Indian Phytopath. 55 (4) : 464-468 (2002)

Studies in fleshy and gelly fungi - Tremellales

S.H. MAHAMULKAR, B.D. KUNDALKAR and M.S. PATIL
Department of Botany, Shivaji University, Kolhapur 416 004

ABSTRACT : In the present paper six new taxa belonging to five genera of the two families - Tremellaceae and Sebacinaceae of the order Tremellales have been presented. These are viz. *Holtermania dimorphobasidiae* sp.nov., *Myxarium intermedius* sp.nov., *Efibulobasidium dimorphobasidiae* sp.nov., *E. patiliensis* sp.nov., *Pseudotremellodendron pusio* (Berk.) Reid var. *papillatus* var.nov. and *Sebacina microbasidiae* Christ & Hauersl. var. *indica* var.nov. based on purely comparative morphological basis. *Holtermania* and *Pseudotremellodendron* are new records for India.

Key words: Hymenomycetes, Heterobasidiomycetidae, Tremellales, Tremellaceae and Sebacinaceae

Various members of the order Tremellales belonging to the different genera of the two families: Sebacinaceae and Tremellaceae have been identified from south western parts of Maharashtra in continuation of fleshy & gelly fungi reported earlier (Kundalkar and Patil M.S., 1986; Patil, M.S., 1978; Patil M.S. and Thite A.N., 1978).

MATERIALS AND METHODS

The collections were made in rainy seasons from different localities, mostly from dead branches, stems and barks of the dicotyledonous plants. Specimens were cleaned and kept separately on the moist filter papers in the petri-plates. The habit, texture and colours were noted in their fresh forms of the sporocarps and further processed for microscopic observations. Semi-permanent micro-preparations were made from the fresh materials in water, and lactophenol and stained with cotton blue. Better preparations were made with cotton blue and slightly acidified l% aniline blue in 50% glycerine, which stained nuclei, basidia and other parts, and then mounted in lactophenol, warmed gently and sealed with sealant (wax).

RESULTS

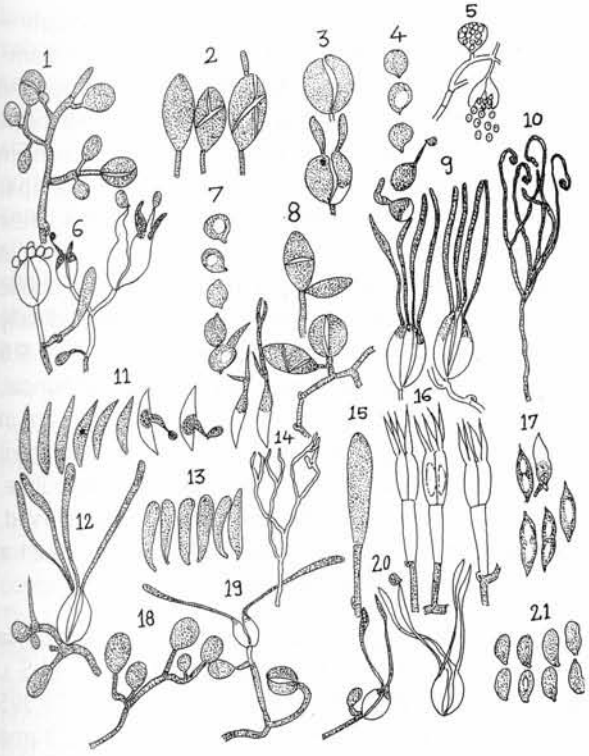
Holtermania dimorphobasidiae Mahamulkar, Kundalkar & M.S. Patil, sp.nov. (Fig. 1-5)

Basidiocarpus clavarioidea, simplex cylindricus dyrus-cartilagineus vel gelatinosae; pallid rosaceous ad basis et vitreus candidus icis, 1-2 x 3-10 µm; Hymenium amphigena, hyphae 2.5-4 mm crassa; basidiae bi-typus: globosus vel sub-globosus et fusiformis, 2-4 partita, 16-19 x 13-19 µm et 22-32 x 9-13 µm propius; basidiosporae ovatus, sub-globosus, unicellularies, apiculatus, 8-13 x 6-9.5 µm; conidia ovatus, sub-globosus, vel fusiformis, 3-5 x 3-4 µm.

Basidiocarps clavaroid, simple, cylindrical, tough cartilaginous to gelatinous with pale pinkish – violet base and glossy-white apex; hymenium amphigenous, hyphae 2.5–4 µm thick with clamps, basidia of two types: globose to sub-globose and spindle-shaped, 2-4 celled, 16-19 x 13-19 µm and 22-32 x 9-13 µm respectively; globose basidia transversely or obliquely septate while spindle-shaped divides transversely or obliquely; epibasidia slender and 3-5 x 32-96 µm; basidiospores one-celled, ovate to sub-globose, apiculate, 8-13 x 6-9.5 µm; germinating by repetition; conidia produced endogenously, ovate, sub-globose or broadly spindle-shaped or fusiform, 3-5 x 3-4 µm.

0n dead branches of *Memecylon umbellatum* Burm. (Fam.- Melastomataceae), Patgaon (Dist. – Kolhapur, M.S.), 7.10.81, B.D. Kundalkar, H.C.I.O. 43,406 (Holotype) & W.I.F., - 505A (Type).

Six species of *Holtermania* Sacc. & Trav. are known (Wojewoda, 1981). The present collection



Figs. 1 to 5. *Holtermania dimorphobasidiae* sp. nov.: 1. Fertile mycelium bearing cluster of basidia, x 670; 2. Young and matured, septate, spindle shaped basidia, x 900; 3. Matured, globose, septate basidia, x 1000; 4. Apiculate basidiospores, x 1000; 5. Conidial apparatus with conidia, x 600; **Figs. 6&7.** *Myxarium intermedius* sp. nov.: 6. Matured metabasidia with sporoid & normal epibasidia, x 800; 7. Basidiospores, x 900; **Figs. 8 to 11.** *Efibulobasidium dimophobasidiae* sp. nov.: 8. Young,spindle-shaped & globose metabasidia, x 1000; 9. Matured, septate, spindle-shaped metabasidia with epibasidia, x 1150; 10. Dikaryophyses, x 2250; 11. Basidiospores (some germinating), x 1000; **Figs. 12 to 14.** *E. patiliensis* sp. nov.: 12. Young and matured metabasidia with epibasidia, x 1000; 13. Basidiospores, x 1150; 14. Dikaryophyses, x 2200; **Figs. 15 to 17.** *Pseudotremellodendron pusio* (Berk.) Reid var. *papillatus* var. nov.: 15. Young cylindrical basidium, x 750; 16 Matured, empty metabasidia with epibasidia, x1000; 17. Guttulate fusiform basiodiospores, x 1465; Fig. 18-21. 18 to 21 *Sebacina microbasidiae* Christ and Hauersl. var. *indica* var. nov. 18. Cluster of young basidia on fertile hyphae, x 1400; 19. Matured 2-celled metabasidia with epibasidia, x 1000; 20. Two & four celled empty metabasidia with epibasidia, x 1500; 21. Basidiospores, x 1200

is morphologically identical with *H. corniformis* Y. Kobayasi except two types of basidia, a unique feature not known in any species of the genus *Holtermania*. On the basis of this feature, a new species has been proposed viz. *H. dimorphobasidiae* sp.nov.

Myxarium intermedius Mahamulkar, Kundalkar and M.S. Patil sp.nov., Fig. 6 and 7

Basidiocarpus pustulatus, mollis-gelatinosae, cerebriformis, 2-10 µm in dimetro, pallidus luteus candidus; Hymenium amphigenous; hyphae cum fibuligerus, 1.5 – 3 µm crassa, dikaryophysis rarus; basidia sphaeropedunculatus; metabasidia globosa et sub-globosa, 2-3 partita, (12-) 16-22 x 13-19 µm; basidiosporae uniloculum, apiculatus, ovatus, 8-11 x 6-8 µm; germinatum per repetitionis.

Basidiocarps pustulate, soft-gelatinous, cerebriform, convoluted, 2-10 mm in diam., pale yellowish, on drying form an inconspicuous resupinate, verrucose patches; hymenium amphigenous; hyphae thin-walled, 1.5-3 µm thick and with clamps; dikaryophyses scantly; basidia sphaeropedunculate, clamps at the base, septum in between hypobasidia and stalk at maturity, 2-3 celled, longitudinally to obliquely cruciate-septate, (12-) 16-22 x 13-19 mm; epibasidia initially sporoid, then cylindrical, 5 x 25 µm; sterigmata not distinguished clearly but bearing basidiospores directly; basidiospores one-celled, smooth, apiculate, ovate, uniguttulate, 8-11 x 6-8 µm; germinating by repetition.

On the decaying, moist stems of *Punica granatum* L. (Fam.- Lythraceae), Kolhapur (M.S.), 15.9.81, leg. B.D. Kundalkar, H.C.I.O. – 43,426 (Holotype) and W.I.F. –545A (Type).

The basidial morphology and development are variable and share the features of *Myxarium* and *Pseudotulasnella, metabasia/not italic* with 2-8 sporoid epibasidia and lack of sterigmata. Since, it differs in morphology of the known species of both the genera, a new species viz. *M. intermedius* sp.nov. has been proposed.

Efibulobasidium dimorphobasidiae Mahamulkar, Kundalkar and M.S. Patil sp.nov., (Fig. 8 to 11)

Basidiocarpus pustulatus, cartilagineus vel

gelatinosae, convolutus, 0.2 – 1.5 mm in dimetro, hyalinus vel candidus, hymenium amphigenus; hyphae fibulis destitutus; basidia sessiles fibulis destitutus, bi-typus : ellipsoideae vel obovatus, fere 4-partita, 13-16x10-13 µm et 16-22 x 10-23 µm; basidiosporae unicellularae, apiculatus, fasiformis et falcatus, 16-26 x 3-4 µm; germinatum per repetitionis aut germtubes.

Basidiocarps pustulate, soft to cartilage – gelatinuous, convolute, 0.2 – 1.5 mm in diam.; coalescing to form large masses, hyaline, glossy-white to pale yellowish; on drying to form inconspicuous vernicose patches or film; hymenium amphigenous, hyphae without clamps, dikaryophyses abundant in younger stages, helicoid with capitate apices; basidia sessile without basal clamps, of two types : sub-globose – ovate and spindle – shaped; 4-celled, cruciate – septate or obliquely and rarely transversely septate, 13-16 x 10-13 µm and 16-22 x 10-13 µm; epibasidia tubular, usually enlarging towards apices; basidiospores one-celled, apiculate, smooth, fusiform to falcate, cylindrical, 3-4 x 16-26 µm; germinating mostly by repetition or by germ tubes.

On decaying moist dead twigs of *Albizzia odoratissima* Benth. (F.- Mimosaceae), Kolhapur, (M.S.), 1.8.81, leg. B.D. Kundalkar, H.C.I.O. – 43,394 (Holotype) and W.I.F. – 590 B (Type).

The genus *Efibulobasidium* Wells is very rare and two species are known (Wojewoda, 1981). The present collection is morphologically identical with *E. albescens* (Sacc. and Malbr.) Wells except two distinct types of basidia and the nature of helicoid and apically capitate dikaryophyses. Therefore, a new species has been proposed.

***E. patiliensis* Mahamulkar**, Kundalkar and M.S. Patil sp.nov., (Fig. 12 to 14)

Basidiocarpus pustulatus, 0.2 to 1 mm in diam., cartilageneous vel gelatinosae, incolorus vel candidus; hymenium amphigenus; hyphae fibulis destitutus; dikaryophysis copious in immaturus, 1-1.5 µm in dimetro; basidia sessiles, fibulis destitatus, sub-globosa vel ovatus, fere 4-partita, 13-19 x 9.5 – 16 µm; basidiosporae unicellularae, apiculatus, fusiformis et falcatus, 16-21 x 3-4 µm; germinarum per repetitionis.

Basidiocarps pustulate, soft to tough – gelatinous, convolute, 0.2 – 1 mm in diam., gregarious, coalescing to form large compound masses, hyaline to glossy – white; on drying forms inconspicuous vernicose patches or film, hymenium amphigenous; hyphae without clamps; dikaryophyses abundant and not capitate to their apices, 1-1.5 µm thick; basidia sessile without basal clamps; metabasidia pyriform, sub-globose to ovate, mostly-4 celled, usually longitudinally and rarely obliquely cruciate-septate, 13-19 x 9.5 – 16 µm; epibasidia mostly daciduous, cylindrical, swollen towards the tip, very long upto 320 µm in length, 2.5-3.5 µm thick and 5 µm thick adjacent to sterigmata, basidiospores one-celled, apiculate, smooth, fusiform, or falcate, cylindrical, curved, tapering sharply towards the lower ends, 16-21 x 3-4 µm, germinating by repetition.

On decaying moist leaves of *Livistonia chinensis* Br. (Fam.- Arecaceae), Kolhapur (M.S.), 22.7.81, leg. B.D. Kundalkar, H.C.I.O. – 43,395 (Holotype) & W.I.F. – 591A (Type). The same species has been also collected on dead moist leaves and stems of *Ficus bengalensis* Linn. (F-Urticaceae), *Cassia fistula* L. (F. Caesalpinaceae), *Borassus flabelliformis* Murr. (F.- Arecaceae), *Zizyphus jujuba* Lam., (F. – Rhamnaceae), *Parkia biglandulosa* W. & A. (F.- Mimosaceae), *Eugenia jambolana* Lam., (F.- Myrtaceae) and *Mangifera indica* L. (F.- Anacardiaceae) in the month of July-Aug. 1981 and deposited in W.I.F. Nos. 591 B to 591-I respectively.

Etymology : The species is named in the honour of late Prof. S.D. Patil for his notable contribution to mycology.

Pseudotremellodendron* pusio (Berk.) Reid var. *papillatus Mahamulkar, Kundalkar and M.S. Patil var. nov. (Figs.15 to 17)

Variety *pusio* simile sed basidiosporae papillatus

Basidiocarps tough-thelephoroid, clavarioid and rough, pale dirty-white, pallid, flesh dirty-buff coloured, erect, bushy, irregularly dichotomously to polychotomously branched, branches mostly swollen, roughly radial and acute, 3-5 x 0.5 – 1.5 cm, truncate; hymenium amphigenous except the base and apices; hyphae monomitic and with

loop-like clamps; basidia clavate, sphaeropedunculate, apical part of metabasidia completely cruciate – septate, 4-celled, cells uniguttulate, basidial stalk with loop-like basal clamp, 29-55 x 4-13 µm; apical tremellaceous portion 13-16 x 8-13 µm; lower part below the septum measured 16-38 x 4-10 µm; sterigmata 4, straight or incurved, 13-16 x 1-5 µm; Basidiospores one-celled, hyaline slender, elliptical, rarely-curved, sharply papillate, uni or biguttulate, 13-16 x 4-6 µm; germination by repetition.

On the soil, Dajipur (Dist. - Kolhapur, M.S.), 20.9.83 B.D. Kundalkar, H.C.I.O. - 43,427 (Holotype) & W.I.F. 510A (Type).

The genus *Pseudotremellodendron* Reid is monotypic and known by two varieties and cosmopolitian in distribution (Wojewoda, 1981). The present specimen differs from *P. pusio* (Berk.) Reid var. *pusio* by papillate basidiospores and larger basidia. Therefore, a new variety has been proposed. The genus has been recorded for the first time in India.

Sebacina microbasidiae* Christ and Hauersl. var. *indica Mahamulkar, Kundalkar and M.S. Patil, var.nov., Fig. 18 to 21

Variety *microbasidiae* simile sed basidiae 4-cellulariae in contra 2-cellulariae et prae longum epibasidiae.

Basidiocarps tought-gelatinous, resupinate, effused, tuberculate, indeterminate, hyaline, glossy to pale grey, 90-180 µm in diam.; drying to form vernicose film over the substrate; hymenium unilateral, or inferior; hyphae thin-walled, 1.5 – 2.5 µm thick and without clamps; zig-zag form ascending fertile hyphae absent; dikaryophyses forming a superficial layer above the basidia; basidia sessile, without basal clamps, probasidia sub-globose, metabasidia globose-ovate, mostly 4-celled, cruciate-septate, rarely 2-celled, 6-7 x 8-10 µm; epibasidia cylindrical, expanding towards apices, 32-80 x 1.5 – 5 µm; basidiospores one-celled, hyaline, smooth, apiculate, allantoid, 6-9.5 x 3-5 µm; germination not observed.

On decaying damp branches of *Albizzia odoratissima* Benth. (F.-Mimosaceae), Kolhapur (M.S.), leg, B.D. Kundalkar, H.C.I.O. – 43,428 (Holotype) and W.I.F.-597 A (Type).

Genus *Sebacina* Tul. has 8 species (Wojewoda, 1981). The present specimen is referred to *S. microbasidiae* Christ. & Hauersl. var. *microbasidiae* except the presence of 4-celled basidia, longer epibasidia and lack of zig-zag ascending fertile hyphae. Therefore, a new variety viz. *S. microbasidiae* Christ and Hauersl. var. *indica* var. nov. has been proposed.

ACKNOWLEDGEMENTS

The authors are thankful to the Head, Dept. of Botany and Shivaji University, Kolhapur for facilities. Authors also acknowledge the help rendered by Dr. R.J. Bandoni, Dept. of Botany, Univ. of British Columbia, Vancouver, B.C. Canada; Flegel, T.W., Dept. of Microbiology, Faculty of Science, Mahidol Univ., Bangkok, Thailand and Lowy, B., Department of Botany, Louisinia State Univ., Baton Rough, Louisiana, America and Wojewoda, W., Mycology Laboratory, Botanical Institute, Polish Academy of Sciences, 31-512 Krakow, Lubicz 46, Poland for identification and providing literature.

REFERENCES

Bilgrami, K.S., Jamaluddin and **Rizwi, M.A.** (1979). *Fungi of India* Part-I. List and References, Today and Tomorrow's Printers & Publishers, New Delhi, 467 pp.

Bilgrami, K.S. *et al.*, (1981). *Fungi of India* Part-II. List and Addenda *ibid*,128 pp.

Bilgrami K.S. *et al.*, (1991). *Fungi of India* List and References 2nd enlarged edition:Today and Tomorrow's Printers & Publishers, New Delhi, 801 pp.

Donk, M.A. *et al.*, (1966). *Check list of European Hymenomycetous Heterobasidae. Persoonia* **4**: 145-335.

Kobayasi, Y. (1937). On the genus *Holtermania* of *Tremallaceae Sci. Rep. Tokyo Bunrika Daigaku Section B.* **3**: 75-81.

Kundalkar, B.D. and **Patil, M.S.** (1986). Study of Sirobasidiaceous fungi from India. *Indian Phytopath.* **39**: 360-61.

Lowy, B. (1968). Taxonomic problems in the *Heterobasidiomycetes Taxon* **17**: 118-127.

Lowy, B. (1971). *Tremellales Monograph No. 6. Flora Neotropica*. Hafner Publ. Co., Inc. N.Y., 153 pp.

Martin, G.W. (1945). The classification of the Tremellales. *Mycologia*. **37**: 527-542.

Patil, M.S. and **Thite, A.N.** (1978). Some fleshy fungi from Maharashtra-II. *The Botanique* **9**: 193-202.

Patil, M.S. (1978). Some fleshy fungi from Maharashtra-III. *Indian Phytopath*. **31**: 32-35.

Sarbhoy, A.K., Varshney, J.L. and **Agarwal, D.K.** (1996). *Fungi of India* (1982-92) C.B.S. Publications, Darya Ganj, New Delhi, 350 pp.

Wells, K. (1957). Studies of some Tremellaceae *Lloydia* **20** : 46 & 48.

Wells, K. (1975). Studies on some Tremellaceae - V.A new *Efibulobasidium*. *ibid* **47**: 147-156.

Wells, K. and **Oberwinkler, G.** (1982). *Tremelloscypha gelationsa*, a species of new family Sebacinaceae. *ibid*. **74** : 325-331.

Wojewoda, W. (1981). *Mala Flora Grzybow* Tom 2. *Basidiomycetes* : (Podstawczaki), Tremellales (Trzesakowe), Auriculariales (Uszakowe), Septobasidiales (Czerwcogryzybowe), Panstwowe Wydawnictwa, Naukowke, Krakow, 408 pp.

Received for publication May 15, 2000