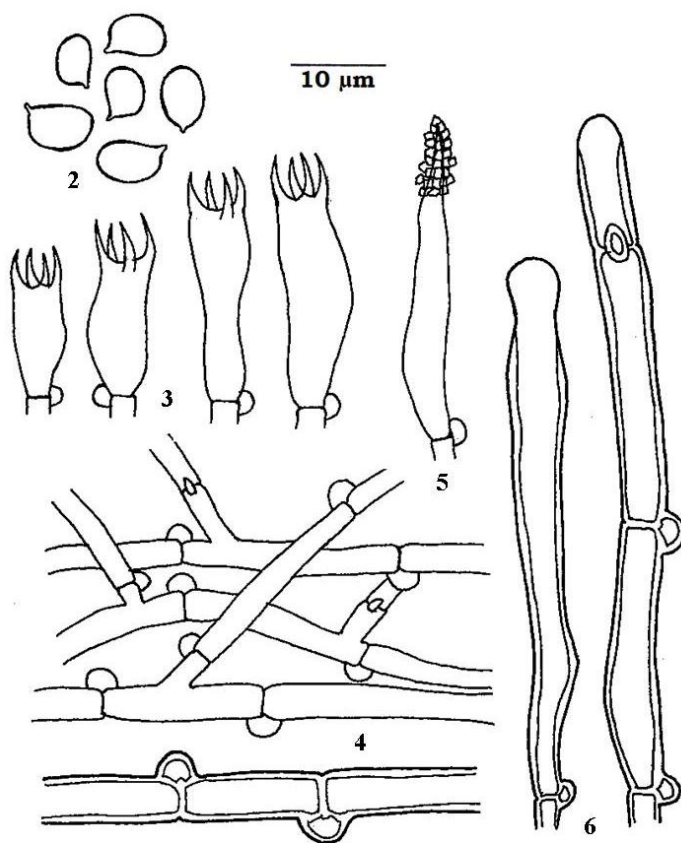
Remarks: It differs from both *H. alutaria* and *H. arguta* in having odontoid hymenial surface and the absence of sterile structures, and the first report from Jammu and Kashmir. Earlier from India, it has been reported by Rattan (1977) from Uttarakhand, followed by Natarajan and Kolandavelu (1998) from Tamil Nadu; Singh (2007), Kaur (2012) and Prashar & Ashok (2013) from Himachal Pradesh; Sharma (2012) and Prashar & Lalita (2013) from Uttarakhand; Ranadive (2013) from Maharashtra. Dhingra et al. (2014) and Samita (2014) reported it as a species under genus *Xylodon* from Himachal Pradesh and Uttarakhand respectively.

4. *Hyphodontia breviseta* (Karst.) Erikss., *Symbolae Botanicae Upsalienses* 16(1): 140, 1958. – *Kneiffia breviseta* Karst., *Hedwigia* 25: 232, 1886. **Figs. 21-27**

Fruitbody resupinate, ≤ 240 μm thick in section, adnate, effused. **Hymenial surface** smooth to grandinoid under lens, color varies from orangish white to pale orange in fresh state to pale orange to grayish orange in dry state. **Margins** pruinose, paler concolorous, or indistinct. **Hyphal system** monomitic. Generative hyphae branched, nodose-

septate, $\leq 3.3 \mu\text{m}$ wide; subicular hyphae loosely interwoven, horizontal, less branched, thick-walled; subhymenial hyphae denser, vertical, more branched, thin-walled. **Sterile structures of 2 types: I. Cystidia** hyphoid, with patches of resinous encrustation, $40\text{--}48 \times 4.5\text{--}5.3 \mu\text{m}$;

projecting $\leq 20 \mu\text{m}$ out of the hymenium. **II. Gloecystidia** torulose, with basal clamp, thin-walled, with oily contents negative to sulphovanillin, $41\text{--}50 \times 4.6\text{--}5 \mu\text{m}$; enclosed in the hymenium. **Basidia** subclavate to subcylindrical, 4-sterigmate, with basal clamp, $15\text{--}31 \times 3.9\text{--}5.5 \mu\text{m}$;



Figs 1-7. *Hypodontia alutaria*: 1. Basidiocarp showing hymenial surface; 2. Basidiospores; 3. Basidia; 4. Generative hyphae; 5. Lagenocystidium; 6. Cystidia; 7. Microphotograph showing cystidium.

sterigmata $\leq 4.2 \mu\text{m}$ long. **Basidiospores** broadly ellipsoid, thin-walled, apiculate, smooth, inamyloid, acyanophilous, $6\text{--}7 \times 3.9\text{--}4.5 \mu\text{m}$.

Specimen examined– India: J&K, Jammu, Udhampur, Sanasar, on decaying gymnospermous stump, Jyoti 8296 (PUN), October 05, 2014.

Remarks: This species is different from *H. aspera* in having smooth to somewhat grandinoid hymenial surface and two types of sterile

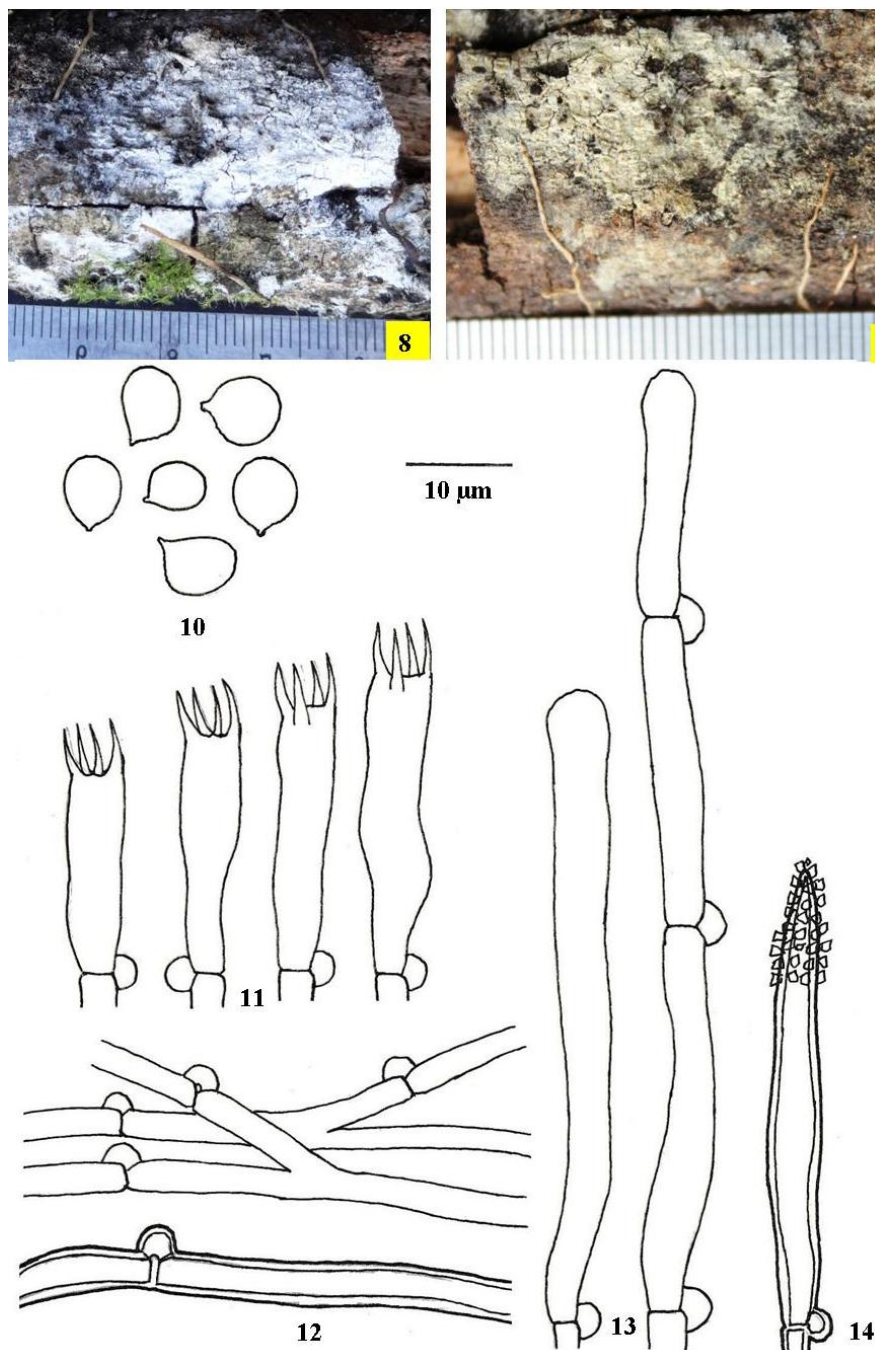
structures, and being described for the first time from Jammu and Kashmir. Previous reports from India were by Singh (2007) and Dhingra et al. (2014) from Himachal Pradesh and Samita (2014) from Uttarakhand.

5. *Hypodontia microspora* Erikss. & Hjortst., The *Corticaceae* of North Europe 4: 651, 1976.

Figs. 28-30

Fruitbodies resupinate, ≤ 250 μm thick in section (excluding aculei), adnate, effused. **Hymenial surface** odontoid, aculei dense, conical, ≤ 270 μm long and ≤ 80 μm wide, color varies from yellowish white to pale orange to reddish gray when collected. **Margins** pruinose, paler concolorous, or

indistinct. **Hyphal system** monomitic. Generative hyphae branched, nodose-septate, ≤ 2.6 μm wide; subicular hyphae horizontal, less branched, thin- to somewhat thick-walled; subhymenial hyphae vertical, irregularly interwoven, more branched, thin-walled. **Cystidia** tubular, apically obtuse,

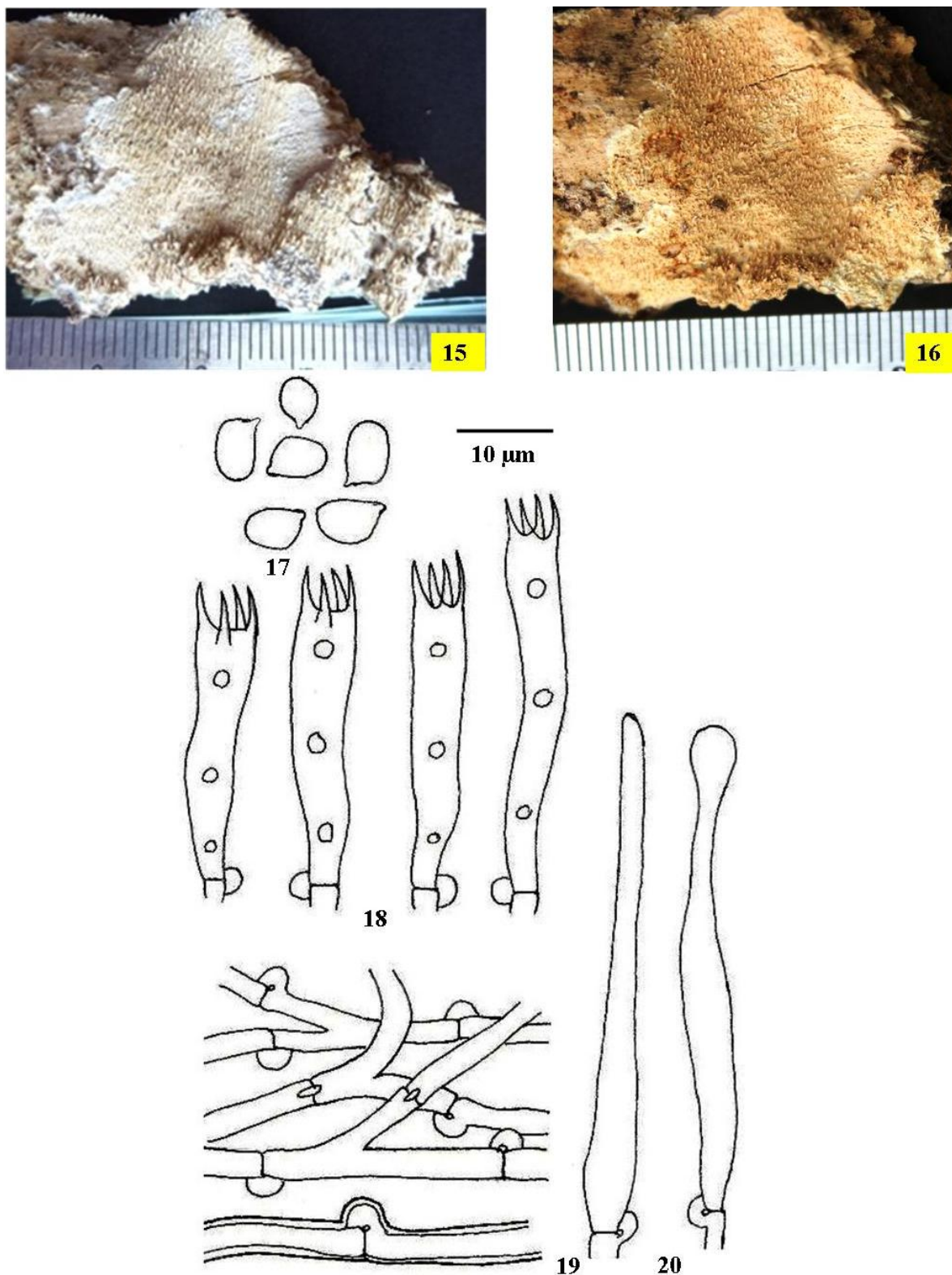


Figs 8-14. *Hyphodontia arguta*: 8-9. Basidiocarp showing hymenial surface (8. fresh, 9. dry); 10. Basidiospores; 11. Basidia; 12. Generative hyphae; 13. Cystidia; 14. Lagenocystidium.

thick-walled throughout the length except at the apex, with basal clamp, $113\text{--}156 \times 7.8\text{--}8.6$ μm ; present in close tufts in aculei. **Basidia** clavate, rarely somewhat constricted, 4-sterigmate, with basal clamp, $8.4\text{--}16 \times 3.5\text{--}4.5$ μm ; sterigmata ≤ 4 μm long. **Basidiospores** subcylindrical to narrowly

ellipsoid, thin-walled, apiculate, smooth, inamyloid, acyanophilous, $3.9\text{--}5.2 \times 1.9\text{--}2.7$ μm .

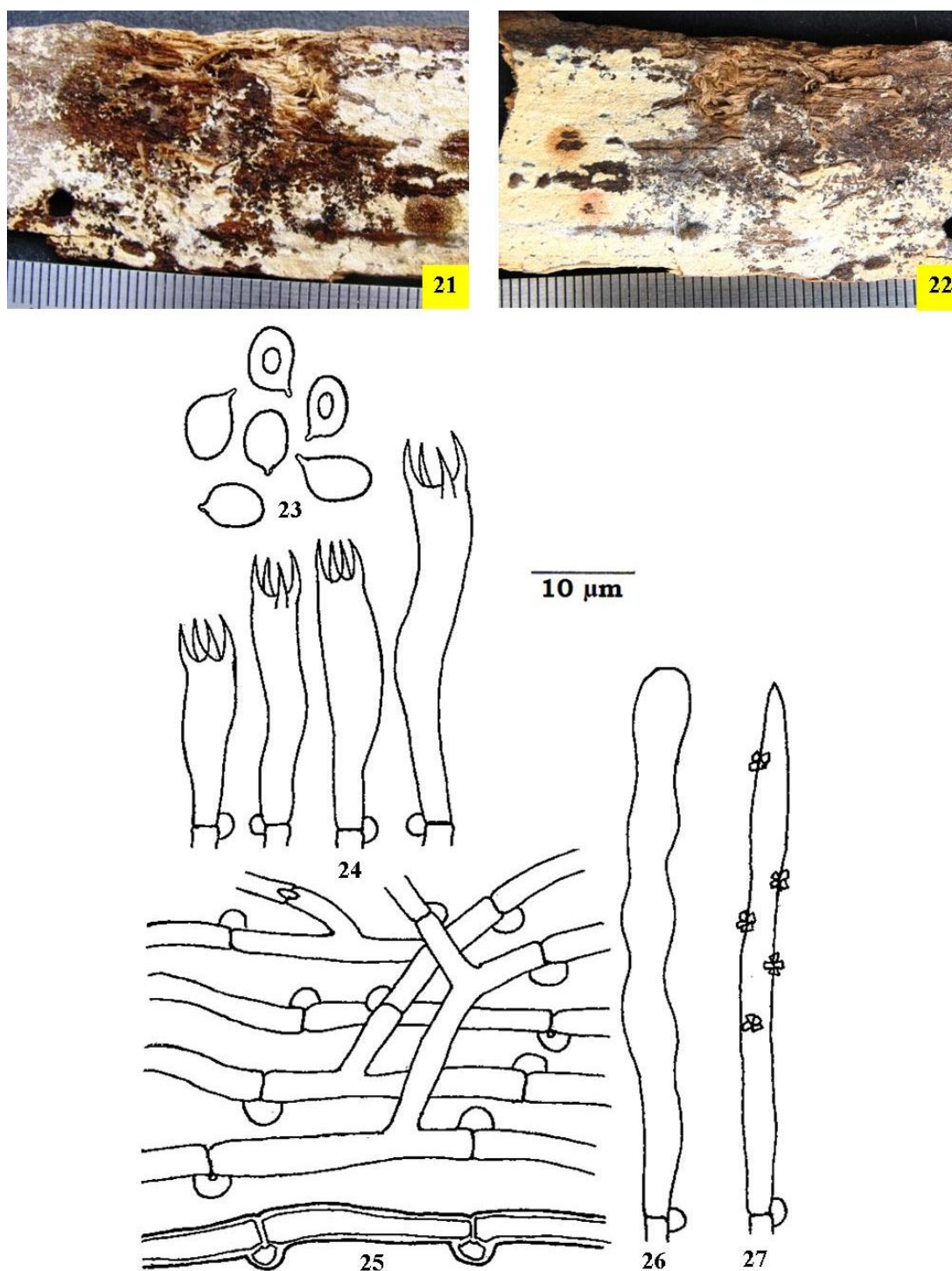
Specimens examined— India: J&K, Jammu, Kathua, Billawar, about 2 km from Sukrala towards Machhedi, on log of *P. roxburghii*, Jyoti 7077, July



Figs 15-20 *Hyphodontia aspera*: 15-16. Basidiocarp showing hymenial surface (15. fresh, 16. dry); 17. Basidiospores; 18. Basidia; 19. Generative hyphae; 20. Hyphal ends.

29, 2013; Kathua, Billawar, about 2 km from Sukrala towards Machhedi, on log of *P. roxburghii*, 8230 (PUN), July 29, 2013; Udhampur, Tikri, on

decaying angiospermous stump, Dhingra 8165 (PUN), August 17, 2014.

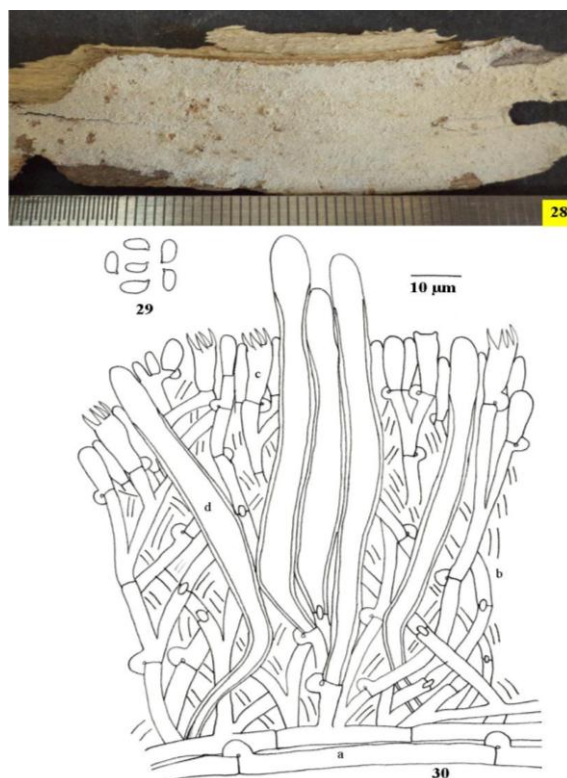


Figs 21-27. *Hyphodontia breviseta*: 21-22. Basidiocarp showing hymenial surface (21. fresh, 22. dry); 23. Basidiospores; 24. Basidia; 25. Generative hyphae; 26. Gloeocystidium; 27. Cystidium.

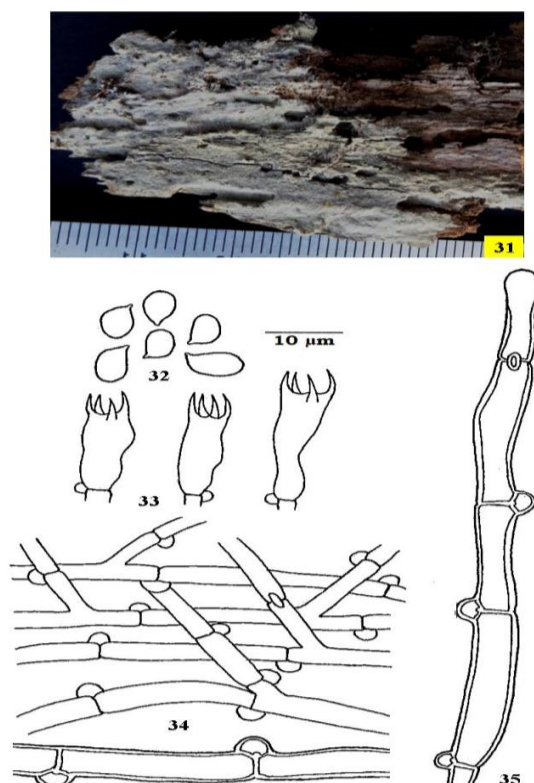
Remarks: This species differs from *H. breviseta* in having tubular cystidia and subcylindrical to narrowly ellipsoid basidiospores and being described for the first time from Jammu and Kashmir. Earlier report from India was by Samita (2014) from Uttarakhand as *Kneiffiella microspora*.

6. *Hyphodontia pallidula* (Bres.) Erikss., *Symbolae Botanicae Upsalienses* 16 (1): 104, 1958. – *Gonatobotrys pallidula* Bres., *Annals mycologicum* 1 (2): 127, 1903. **Figs. 31-35**

Fruitbodies resupinate, $\leq 240 \mu\text{m}$ thick in section, adnate, effused. **Hymenial surface** smooth, color



Figs 28-30. *Hyphodontia microspora*: 28. Basidiocarp showing hymenial surface; 29. Basidiospores; 30. Vertical section through basidiocarp showing a. subicular hyphae, b. subhymenial hyphae, c. basidium and d. cystidium.



Figs 31-35. *Hyphodontia pallidulaa*: 31. Basidiocarp showing hymenial surface; 32. Basidiospores; 33. Basidia; 34. Generative hyphae; 35. Cystidium.

varies from orangish white to grayish orange in fresh state, grayish orange to brownish orange in dry state. **Margins** pruinose, paler concolorous, or indistinct. **Hyphal system** monomitic. Generative

hyphae branched, nodose-septate; subicular hyphae horizontal, less branched, thick-walled, $\leq 5.2 \mu\text{m}$ wide; subhymenial hyphae vertical, more branched, thin-walled, $\leq 3.9 \mu\text{m}$ wide. **Cystidia** hyphoid,

usually 4 to 5-celled due to 3-4 nodose septa, apically obtuse to somewhat capitate, thick-walled, with basal clamp, cyanophilous, $88-116 \times 3.9-4.7 \mu\text{m}$; projecting $\leq 20 \mu\text{m}$ out of the hymenium.

Basidia clavate to subclavate, constricted, 4-sterigmate, with basal clamp, $10-20 \times 4.6-6.6 \mu\text{m}$; sterigmata $\leq 3.9 \mu\text{m}$ long. **Basidiospores** ellipsoid to broadly ellipsoid, thin-walled, apiculate, smooth, inamyloid, acyanophilous, $5-7 \times 3.3-4.5 \mu\text{m}$.

Specimens examined— India: J&K, Jammu, Kathua, Billawar, about 8 km from Sukrala towards Machhed, on stump of *P. roxburghii*, Jyoti 8003 (PUN), July 28, 2013; ; Kathua, Basholi, on stump of *C. deodara*, Jyoti 8162 (PUN), August 28, 2014; Doda, Bhadarwah, Duggi, on bark of *C. deodara*, Dhingra 8001 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on stump of *C. deodara*, Jyoti 8086 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on bark of *B. aristata*, Jyoti 8132 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on stump of *C. deodara*, Brij 8155 (PUN), September 27, 2014; Doda, Bhadarwah, Jai, on stump of *C. deodara*, Brij 8002 (PUN), September 28, 2015; Doda, Bhadarwah, Jai, on stump of *C. deodara*, Dhingra 8117 (PUN), September 28, 2015; Doda, Bhadarwah, Jai, on stump of *C. deodara*, Jyoti 8122 (PUN), September 28, 2015; Doda, Bhadarwah, Jai, on stump of *C. deodara*, Dhingra 8147 (PUN), September 28, 2015; Doda, Bhadarwah, Jai, on stump of *C. deodara*, Dhingra 8150 (PUN), September 28, 2015.

Remarks: This species is different from *H. microspora* in having hyphoid, usually 4 to 5-celled cystidia and ellipsoid to broadly ellipsoid basidiospores. Earlier reports from India were by Rattan (1977) from districts Anantnag, Baramula, Doda, Ramban, Udhampur (J&K), Uttarakhand and Himachal Pradesh; Natarajan and Kolandavelu (1998) from Tamil Nadu; Dhingra (2005) and Dhingra et al. (2011) from Arunachal Pradesh; Dhingra et al. (2006), Singh (2007), Kaur (2012), Prashar & Ashok (2013), Dhingra et al. (2014) and Kaur et al. (2014) from Himachal Pradesh; Sharma (2012) from District Doda, Udhampur (J&K); Lalji (2003), Prashar & Lalita (2013) and Samita (2014) from Uttarakhand.

7. *Hyphodontia pruni* (Lasch) Svrcek, Česká Mykologie 27 (4): 204, 1973. – *Odontia pruni* Lasch, Flora 565, 1851.

Figs. 36-41

Fruitbody resupinate, $\leq 160 \mu\text{m}$ thick in section, adnate, effused. **Hymenial surface** odontoid, aculei $\geq 1 \text{ mm}$ long, color varies from orangish white to pale orange in fresh state, to pale orange to grayish orange in dry state. **Margins** fibrillose,

paler concolorous, or indistinct. **Hyphal system** monomitic. Generative hyphae branched, nodose-septate, $\leq 4.6 \mu\text{m}$ wide; subicular hyphae horizontal, less branched, encrusted with patches of crystalline matter; subhymenial hyphae vertical, more branched. **Cystidioles** hyphoid, obtuse to somewhat capitate, thin-walled, encrusted with irregular patches of crystals, $31-50 \times 2.6-3.6 \mu\text{m}$.

Basidia subclavate to clavate, 4-sterigmate, with basal clamp and oily contents, $18-33 \times 4.6-6 \mu\text{m}$; sterigmata $\leq 4.2 \mu\text{m}$ long. **Basidiospores** broadly ellipsoid, thin-walled, apiculate, smooth, inamyloid, acyanophilous, uniguttulate, $5-6.6 \times 3.3-4.5 \mu\text{m}$.

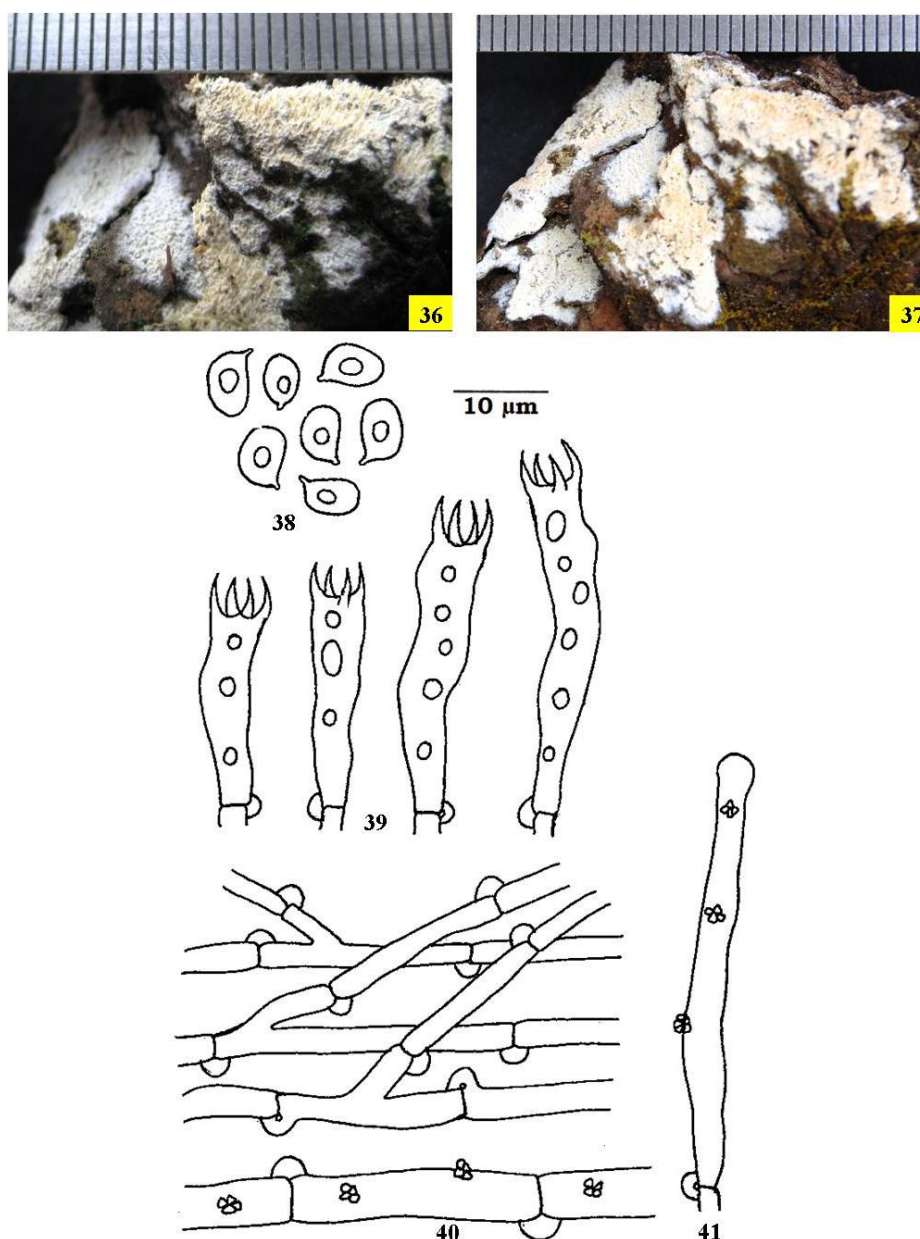
Specimen examined— India: J&K, Jammu, Udhampur, about 2 km from Patnitop towards Batote, on stump of *C. deodara*, Jyoti 8275 (PUN), October 05, 2014.

Remarks: It differs from *H. pallidula* in having odontoid hymenial surface and obtuse to somewhat capitate cystidioles and the first report from Jammu division (J&K). Natarajan and Kolandavelu (1998) reported it for the first time from India from Tamil Nadu; followed by Singh (2007), Kaur (2012), Prashar & Ashok (2013), Dhingra et al. (2014) and Kaur et al. (2014) from Himachal Pradesh; Sharma (2012) from district Baramula (J&K) and Himachal Pradesh; Ranadive (2013) from Maharashtra.

8. *Hyphodontia sambuci* (Pers.) Erikss., Symbolae Botanicae Upsalienses 16 (1): 104, 1958. – *Corticium sambuci* Pers., Neues Magazin für die Botanik 1: 111, 1794. **Figs. 42-46**

Fruitbodies resupinate, $\leq 250 \mu\text{m}$ thick in section, adnate, effused. **Hymenial surface** smooth to somewhat grandinoid, color varies from grayish white to chalky white when collected. **Margins** pruinose, paler concolorous, or indistinct. **Hyphal system** monomitic. Generative hyphae nodose-septate, $\leq 3.9 \mu\text{m}$ wide, encrusted with patches of crystalline matter; subicular hyphae horizontal, less branched, thin- to somewhat thick-walled; subhymenial hyphae vertical, more branched, thin-walled. **Cystidioles** subfusiform, encrusted with patches of crystals, $29-48 \times 7-8 \mu\text{m}$; enclosed in the hymenium. **Basidia** clavate, usually with median suburniform constriction, 4-sterigmate, with basal clamp, $16-24 \times 4.6-6 \mu\text{m}$; sterigmata $\leq 4.2 \mu\text{m}$ long. **Basidiospores** ellipsoid, thin-walled, apiculate, smooth, inamyloid, acyanophilous, $6.5-8 \times 4.6-5 \mu\text{m}$.

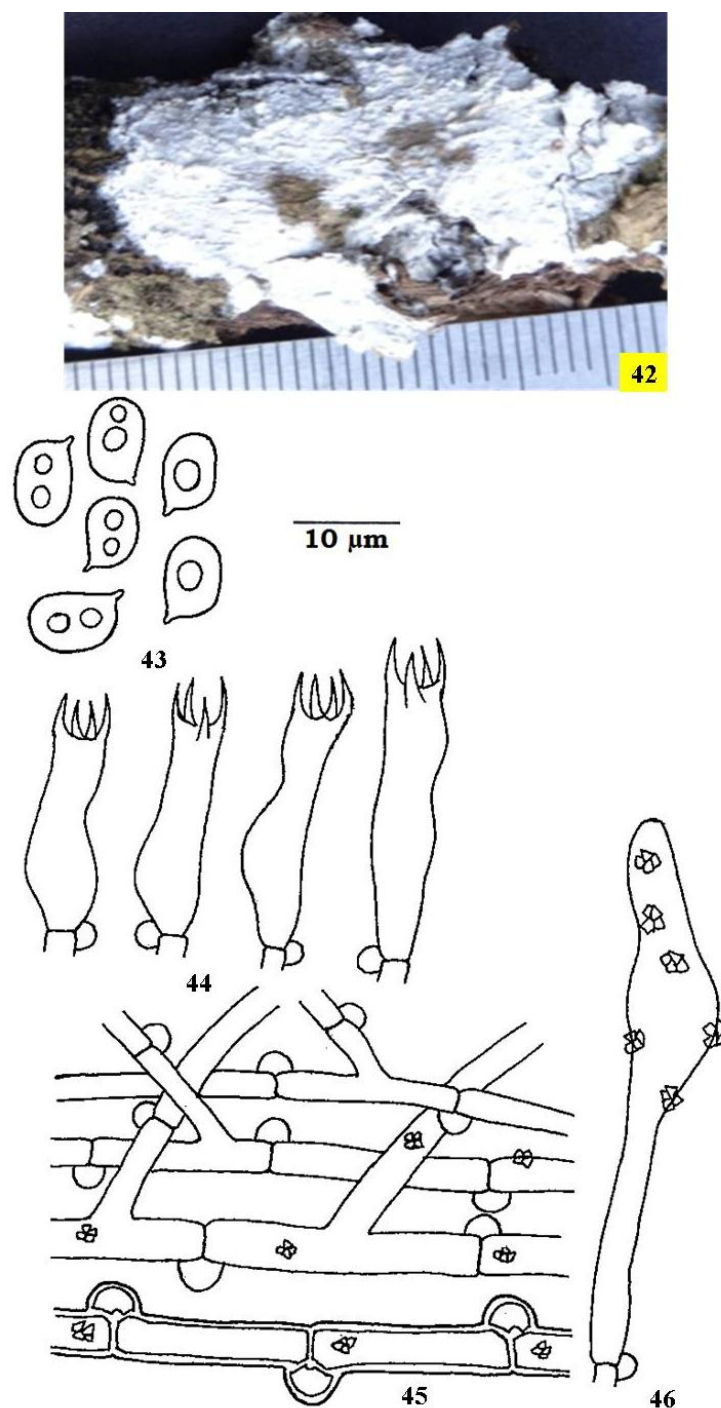
Specimens examined— India: J&K, Jammu, Kathua, Hiranagar, Arnoha, on stick of *B. aurandinacea*, Jyoti 8179 (PUN), August 02, 2014;



Figs 36-41. *Hyphodontia pruni*: 36-37. Basidiocarp showing hymenial surface (36. fresh, 37. dry); 38. Basidiospores; 39. Basidia; 40. Generative hyphae; 41. Cystidium.

Udhampur, Devika, on bark of *B. aristata*, 8107 (PUN), August 17, 2014; Bani, Duggan, on bark of *B. aristata*, Dhingra 8172 (PUN), September 06, 2014; Doda, Doda, Bhadarwah, Nalthi, on stump of *C. deodara*, Jyoti 8164 (PUN), September 26, 2014; Doda, Bhadarwah, Duggi, on stump of *C. deodara*, Jyoti 8046 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on stump of *B. aristata*, Dhingra 8090 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on decaying angiospermous sticks, Jyoti 8096 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on decaying angiospermous sticks, Dhingra 8097 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on decaying angiospermous stick, Jyoti 8099 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on bark of *B. aristata*, Jyoti 8115 (PUN), September

27, 2014; Doda, Bhadarwah, Duggi, on decaying angiospermous sticks, Jyoti 8137 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on decaying angiospermous bark, Jyoti 8101 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on bark of *B. aristata*, Jyoti 8103 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on stump of *C. deodara*, Jyoti 8134 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on bark of *B. aristata*, Jyoti 8135 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on bark of *B. aristata*, Jyoti 8136 (PUN), September 27, 2014; Doda, Bhadarwah, Duggi, on bark of *B. aristata*, Jyoti 8144 (PUN), September 27, 2014; Jammu, Akhnoor, on bark of *B. aurandinacea*, Jyoti 8102 (PUN) October 14, 2014; Doda, Bhadarwah, Jai, on stump of *P. wallichiana*, Dhingra 8098 (PUN),



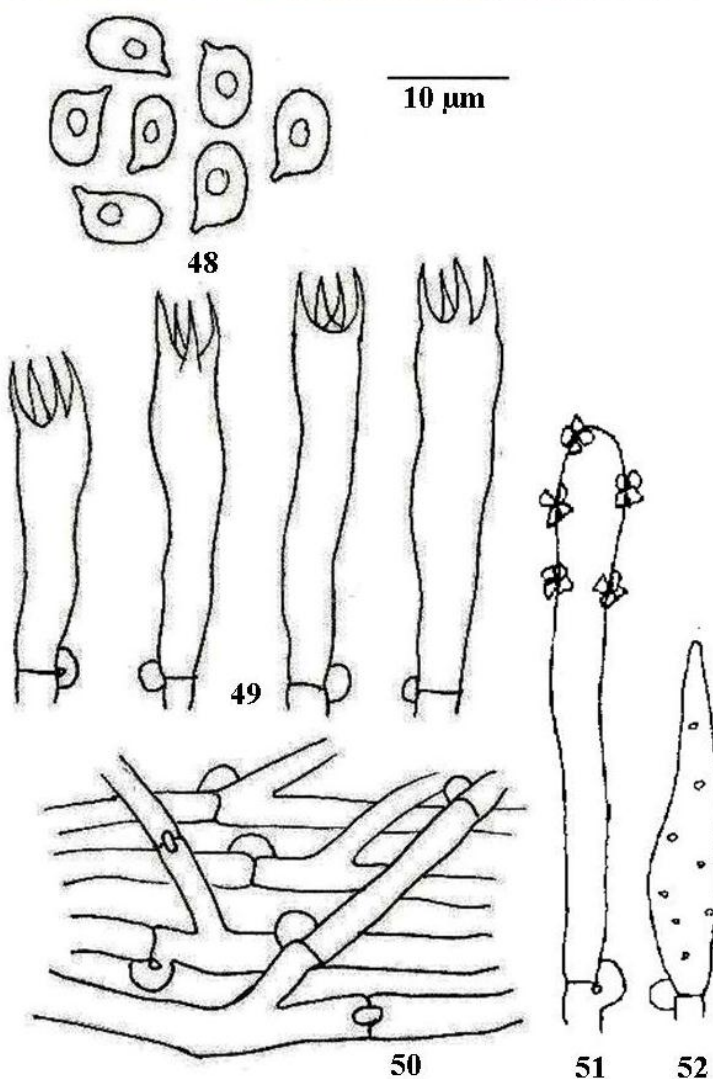
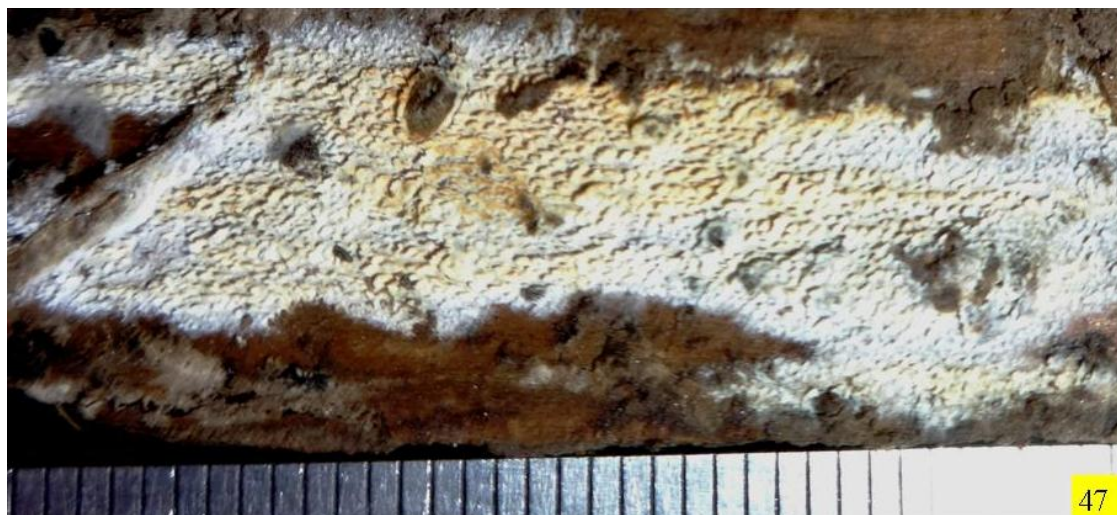
Figs 42-46. *Hyphodontia sambuci*: 42. Basidiocarp showing hymenial surface; 43. Basidiospores; 44. Basidia; 45. Generative hyphae; 46. Cystidium.

October 01, 2015; Doda, Bhadarwah, Jai, on stump of *C. deodara*, Jyoti 8220 (PUN), October 01, 2015.

Remarks: It is being described for the first time from Jammu and Kashmir. Previous reports from India were by Dhingra (1989) from Arunachal Pradesh; Lalji (2003) and Dhingra & Navneet (2005) from Uttarakhand; Singh (2007), Priyanka (2012) and Dhingra et al. (2014) from Himachal Pradesh; Dhingra et al. (2011) from West Bengal; Ranadive (2013) from Maharashtra and Samita (2014) from Uttarakhand.

9. *Hyphodontia spathulata* (Schrad.) Parmasto, *Conspectus Systematis Corticiacearum* 123, 1968. – *Hydnum spathulatum* Schrad., *Spicilegium Florae Germanicae* 1: 178, 1794. **Figs. 47-52**

Fruitbodies resupinate, ≤ 270 μm thick in section, adnate, effused. **Hymenial surface** odontoid, aculei ≥ 1 mm long, color varies from orangish white to pale orange to grayish orange to brownish orange when collected. **Margins** fibrillose, paler concolorous, or indistinct. **Hyphal system** monomitic. Generative hyphae branched, nodose-



Figs 47-52. *Hyphodontia spathulata*: 47. Basidiocarp showing hymenial surface; 48. Basidiospores; 49. Basidia; 50. Generative hyphae; 51. Capitate hyphal end; 52. Spathulate hyphal end.

septate, thin-walled, $\leq 3.9 \mu\text{m}$ wide; subicular hyphae horizontal, less branched; subhymenial hyphae vertical, more branched. **Cystidioles of 2 types: I. Capitate hyphal ends** thin-walled, with

basal clamp, encrusted with crystals, $28\text{--}36 \times 3.9\text{--}5.3 \mu\text{m}$. **II. Spathulate hyphal ends** tapering towards the apex, thin-walled, with basal clamp, oily contents negative to sulphovanillin, $18\text{--}31 \times$

3.2–4 μm . **Basidia** clavate, generally with suburniform constriction, 4-sterigmate, with basal clamp and oily contents, 18–29 \times 5.2–7.2 μm ; sterigmata \leq 5.5 μm long. **Basidiospores** ellipsoid to broadly ellipsoid, thin-walled, apiculate, smooth, inamyloid, acyanophilous, generally uniguttulate, 6.5–7.2 \times 3.2–3.9 μm .

Specimens examined– India: J&K, Jammu, Udampur, about 8 km from Patnitop towards Sanasar, on stump of *C. deodara*, Jyoti 7998 (PUN), September 10, 2012; Doda, Bhadarwah, Nalhi, on stump of *C. deodara*, Jyoti 8060 (PUN), September 26, 2014; Doda, Bhadarwah, Nalhi, on stump of *C. deodara*, Jyoti 8116 (PUN), September 26, 2014; Doda, Bhadarwah, Nalhi, on stump of *C. deodara*, Jyoti 8237 (PUN), September 26, 2014.

Remarks: This species differs from *H. sambuci* in having odontoid hymenial surface and a rereport from the study area. Earlier reports from India are by Thind and Khara (1968) from Himachal Pradesh; Rattan (1977) from districts Doda, Ramban, Anantnag and Baramula (J&K) and Uttarakhand; Singh (2007), Kaur (2012), Prasher & Ashok (2013) and Dhingra et al. (2014) from Himachal Pradesh; Sharma (2012) from district Baramula (J&K) and Uttarakhand; Prashar & Lalita (2013) and Samita (2014) from Uttarakhand and Ranadive (2013) from Maharashtra.

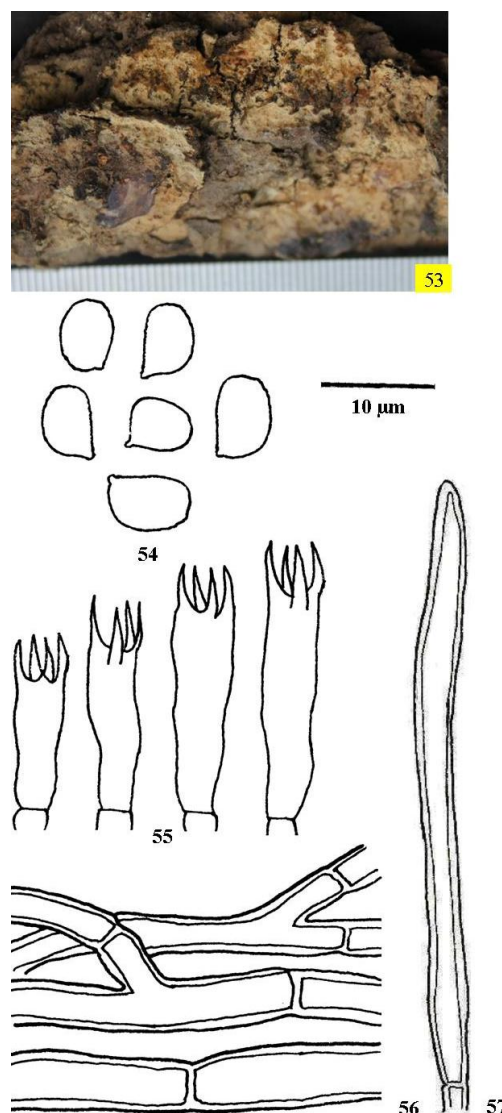
10. *Hyphodontia tetraspora* (Rattan) Hjortst., Windahlia 17: 58, 1987. – *Hyphodontia efibulata* f. *tetraspora* Rattan, Bibliotheca Mycologica 60: 335, 1977. **Figs. 53-57**

Fruitbody resupinate, \leq 250 μm thick in section, adnate, effused. **Hymenial surface** smooth, color varies from brownish orange to light brown when collected. **Margins** fibrillose, paler concolorous, or indistinct. **Hyphal system** monomitic. Generative hyphae branched, simple-septate, thick-walled, without clamps, \leq 4.5 μm wide; subicular hyphae horizontal, less branched, thick-walled; subhymenial hyphae vertical, more branched, thin-to thick-walled. **Cystidia** cylindrical, apically tapering, thick-walled, smooth, without basal clamp, 71–94 \times 3.9–5.9 μm ; projecting \leq 45 μm out of the hymenium. **Basidia** clavate, 4-sterigmate, without basal clamp, 10–19 \times 3.9–5.2 μm ; sterigmata \leq 4.2 μm long. **Basidiospores** broadly ellipsoid, thin-walled, apiculate, smooth, inamyloid, acyanophilous, 5.2–6.8 \times 3.9–4.5 μm .

Specimen examined– India: J&K, Jammu, Kathua, Billawar, Sukrala, on decaying gymnospermous stump, Jyoti 8242 (PUN), July 29, 2013.

Remarks: This species is different from rest of the species in lacking clamps on the generative hyphae, cystidial as well as basidial bases and being described for the first time from Jammu and Kashmir. Previous reports were by Rattan (1977) from Himachal Pradesh; Sharma (2012) from Uttarakhand; Prashar & Ashok (2013) from

Himachal Pradesh and Ranadive (2013) from Maharashtra.



Figs 53-57. *Hyphodontia tetraspora*: 53. Basidiocarp showing hymenial surface; 54. Basidiospores; 55. Basidia; 56. Generative hyphae. 57. Cystidium.

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