

Additions to the Family *Thelephoraceae* from District Sirmaur (Himachal Pradesh)Ramandeep Kaur¹, Maninder Kaur², Ellu Ram³, Avneet Pal Singh^{4*} and Gurpaul Singh Dhingra⁴¹*Department of Botany, Baba Farid College, Bathinda - 151 001, Punjab, India.*²*PG Department of Botany, Dev Samaj College for Women, Ferozpur - 152002, Punjab, India.*³*Department of Botany, Government College, Seraj, Lambathach - 175 048, Himachal Pradesh, India.*⁴*Department of Botany, Punjabi University, Patiala - 147 002, Punjab, India.*

*Corresponding author Email: avneet@pbi.ac.in; avneetbot@gmail.com

(Submitted on May 06, 2024; Accepted on August 07, 2024)

ABSTRACT

This paper describes five species (*Pseudotomentella tristis*, *Tomentella greseoumbrina*, *T. pillati*, *T. puberula* and *T. scobinella*) of corticioid fungi belonging to the family *Thelephoraceae*. All the five species are new records for district Sirmaur and one i.e. *Tomentella pillati*, is being described for the first time from India.

Keywords: *Agaricomycetes*, Himalaya, Wood rotting fungi, Diversity, Taxonomy, Hyphal system

INTRODUCTION

The family *Thelephoraceae* is an assemblage of corticioid, clavarioid, hydroid, and some polyporoid forms of wood rotting fungi. Of these, the corticioid forms are characteristic in having annual, resupinate, effused, and loosely adnate to adnate basidiocarps with variable (smooth/hypochnoid/arachnoid/granulose/mucedinoid/colliculose) hymenial surface. The basidiocarps are composed of either only generative hyphae that may be with or without clamp connections or in combination with the skeletal hyphae. The hymenium generally consists of a palisade of basidia alone or in association with some kind of cystidial elements (Cunningham, 1963). The basidia and basidiospores are also quite variable in their morphology. Majority of the members of the family are responsible for different types of rot of wood but few of these fungi form ectomycorrhizal association with different types of plant species (Haug *et al.*, 2005). As per Hibbet *et al.*, (2007), Kirk *et al.*, (2008) and MycoBank (2024), the family has been placed in order *Thelephorales* of class *Agaricomycetes* with in sub-phylum *Agaricomycotina* of phylum *Basidiomycota*.

During the exploration of different localities of Simaur district of Himachal Pradesh many samples of wood rotting fungi were collected and have been identified as five species i.e. *Pseudotomentella tristis* (Karsten) Larsen, *Tomentella greseoumbrina* Litsch., *T. pillati* Litsch., *T. puberula* Bourdot & Galzin and *T. scobinella* G. Cunn. of the family *Thelephoraceae* based on morphological

characterization and comparison with the literature (Thind and Rattan, 1968; Rattan, 1977; Dhingra, 1985; Dhingra and Rani, 1994; Lalji, 2003; Bernicchia and Gorjón, 2010; Sharma, 2012; Kaur, 2012; Dhingra *et al.*, 2014; Samita, 2014; Dhingra, 2016; Kaur, 2018; Ritu, 2019 ; Kaur, 2020). All these are being described for the first time from district Sirmaur (Himachal Pradesh), with *T. pillati* as a new record for India. The specimens have been deposited at the herbarium of the Department of Botany, Punjabi University, Patiala (PUN). The color standards used are as per Methuen's Handbook of Colours by Kornerup and Wanscher (1978).

TAXONOMIC DESCRIPTIONS

1. *Pseudotomentella tristis* (P. Karst.) M.J. Larsen, *Nova Hedwigia*, **22**:613, 1971.

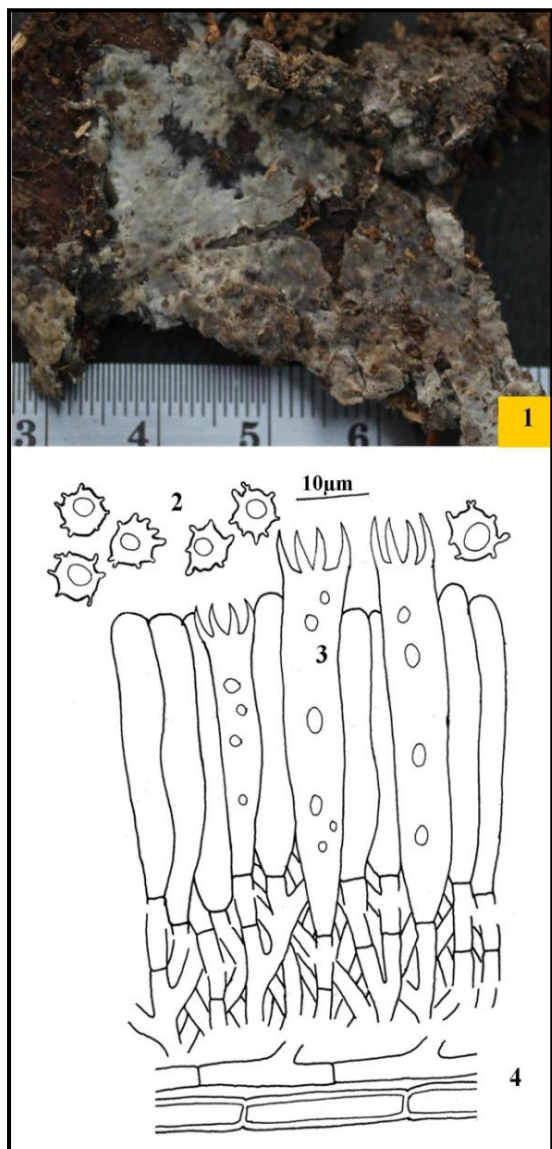
– *Hypochnus subfuscus* subsp. *tristis* Karst., *Meddelanden af Societas pro Fauna et Flora Fennica*, **9**:71, 1882. **Figures 1-4**

Basidiocarp resupinate, effused, adnate, up to 250 µm thick in cross section; hymenial side smooth, light brown to dark brown to black when collected, no prominent change on drying; margins fibrillose, paler concolorous, occasionally indeterminate. Hyphal system monomitic. Generative hyphae brown, septate, without clamps; subicular hyphae up to 5.5 µm wide, thick-walled, less branched; usually parallel to substrate, loosely intertwined; sub-hymenial hyphae pale brown, septate, without clamps, up to 3.7 µm wide, thin- to thick-walled, more branched, at right angles to substrate,

compact. Cystidial elements absent. Basidia subclavate to clavate, $30\text{--}50 \times 6\text{--}8.8 \mu\text{m}$, four sterigmate, without basal clamp; sterigmata up to $6 \mu\text{m}$ long. Basidiospores pale brown, globose to subglobose to irregular, $6\text{--}7.4 \times 5.8\text{--}6.6 \mu\text{m}$, echinulate, thick-walled, wall not stained in cotton blue and Melzer's reagent.

Sample studied – Himachal Pradesh: Sirmaur, Rajgarh, on a gymnospermous log, Ramandeep and Avneet 11043 (PUN), September 11, 2016.

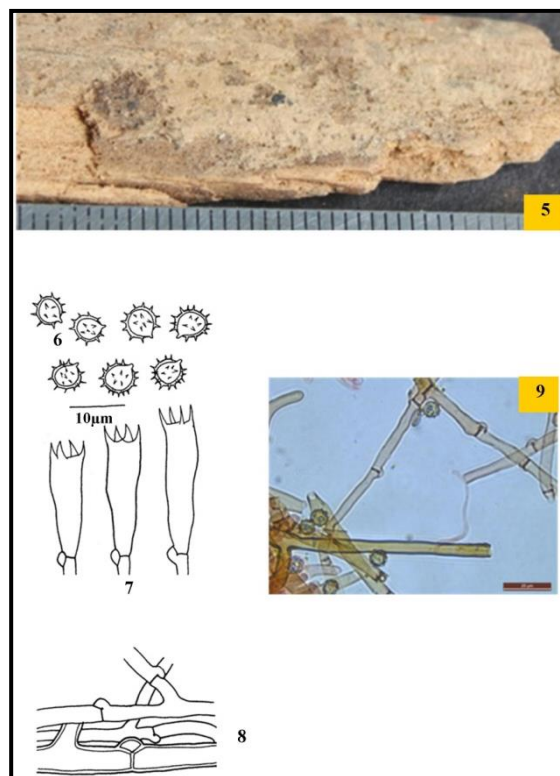
Remarks – This species is being described for the first time from the study area. Formerly in India, it has been reported from district Chamba of Himachal Pradesh by Kaur (2012) and Dhingra *et al.* (2014).



Figures 1-4: *Pseudotomentella tristis* 1, Basidiocarp showing hymenial side; 2-4, Line diagrams Line diagrams showing outline of 2. Basidiospores, 3. Basidia and 4. Generative hyphae.

2. *Tomentella griseoumbrina* Litsch., *Fungi ExsiccatiSuecici Fasc. 8:24*, 1936. **Figures 5-9**

Basidiocarp resupinate, effused, adnate, up to $240 \mu\text{m}$ thick in cross section; hymenial side smooth to hypochnoid, brownish grey to brown when collected, no prominent change on drying; margins fibrillose, paler concolorous, occasionally indeterminate. Hyphal system monomitic. Generative hyphae brown, septate, with clamps; subicular hyphae up to $5.2 \mu\text{m}$ wide, thick-walled, less branched, usually parallel to substrate, loosely interwoven; subhymenial hyphae up to $3.3 \mu\text{m}$ wide, pale brown, thin-walled, more branched, usually vertical, comparatively compact. Cystidial elements absent. Basidia pale brown, subclavate to subutriform, $17\text{--}23 \times 5.5\text{--}6.6 \mu\text{m}$, four sterigmate, with basal clamp, with oily contents; sterigmata up to $3.3 \mu\text{m}$ long. Basidiospores brown, subglobose to globose, $5.2\text{--}6 \times 4.7\text{--}6 \mu\text{m}$, echinulate, thick-walled, wall not stained in cotton blue and Melzer's reagent.



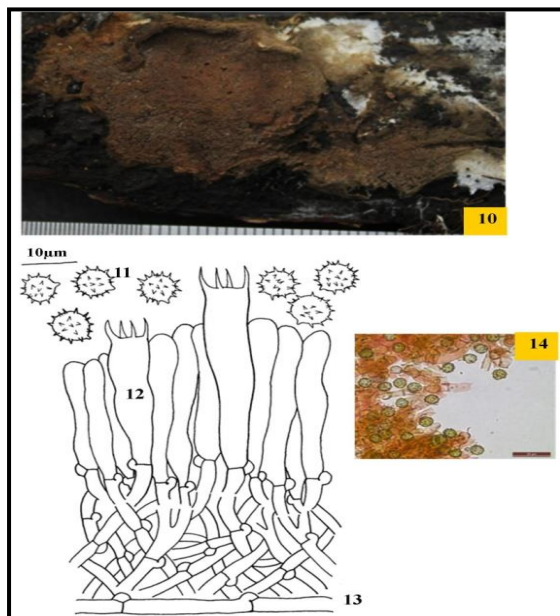
Figures 5-9: *Tomentella griseoumbrina* 5, Basidiocarp showing hymenial side; 6-8, Line diagrams showing outline of 6. Basidiospores, 7. Basidia, 8. Generative hyphae; 9, Photomicrograph showing basidiospores and generative hyphae.

Sample studied – Himachal Pradesh: Sirmaur, Rajgarh, on a gymnospermous log, Ramandeep and Avneet 11044 (PUN), September 11, 2016.

Remarks – This species with brown, subglobose to globose, echinulate basidiospores is being described for the first time from the study area. Formerly in India, it has been reported from Shimla district of Himachal Pradesh by Rattan (1977), Dhingra et al. (2014), Dhingra (2016), Kaur (2018) and from Uttarakhand by Lal ji (2003) and Sharma (2012).

3. *Tomentella pilatii* Litsch., *Bulletin de la Société Mycologique de France* **49**: 72, 1933. **Figures 10-14**

Basidiocarp resupinate, effused, adnate, up to 250 μm thick in cross section; hymenial side smooth to colliculose under lens, dull brown to greyish brown when collected, no prominent change on drying; margins fibrillose, paler concolorous, occasionally indeterminate. Hyphal system monomitic. Generative hyphae septate, with clamps, thin-walled; subicular hyphae dull brown, up to 4.2 μm wide, branched, usually parallel to substrate, loosely interwoven; subhymenial hyphae brown, up to 3.2 μm wide, more branched, usually at right angles to substrate, comparatively compact. Cystidial elements absent. Basidia pale brown, subclavate to clavate, 31–46 \times 7–8.5 μm , four sterigmate, with basal clamp, with oily contents; sterigmata up to 5 μm long. Basidiospores dark brown, subglobose to globose, elongate along one axis, 6.3–8.3 \times 6.3–7.7 μm , echinulate, thick-walled, wall not stained in cotton blue and Melzer's reagent.



Figures 10-14: *Tomentella pilatii* 10, Basidiocarp showing hymenial side; 11-13, Line diagrams showing outline of 11. Basidiospores, 12. Basidia, 13. Generative hyphae; 14, Photomicrograph showing Basidiospores.

Sample studied – Himachal Pradesh: Sirmaur, Rajgarh, Nauradhar, on log of *Quercus leucotrichophora*, Ramandeep and Avneet 11045 (PUN), September 12, 2016.

Remarks – This species with smooth to colliculose (under lens) hymenial side is being described for the first time from India. Formerly, it has been reported from Turkey (Mycobank, 2024).

4. *Tomentella puberula* Bourdot and Galzin, *Bulletin de la Société Mycologique de France* **40** (2): 150, 1924. **Figures 15-18**

Basidiocarp resupinate, effused, adnate, up to 250 μm thick in cross section; hymenial side smooth to granulose, brownish grey to brown when collected, no prominent change on drying; margins fibrillose, paler concolorous, occasionally indeterminate. Hyphal system monomitic. Generative hyphae pale brown, septate, with clamps, up to 5 μm wide, thin-walled; subicular hyphae less branched, usually parallel to substrate, loosely interwoven; subhymenial hyphae pale tan, more branched, usually at right angles to substrate, compactly arranged. Cystidial elements absent. Basidia pale brown, subclavate to clavate, 30–44 \times 6.4–9 μm , four sterigmate, with basal clamp, with oily contents; sterigmata up to 4.7 μm long. Basidiospores brown, subglobose to globose, 4.3–7.4 \times 4.2–6.8 μm , regular in outline, echinulate, thick-walled, wall not stained in cotton blue and Melzer's reagent.



Figures 15-18: *Tomentella puberula* 15, Basidiocarp showing hymenial side; 16-18, Line diagrams showing outline of 16, Basidiospores; 17, Basidia; 18, Generative hyphae.

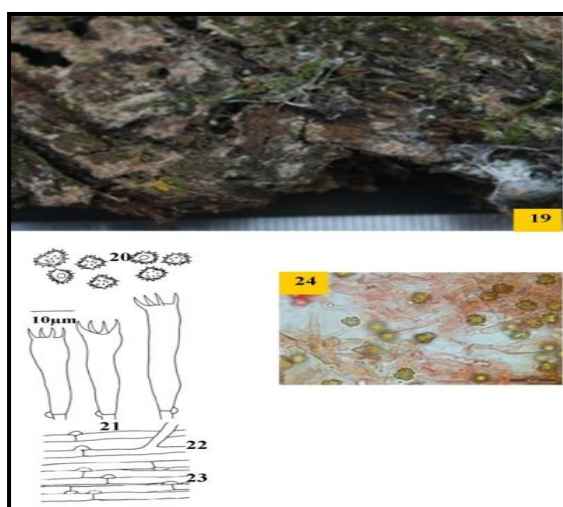
Sample studied – Himachal Pradesh: Sirmaur, Rajgarh, on a gymnospermous log, Ramandeep and Avneet 11046 (PUN), September 11, 2016.

Remarks – This species is being described for the first time from the study area. Formerly in India, it has been reported Chamba district of Himachal Pradesh by Dhingra and Rani (1991), Dhingra *et al.* (2014) and Dhingra (2016).

5. *Tomentella scobinella* Cunningham, *Transactions and Proceedings of the Royal Society of New Zealand* **84**(3):485, 1957.

Figures 19-24

Basidiocarp resupinate, effused, adnate, up to 250 µm thick in cross section; hymenial side smooth to granulose, greyish red to light brown to reddish brown when collected, no prominent change on drying; margins fibrillose, paler concolorous, occasionally indeterminate. Hyphal system-monomitic. Generative hyphae septate, with clamps, up to 3.7 µm wide, thick-walled; subicular hyphae brown, less branched, usually parallel to substrate, loosely interwoven; subhymenial hyphae light brown, thin- to thick-walled, more branched, usually at right angles to substrate, compact. Hyphal cordon slight brown, up to 18 µm wide; individual hyphae up to 3 µm wide, septate, with clamps. Cystidial elements absent. Basidia subclavate to clavate, 26–47 × 6.6–9.5 µm, four sterigmate, with basal clamp, with oily contents; sterigmata up to 4.7 µm long. Basidiospores pale brown, irregular to lobed, 5.7–8.5 × 4.7–6.6 µm, echinulate, thick-walled, wall not stained in cotton blue and Melzer's reagent.



Figures 19-24: *Tomentella scobinella* 19, Basidiocarp showing hymenial side; 20-23, Line diagrams showing outline of 20, Basidiospores; 21, Basidia; 22, generative hyphae; 23, Hyphal cordon; 24, Photomicrograph showing Basidiospores.

Sample studied – Himachal Pradesh: Sirmaur, Rajgarh, on a gymnospermous log, Ramandeep and Avneet 11047 (PUN), September 11, 2016.

Remarks – This species with irregular to lobed basidiospores is being described for the first time from the study area. Formerly in India, it has been reported from Arunachal Pradesh by Dhingra (1985), from district Chamba of Himachal Pradesh by Dhingra and Rani (1991), Dhingra *et al.* (2014), Dhingra (2016), from district Kangra of Himachal Pradesh by Ritu (2019) and from Uttarakhand by Samita (2014).

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 funding under DSA-I and SERB DST for financial assistance under FIST Level I programme.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

- Bernicchia, A. and Gorjón, S.P. 2010. *Corticaceae s.l. Fungi Europaei*, 12. Edizioni Candusso Alassio, Italia. 1008 pp.
- Cunningham, G.H. 1963. The Thelephoraceae of Australia and New Zealand. *Bulletin New Zealand Department of Industrial Research*, **164**:1-304.
- Dhingra, G.S. 1985. The genus *Tomentella* in the Eastern Himalaya. *Res. Bull. (Sci.) Pan. Uni.* **36**:367-371.
- Dhingra, G.S. 2016. The genus *Tomentella* Indian scenario. *Kavaka*, **47**:95-98.
- Dhingra, G.S. and Rani, M. 1991. Two new records of the genus *Pseudotomentella* from Dalhousie hills. *Geobios New Reports*, **10**:125-127.
- Dhingra, G.S., Singh, A.P., Kaur, J. *et al.*, 2014. A checklist of resupinate, non-poroid Agaricomycetous fungi from Himachal Pradesh, India. *Synopsis Fungorum*, **32**:8-37.
- Hibbett, D.S., Binder, M., Bischoff, J.F. *et al.*, 2007. A higher - level phylogenetic classification of the Fungi. *Mycological Research*, **111**:509-547.

- Haug, I., Michael W., Homeier, J., *et al.*, 2005. Russulaceae and Thelephoraceae form ectomycorrhizas with members of the Nyctaginaceae (Caryophyllales) in the tropical mountain rain forest of southern Ecuador. *New Phytologist*, **165**:923-936.
- Kaur, J. 2012. *Studies on resupinate, non-poroid Agaricomycetous fungi Himachal Pradesh*. Ph.D. Thesis. Punjabi University, Patiala. 256pp.
- Kaur, M. 2018. *Systematic studies on resupinate non-poroid Hymenomycetous fungi from district Shimla (H.P.) and evaluation of selected taxa for ligninolytic activity*. Ph.D. Thesis. Punjabi University, Patiala. 303pp.
- Kirk, P.M., Cannon, P.F., Minter D.W. and Stalpers, J.A. 2008. *Dictionary of the Fungi* (10th Ed.). Wallingford Oxon, UK. 771pp.
- Kornerup, A. and Wanscher, J.H. 1978. *Methuen's Handbook of colours*, IIIrd Ed. Methuen and Co. Ltd. London. 252pp.
- Lalji, K. 2003. *Mycoflora associated with multipurpose tree species of North-West India*. Ph.D. Thesis. Panjabi University, Patiala. 254pp.
- MycoBank. 2024. Fungal databases. Nomenclature and species banks. [Accessed: 03/05/2024].
- Rattan, S.S. 1977. The resupinate *Aphyllophorales* of the North Western Himalaya. *Bibliotheca Mycologica*. **60**, Cramer, Germany. 427pp.
- Ritu. 2019. *Taxonomic studies on poroid and resupinate non-poroid Agaricomycetes of district Kangra (Himachal Pradesh)*. Ph.D. Thesis Punjabi University, Patiala. 554pp.
- Samita. 2014. *Systematic studies on resupinate non-poroid Agaricomycetes of Uttarakhand*. Ph.D. Thesis. Punjabi University, Patiala. 331pp.
- Sharma, J.R. 2012. *Aphyllophorales of Himalaya*. Bull. Bot. Surv. Ind. Ministry of Environment and forests, Calcutta. 590pp.
- Thind, K.S. and Rattan, S.S. 1968. The Thelephoraceae of North Western Himalaya. *Indian Phytopathology*, **4**:15-24.