GLOBAL JOURNAL OF BIO-SCIENCE AND BIOTECHNOLOGY

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SOME NOTEWORTHY CORTICIOID FUNGI FROM DISTRICT CHAMBA (HIMACHAL PRADESH)

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ABSTRACT
Five species of corticioid fungi *i.e*. *Granulobasidium vellereum* (Ellis & Cragin) Jülich, *Phanerochaete leptoderma* Sheng H. Wu, *P. magnoliae* (Berk. & M.A. Curtis) Burds., *Steccherinum bourdotii* Saliba & A. David, and *S. cremeoalbum* Hjortstam are described and illustrated for the first time from district Chamba of Himachal Pradesh. Of the described species, *Granulobasidium vellereum* and *Phanerochaete magnoliae* are also new records for India.

KEY WORDS: Basidiomycota, Agaricomycetes, Himalaya, wood rotting fungi.

INTRODUCTION

Corticioid fungi, a unique group of wood rotting fungi, are characteristic in having gymnocarpic, unilateral hymenium which is usually organized in the form of resupinate to effused-reflexed basidiocarps. The hymenial surface ranges from smooth, ridged, tuberculate, toothed, warted to merulioid, with colour range of orange, grey or yellow to sometimes more bright shades of blue, red and brown etc. During the collection tours in different localities of district Chamba (Himachal Pradesh), Poonam collected some specimens of corticioid fungi. These were identified on the basis of macro and micromorphological features and comparison with literature (Bernicchia and Gorjón, 2010; Dhingra *et al*., 2014; Eriksson *et al*., 1978; Eriksson *et al*., 1984; Kaur *et al*., 2018; Mycobank, 2018; Prasher and Ashok, 2013; Prasher and Lalita, 2013; Ranadive *et al.*, 2011; Rattan, 1977; Sanyal *et al*., 2016 and Sharma, 2012) were identified as *Granulobasidium vellereum* (Ellis & Cragin) Jülich, *Phanerochaete leptoderma* Sheng H. Wu, *P. magnoliae* (Berk. & M.A. Curtis) Burds, *Steccherinum bourdotii* Saliba & A. David, and *S. cremeoalbum* Hjortstam. All the five species are being reported for the first time from district Chamba (Himachal Pradesh). It is worth mentioning here that two species *i.e*. *Granulobasidium vellereum* and *Phanero-chaete magnoliae* are also new records for India.

MATERIALS AND METHODS

Present studies are based on the collections made from different localities of district Chamba (Himachal Pradesh) during the fungal forays conducted in the monsoon months of year 2015. These basidocarps were carefully collected along with a portion of the substrate with the help of a hammer and a chisel. The details pertaining to type of hymenial surface, colour, margins etc., were noted carefully with the help of a hand lens. A moist piece of the basidiocarp was used to get the spore print on a glass slide. These speciemens were dried either in sun or using an electric drier. The dried basidiocarps were packed in bond paper envelops carrying a standard herbarium label with requisite information. All the specimens have been deposited at the Herbarium, Department of Botany, Punjabi University, Patiala (PUN). The micromorpho logical details of the collected specimens were observed by making crush mounts/vertical sections of the basidiocarp in water, 3% KOH solution, 1% congo red, 1% pholxine, 1% cotton blue and Melzer's reagent (0.5gm Iodine + 1.5gm KI + 20gm Chloral hydrate + 20ml Distilled water). The outline of the microscopic structures was drawn with the help of a camera lucida mounted on compound microscope at 100X, 400X and 1000X magnifications. The data was compiled and compared with the published literature for identification.

TAXONOMIC DESCRIPTIONS

1. *Granulobasidium vellereum* (Ellis & Cragin) Jülich, Persoonia 10(3): 328, 1979 – *Corticium vellereum* Ellis & Cragin, Bulletin of the Washburn Laboratory of Natural History 1: 66, 1885.

Figs. 1-7

Basidiocarp resupinate, effused, adnate, up to 280 µm thick in section; hymenial surface hypochnoid to smooth, pale orange to grayish orange to brownish orange when fresh, no change on drying; margins thinning, somewhat fibrillose, paler concolorous, or indeterminate. Hyphal system monomitic. Generative hyphae branched, septate, clamped; basal hyphae up to 3.5 µm wide, parallel to the substrate, loosely interwoven, thick-walled; subhymenial hyphae up to 2.5 µm wide, vertical, compact, thin- to somewhat thick-walled. Basidia 42–59 × 7.8–8.4 µm, clavate, sinuous, 4–sterigmate, with basal clamp and oily contents; sterigmata up to 5.6 µm long. Basidiospores 6.7–8.3 × 6–8.3 µm, subglobose to globose, thick-walled, finely verrucose, cyanophilous, inamyloid. Chlamydo spores up to 8.3 × 5.6 µm, pear shaped; thick-walled, cyanophilous.

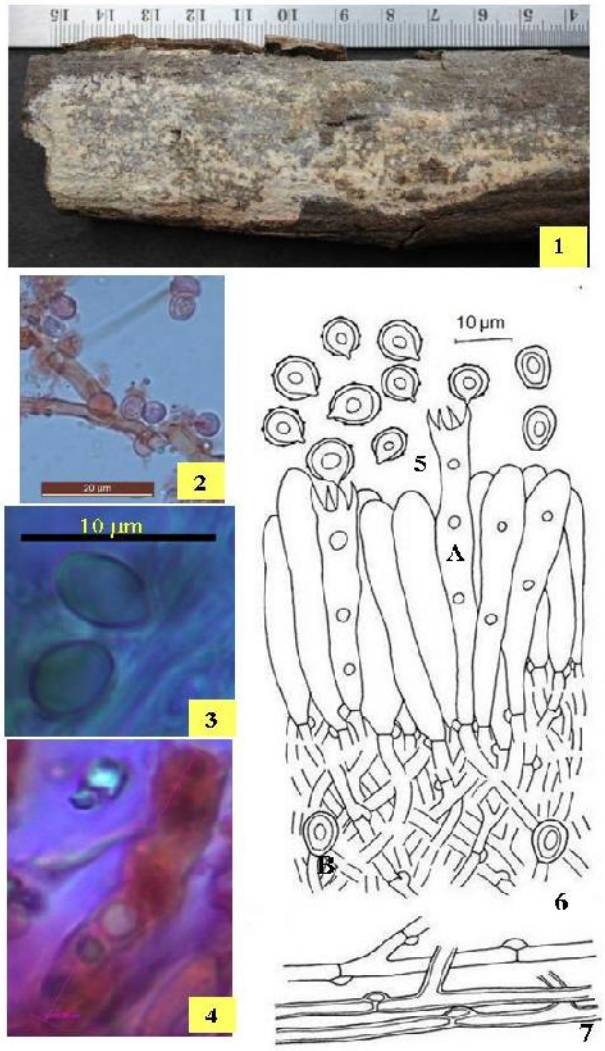


FIGURE 1-7. ***Granulobasidium vellereum***: 1. Basidiocarp showing hymenial surface; 2-4. Photomicrographs showing 2. Basidiospores; 3. Chlamydospores; 4. Basidium; 5. Basidiospores; 6. Reconstruction of hymenium and subhymenium (A. Basidium, B. Chlamydospores); 7. Generative hyphae.

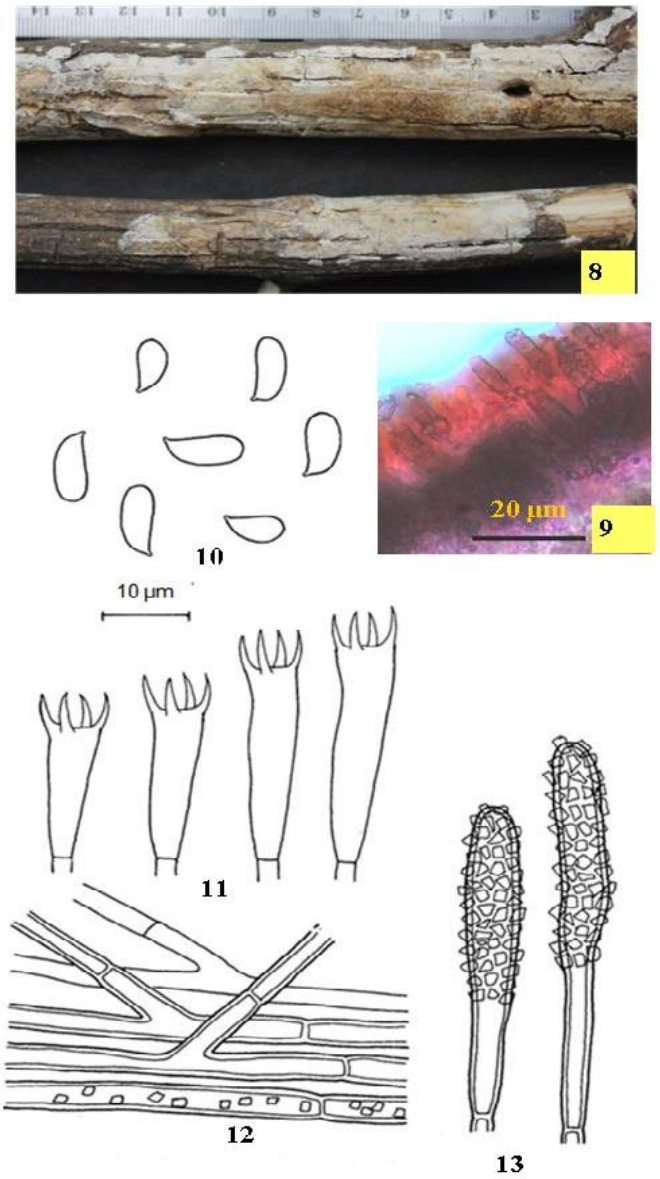
Collection examined: India, Himachal Pradesh, Chamba, Holi, on gymnospermous stick, Poonam 7647 (PUN), August 23, 2015.

Remarks: This species is characteristic in having thin, hypochnoid basidiocaparps; thick-walled, cyanophilous, chlamydospores; sinuous, basally clamped basidia and subglobose to globose, thick-walled, finely verrucose, cyanophilous basidiospores and is being described for the first time from India. Earlier, it has been reported from France, Czech Republic, Belarus, Croatia, Macedonia, United Kingdom, Netherlands, Russia, Portugal, Turkey, Sweden, Italy, Denmark, Norway, Finland, Spain, Ukraine and the Caucasus (Mycobank, 2018).

2. ***Phanerochaete leptoderma*** Sheng H. Wu, Acta Botanica Fennica 142: 45, 1990.

Figs. 8-13

Basidiocarp resupinate, effused, adnate, up to 200µm thick in section; hymenial surface smooth, orange white to pale orange to grayish orange to brownish orange when fresh, orange white to pale orange to grayish orange on drying; margins thinning, fibrillose, paler concolorous, or indeterminate. Hyphal system monomitic. Generative hyphae branched, septate, generally without clamps, thin- to thick-walled, smooth to encrusted; basal hyphae up to 4 µm wide, branched; subhymenial hyphae up to 3 µm wide, richly branched. Cystidia 40–52×3.2–6µm, subcylindrical, thick-walled, encrusted with crystals, encrustation dissolves in 3% KOH solution. Basidia 17–28 × 6–6.8 µm, clavate to subclavate, 4–sterigmate, without basal clamp; sterigmata up to 5.6 µm long. Basidiospores 6.7–9.3×3–4µm, ellipsoid, smooth, thin-walled, acyanophilous, inamyloid.



Figs. 8-13 *Phanerochaete leptoderma*: 8. Basidiocarp showing hymenial surface; 9. Photomicrographs showing cystidia; 10. Basidiospores; 11. Basidia; 12. Generative hyphae; 13. Cystidia.

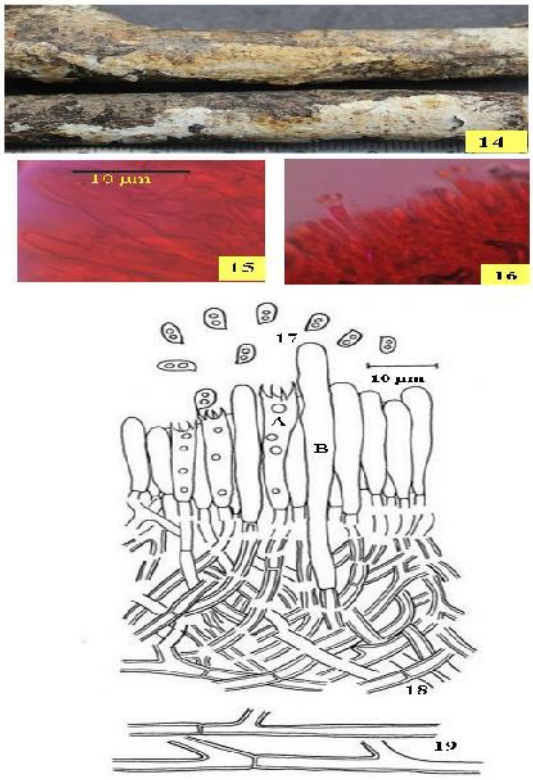
Collection examined: India, Himachal Pradesh, Chamba, Holi, on sticks of *Picea smithiana*, Poonam 7646 (PUN), August 23, 2015.

Remarks: *P. leptoderma* is typical in having smooth basidiocarp with encrusted cystidia, encrustation dissolving in 3% KOH solution, clavate to subclavate basidia and ellipsoid basidiospores. It is known earlier only from Uttarakhand (Sanyal, 2014) and district Shimla of Himachal Pradesh (Kaur *et al*., 2018). However, it is being described for the first time from the study area.

3. *Phanerochaete magnoliae* (Berk. & M.A. Curtis) Burds, Mycologia Memoirs 10: 95, 1985.–*Radulum magnoliae* Berk. & M.A. Curtis, Hooker's Journal of Botany and Kew Garden Miscellany 1: 236, 1849.

Figs. 14-19

Basidiocarp resupinate, effused, adnate, up to 400 µm thick in section; hymenial surface smooth, orange white to grayish orange to brownish orange when fresh, not changing much on drying; margins thinning, somewhat fibrillose, paler concolorous, or indeterminate. Hyphal system monomitic. Generative hyphae generally simple septate; basal hyphae up to 4 µm wide, thick-walled, less branched, sometimes with numerous short branches, horizontal; subhymenial hyphae up to 2.8 µm wide, more branched, vertical.



Figs. 14-19. ***Phanerochaete magnoliae:*** 14. Basidiocarp showing hymenial surface; 15-16. Photomicrographs showing 15. Cystidia; 16. Basidia; 17. Basidiospores; 18. Reconstruction of hymenium and subhymenium (a. Basidium; b.Cystidium); 19. Generative hyphae.

Cystidia 39–69 × 4–5µm, subcylindrical, sinuous, thin-walled, without basal clamp. Basidia 19–30 × 3.6–5.6 µm, clavate to subclavate, 4–sterigmate, without basal clamp; sterigmata up to 5 µm long. Basidiospores 4.9–6.1 × 2.2–2.8 µm, ellipsoid to subcylindrical, smooth, thin-walled, with oily contents, acyanophilous, inamyloid.

Collection examined: India, Himachal Pradesh, Chmaba, Udaipur, on sticks of *Adhatoda vasica*, Poonam 7645 (PUN), September 6, 2018.

Remarks: *Phanerochaete magnoliae* differs from *P. leptoderma* in having thick-walled, straight, less branched basal hyphae interspersed with hyphae with numerous short branches; smooth, subcylindrical, sinuous cystidia and ellipsoid to subcylindrical basidiospores. It is being described for the first time from India. Earlier, it has been described from South Carolina, Germany, Poland, France, Belarus, Bosnia and Herzegovina, Croatia, Macedonia, Slovakia, Serbia, Greece, Belgium, United Kingdom, Slovenia, Russia, Bulgaria, Portugal, Sweden, Italy, Norway, Finland, Spain, Ukraine and the Caucasus (Mycobank, 2018).

4. *Steccherinum bourdotii* Saliba & A. David, Cryptogamie Mycologie 9(2): 100, 1988.

Figs. 20-26

Basidiocarp resupinate, effused, adnate, up to 280 µm thick in section; hymenial surface odontioid, pale orange to deep orange to grayish orange when fresh, grayish orange to brownish orange on drying; aculei up to 1.5 mm long; margins whitish to paler concolorous, thinning, fibrillose, or indeterminate. Hyphal system dimitic. Generative hyphae septate, clamped; basal hyphae up to 4.4 µm wide, parallel to the substrate, less branched, thick-walled; subhymenial hyphae up to 2.8 wide, vertical, more branched, thin- to thick-walled, denser. Skeletal hyphae up to 5 µm wide, without septa, thick-walled, unbranched. Skeletocystidia 95–119 × 5.6–6.1 µm, subcylindrical, heavily encrusted, thick-walled; projecting up to 45 µm out of the hymenium. Basidia 16-25 × 4.7–5.6 µm, subclavate to clavate, 4–sterigmate, with basal clamp; sterigmata up to 5.6 µm long. Basidiospores 5–5.6 × 3.3–5.6 µm, ellipsoid to subglobose to globose, smooth, thin-walled, uniguttulate, acyanophilous, inamyloid.

Collection examined: India, Himachal Pradesh, Chamba, Kihar, on sticks of *Pinus wallichiana*, Poonam 7649 (PUN), August 15, 2015.

Remarks: The presence of dimitic hyphal system with clamped generative hyphae, subcylindrical, heavily encrusted skeletocystidia and ellipsoid to subglobose to globose basidiospores are the distinguishing features of *S. bourdotii*. It is known earlier from Uttarakhand (Sanyal *et al*., 2016) and district Shimla of Himachal Pradesh (Kaur *et al*., 2017). However, it is being described for the first time from the study area.

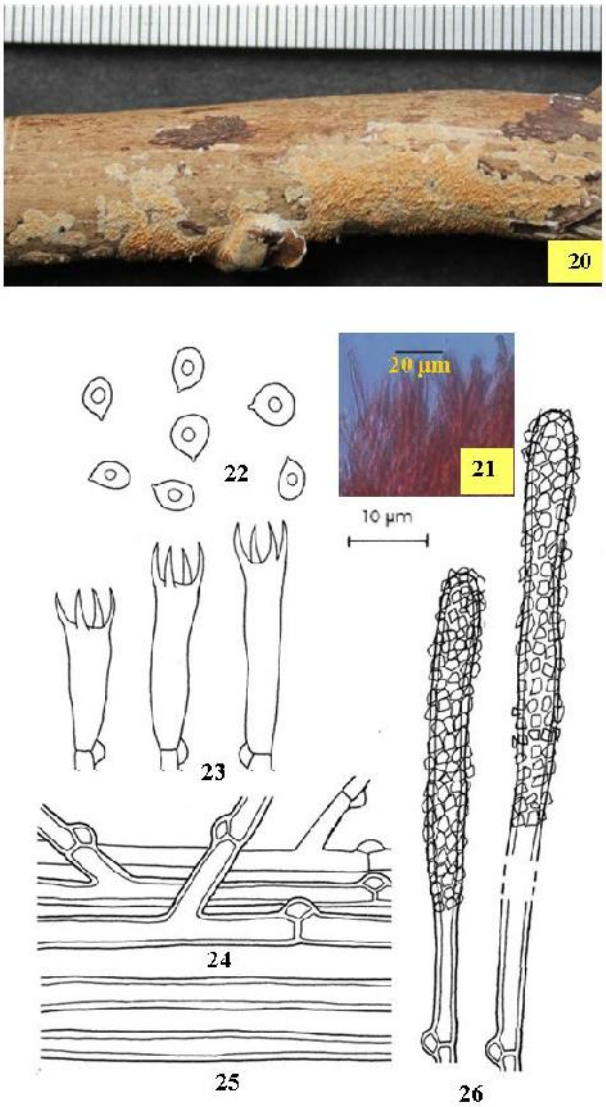
5. *Steccherinum cremeoalbum* Hjortstam, Mycotaxon 19: 507, 1984.

Figs. 27-33

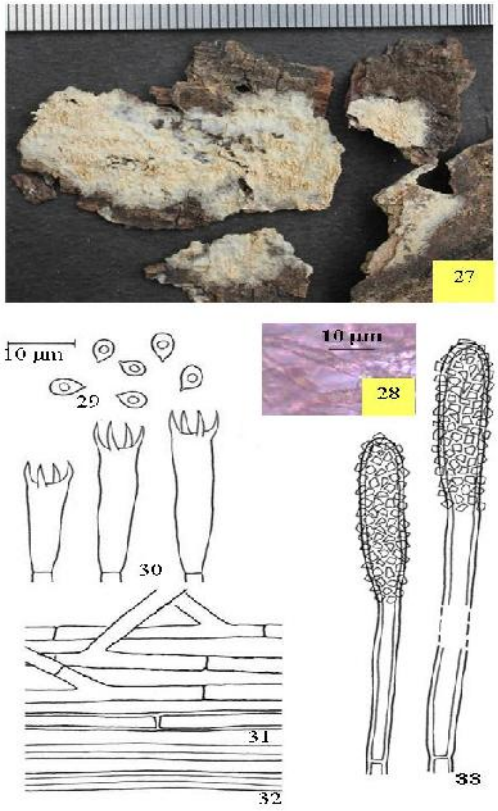
Basidiocarp resupinate, effused, adnate, up to 280µm thick in section; hymenial surface odontioid, orange white to pale orange to grayish orange when fresh, not changing much on drying; margins thinning, fibrillose, paler concolorous, or indeterminate. Hyphal system dimitic. Generative hyphae simple septate; basal hyphae up to 4 µm wide, parallel to the substrate, thin- to somewhat thick-walled, less branched; subhymenial hyphae up to 2.8 µm, vertical, denser, thin-walled, more branched. Skeletal hyphae up to 4.4 µm wide, thick-walled, aseptate. Skeletocystidia 60–101 × 6–8.3 µm, subcylindrical to subfusiform, encrusted with crystals, encrustation dissolves in 3% KOH solution; projecting up to 30 µm out of the hymenium. Basidia 18–27 × 5.6–6.1 µm, clavate, 4–sterigmate, without basal clamp; sterigmata up to 5.6 µm long. Basidiospores 3.3–4.4 × 2.8–3.3 µm, ellipsoid, smooth, thin- walled, uniguttulate, acyanophilous, inamyloid.

Collection-examined: India, Himachal Pradesh, Chamba, Hardaspura, on stump of *Pyrus malus*, Poonam7650 (PUN), August 15, 2015.

Remarks: It differs from *S. bourdotii* in lacking clamps on generative hyphae, smaller, ellipsoid basidiospores and is beng described for the first time from the study area. It is known earlier from Uttarakhand (Sanyal *et al*., 2016) and district Shimla of Himachal Pradesh (Kaur *et al*., 2017). However, it is being described for the first time from the study area.



Figs. 20-26. ***Steccherinum bourdotii*****:** 20. Basidiocarp showing hymenial surface; 21. Photomicrograph showing skeletocystidia; 22. Basidiospores; 23. Basidia; 24. Generative hyphae; 25. Skeletal hyphae; 26. Skeletocystidia.



Figs. 27-33. ***Steccherinum cremeoalbum***: 27. Basidiocarp showing hymenial surface; 28. Photomicrograph showing skeletocystidia; 29. Basidiospores; 30. Basidia; 31. Generative hyphae; 32. Skeletal hyphae; 33. Skeletocystidia.

ACKNOWLEDGEMENTS

The authors are grateful to the Head, Department of Botany, Punjabi University, Patiala for providing necessary laboratory facilities; University Grants Commission, New Delhi for financial assistance under DRS-SAP DSA level-I programme and Prof. Nils Hallenberg, Gothenburg for expert comments and peer review.

REFERENCES

Bernicchia, A. and Gorjón, S.P. (2010) *Corticiaceae* s.l. Fungi Europaei 12. Edizioni Candusso. Alassio. Italia. 1008 pp.

Dhingra, G.S., Singh, A.P., Kaur, J., Priyanka, Kaur, H., Rani, M., Sood, S., Singla, N., Kaur, H., Jain, N., Gupta, S., Kaur, M., Sharma, J., Rajnish and Kaur, G. 2014. A checklist of resupinate, non–poroid Agaricomycetous fungi from Himachal Pradesh, India. Synopsis Fungorum 32: 8–37.

Eriksson, J., Hjortstam, K. and Ryvarden, L. (1978) The Corticiaceae of North Europe. Volume 5 *Mycoaciella* – *Phanerochaete*. Fungiflora, Oslo, Norway: 887– 1047.

Eriksson, J., Hjortstam, K. and Ryvarden, L. (1984) The Corticiaceae of North Europe. Volume 7 *Schizopora* – *Suillosporium*. Fungiflora, Oslo, Norway: 1281–1449.

Kaur, M., Kaur, R., Singh, A.P. and Dhingra, G.S. (2018) Some noteworthy additions to family Phanerochaetaceae from district Shimla (Himachal Pradesh). Journal on New Biological Reports 7(1): 38–49.

Myco Bank (2018) Fungal databases Nomenclature and species banks. [Accessed: 12/04/2018].

Prasher, I.B. and Ashok, D. (2013) A Checklist of Wood rotting Fungi (non-gilled Agaricomycotina) of Himachal Pradesh. Journal on New Biological Reports 2(2): 71–98.

Prasher, I.B. and Lalita (2013) A checklist of wood rotting fungi (non-gilled Agaricomycotina) of Uttarakhand. Journal on New Biological Reports 2(2): 108–123.

Ranadive, K.R., Vaidya, J.G., Jite, P.K., Ranade, V.D., Bhosale, S.R., Rabba, A.S., Hakimi, M., Deshpande, G.S., Rathod, M.M., Forutan, A., Kaur, M., Naik, Vaidya, C.D., Bapat, G.S. and Lamrood, P. (2011) Checklist of Aphyllophorales from the Western Ghats of Maharshtra State, India. Mycosphere 2(2): 91-114.

Rattan, S.S. (1977) The resupinate Aphyllophorales of the North Western Himalayas. Bibliotheca Micologica 60: 427pp.

Sanyal, S.K., Devi, R. and Dhingra, G.S. (2016) Some new records and status of genus Steccherinum (Polyporales, Basidiomycetes) in India. Journal of Mycology 2016 Article ID 5047617, 8 pp. doi.org/10. 1155/2016/5047617. Sharma, J.R. (2012) Aphyllophorales of Himalaya. Botanical Survey of India, Ministry of Environment and Forests, Government of India, Kolkata. 590 pp.