

Rare and interesting microfungi at the confluence of Eastern and Western Ghats (India)

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Key words: *Ascomycota*, Biligiri sanctuary, Western Ghats, litter fungi.

Zusammenfassung: Bei Feldarbeiten im Biligiri Rangaswamy Wildlife Sanctuary (BRT WLS), Indien, wurden 12 seltene und interessante *Ascomycota* gesammelt. Alle sind mitospore Morphen, nämlich *Arthrinium urticae*, *Deshpandiella jambolana*, *Diplocladiella scalaroides*, *Gonytrichum macrocladum*, *Moorella speciosa*, *Neopestalotiopsis asiatica*, *Podosporiella faureae*, *Stachybotrys proliferatus*, *Triadelphia heterospora*, *Trimmatostroma scutellare*, *Virgariella globigera* und *Volutina concentrica*. Sie werden beschrieben und illustriert.

Abstract: During fieldwork in Biligiri Rangaswamy Wildlife Sanctuary (BRT WLS) 12 unusual and interesting *Ascomycota* were collected. All are mitosporic morphs, namely *Arthrinium urticae*, *Deshpandiella jambolana*, *Diplocladiella scalaroides*, *Gonytrichum macrocladum*, *Moorella speciosa*, *Neopestalotiopsis asiatica*, *Podosporiella faureae*, *Stachybotrys proliferatus*, *Triadelphia heterospora*, *Trimmatostroma scutellare*, *Virgariella globigera*, and *Volutina concentrica*. They are described and illustrated.

During mycological investigation and routine collection of fungal specimens at the confluence of Eastern and Western Ghats in the protected area of Biligiri Rangaswamy Temple Wildlife Sanctuary (BRT WLS), 12 rare and interesting litter degrading fungi were isolated and identified which are reported here.

The important mountain range of Biligirirangan hills is situated between Eastern Ghats and Western Ghats. The most valuable part is protected in the BRT WLS. The unique biogeographical position of these protected area enriches it with high biological diversity of flora and fauna (KUMARA & al. 2012) and funga.

Materials and methods

All material was collected during field studies conducted 2014–2016 in various parts of Biligiri Rangaswamy Temple Wildlife Sanctuary (BRT WLS) by S. SENGUPTA CHATTERJEE. Samples of dried leaves were placed in brown paper bags, taken to the laboratory, and prepared according to CASTAÑEDA-RUIZ (2005). Mounts were prepared in PVL (polyvinyl alcohol, lactic acid and phenol). Photomicrographs were taken using a Nikon eclipse 50i microscope connected to a Nikon DS-Fi1 camera. Cultures were obtained by moist chamber incubation (HAWKSWORTH 1974), particle plating method (BILLS & POLISHOOK 1994) and 3 step sterilization process. Specimens are deposited in Botanical Survey of India, Western Regional Centre, Pune.

List of rare and interesting species

Arthrinium urticae M. B. ELLIS, Mycol. Pap. 103: 16 (1965) (*Apiosporaceae*) (Figs. 1 A, 3 a)

C o l o n i e s : pulvinate, round, 100–250 µm diam. or elongated up to 1 mm, dark blackish brown to black. Mycelium partly superficial, partly immersed in the substratum, composed of branched and anastomosing, septate, hyaline to olivaceous brown, smooth-walled, 1–4 µm thick hyphae.

C o n i d i o p h o r e m o t h e r c e l l s : subspherical or flask-shaped, 4–5 × 3–5 µm.

C o n i d i o p h o r e s : erect or ascending, simple, straight or flexuous, cylindrical, colourless except for the brown or dark brown, transverse septa, smooth-walled, 40–74 µm long, 1–5–2 µm thick.

C o n i d i a : round or almost round in face view, 5–6 (av. 5.2) µm diam., slightly compressed and oval or elliptical in side view, 3.68–4.2 (av. 3.99) µm thick. Sterile cells none.

Material examined: On unidentified dried stem, K. Gudi, 8th September 2015, BSI WRC 202264.

Notes: First time reported from India.

Deshpandiella jambolana (T. S. RAMAKR., SRINIV. & SUNDARAM) KAMAT & ULLASA, Bull. Torrey Bot. Club 100: 42 (1973) (*Phyllachoraceae*) (Fig. 1 F, G)

C o n i d i o m a t a : gregarious, immersed with an ostiole reaching the surface of substratum, subepidermis pycnidoid, at times convoluted, subglobose or ellipsoidal, 245–324 × 206–310 µm, periphyses brown, septate, 5–6.5 µm thick. Conidiomatal wall 16–24.5 µm thick, consisting of several layers of highly compressed, hyaline or brown, thick-walled cells, becoming brown around the ostiole. Sterile hyphae cylindrical, 1–3-septate, brown, arising from all around the inside of conidioma among conidiophores, 20–45 × 4–5 µm. Conidiophores reduced to conidiogenous cells.

C o n i d i o g e n o u s c e l l s : holoblastic, discrete, cylindrical, 6–14 × 3–4.5 µm.

C o n i d i a : brown, with wide, paler median band, clavate with obtuse apex and truncate base, 11.87–12.7 (av. 12.39) × 5–5.9 (av. 5.42) µm, 1-septate, with apical and basal appendages; apical appendage tubular, unbranched for a short length from the base, 1–2(–2.5) µm (av. 1.5 µm) and then branching irregularly; branches mostly 4–5, more or less attenuated, flexuous, (17.5–)26–41(–45) µm long (av. 33.5 µm); basal appendage often present, visible in water, gelatinous, doliform, 2–4 × 3–4.5 µm.

Material examined: On unidentified stem litter, K Gudi, 2nd October 2014, BSI WRC 202271.

Notes: Reported on *Eugenia jambolana* (SARBHOY & al. 1971, HOSAGOUDAR & ABRAHAM 2000); associated with *Eugenia jambolana*, West Bengal (KAR & GHOSH 1986); on *Syzygium cumini*, TBGRI, Palode (HOSAGOUDAR 2012); on *S. densiflorum*, Mathikettan shola, Kodaikannal, Tamil Nadu (HOSAGOUDAR 2012); *Syzygium* sp., Vandanam, Alapuzha, Kerala (HOSAGOUDAR 2012); living leaves of *Eugenia jambolana* Lam, Daspur, W. B. (KAR & MAITY 1970).

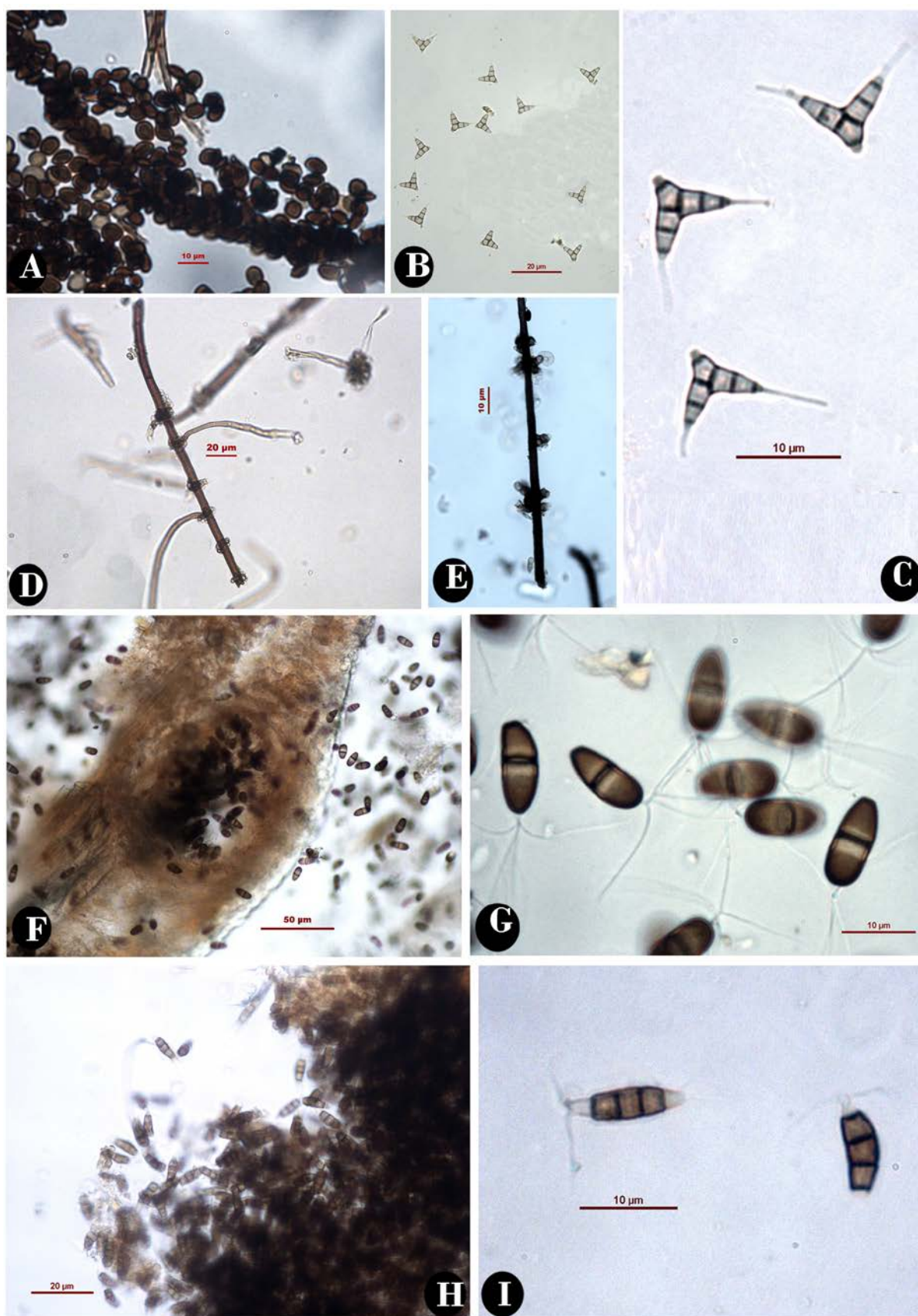


Fig.1. Light microscopic images of rare asexual morphs. A Colony of *Arthrimum urticae* with conidia; B, C *Diplocladiella scalaroides* colony and conidia; D *Gonytrichum macrocladum* conidiophores and conidia; E *Moorella speciosa*; F, G *Deshpandiella jambolana*, F colony with pycnidia, G conidia with paler median band and appendages; H, I *Neopestalotiopsis asiatica*, H colony, I conidia with apical and basal appendages. Bars: F 50 µm; B, D, H 20 µm; A, C, E, G, I 10 µm.

Diplocladiella scalaroides G. ARNAUD ex M. B. ELLIS, More Dematiaceous Hyphomycetes (Kew): 229 (1976) (*Pezizomycotina*) (Fig. 1 B, C)

Mycelium: partly superficial, partly immersed, composed of smooth, brown, branched, septate, 2–3 m wide hyphae.

Conidiophores: scattered, macronematous, $19\text{--}32 \times 3.2\text{--}5$ m.

Conidiogenous cells: integrated, terminal, geniculate sympodial, conidial scars situated on round shoulders.

Conidia: solitary, holoblastic, dark brown, triangular, 7-celled, distoseptate, consisting of a main axis with two divergent arms, bilaterally symmetrical, with two middle oblique septa, separating the arms. Main axis 2-celled, $3.7\text{--}4$ (av. 3.9) μm long and $2.15\text{--}3.4$ (av. 2.97) μm wide (measured from the truncate base to the curvature of the arms). The arms (excluding the appendages) $4.4\text{--}4.8$ (av. 4.64) $\mu\text{m} \times 2.14\text{--}2.75$ (av. 2.38) μm wide at the base, narrowing to $1\text{--}1.5$ μm at the lighter coloured apical cells, ending in a long, thin, hyaline, non-septate appendage, $5.2\text{--}6$ (av. 5.43) $\mu\text{m} \times 0.4\text{--}0.6$ (av. 0.5) μm at the base and 1.23 μm at the apex.

Material examined: On unidentified stem litter, Attiken coffee estate, 10th September 2015, BSI WRC 202254.

Notes: Foam samples, Western Ghats, India (SUBRAMANIAM & BHAT 1987); submerged root and leaves, Hyderabad, Andhra Pradesh (RAO & VERGHESE 1981).

Gonytrichum macrocladum (SACC.) S. HUGHES, Trans. Brit. Mycol. Soc. 34(4): 565 (1952) [1951] (*Chaetosphaeriaceae*) (Figs. 1 D, 3 b, c)

Mycelium: mostly immersed.

Conidiophores: subulate, crowded, arising singly, consisting of a straight erect stipe, brown, unbranched, $87.1\text{--}115.13$ (av. 102.15) μm long with a terminal sporulating phialide, others $275\text{--}370$ μm long with a sterile ending, $3\text{--}5.0$ μm wide at the dark brown base, tapering to $2.5\text{--}3$ μm wide at the paler setiform apex, septate. Collar-like hyphae (or short basal cells) formed just underneath the septum, arising from the lower half of the conidiophore stipe, short, irregularly curved, slightly pigmented and giving rise to a succession of 2–4 phialides. Internodes $(17.5\text{--})20\text{--}30\text{--}(32.5)$ μm long, repeatedly septate.

Phialides: lightly pigmented, subtle with a tapering tip, $(15.0\text{--})17.5\text{--}22.5 \times 2.5\text{--}3.8$ μm , collarette conspicuous, occasionally proliferating percurrently.

Conidia: formed on a protruding meristematic tip from multiple conidiogenous loci, accumulating in slimy heads, 1-celled, ellipsoidal to oval, colourless or pale brown, smooth, usually uniguttulate, slightly apiculate at the base, $4\text{--}6$ (av. 5) $\times 2.5\text{--}3.8$ μm . Chlamydospores absent. Sterile lateral setae in the upper part of the conidiophores absent.

Material examined: On unidentified stem litter, Bedguli, 11th September 2015 BSI WRC 202277.

Notes: In soil, Cuttack, Orissa (GHOSH & DUTTA 1962); in shisham forest soil; Dchradun, U. P. (BAKSHI & SINGH 1956); wood, Warangal, A. P. (RANGASWAMI & al. 1970); dead leaves of *Myrica nagi* Chambaaghat, Solan, H. P. (SHARMA & MUNJAL 1978); dead fruits of *Pyrus pashia*, Chambaaghat, Solan, H. J. (SHARMA & MUNJAL 1981); dead twigs of *Dalbergia sissoo*, Bilaspur, H. P. (SHARMA & MUNJAL 1982).

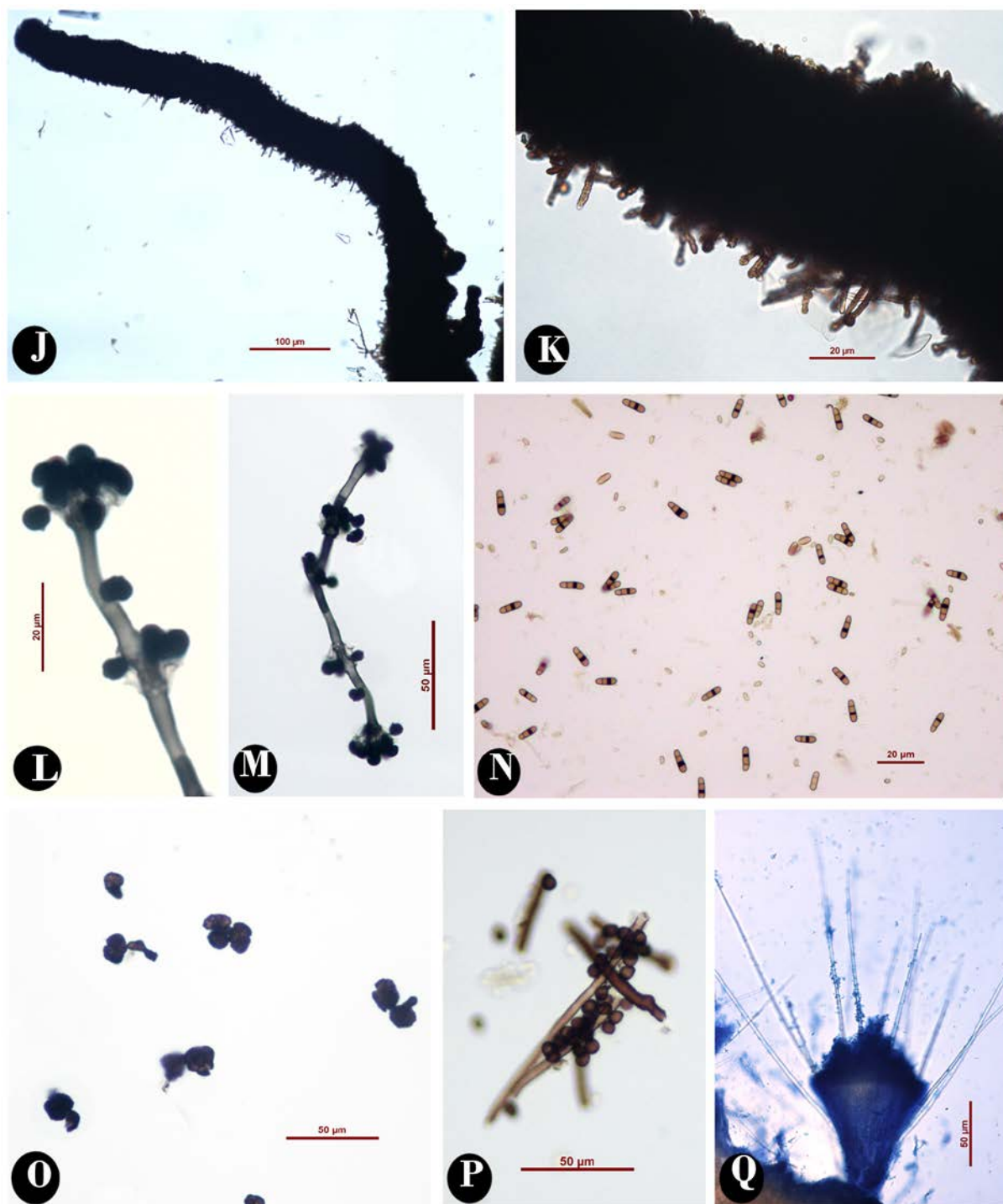


Fig. 2. Light microscopic images of rare asexual morphs. *J, K Podosporiella faureae* columnar sporodochia; conidiophores and conidia emerging from sporodochia; *L, M Stachybotrys proliferatus* with proliferating growing apex through phialides; *N Triadelphia heterospora* with three types of spores; *O Trimmatostroma scutellare* conidia; *P Virgariella globigera* conidiophores and conidia, *Q Volutina concentrica* sporodochia, setae and conidia. Bars: *J* 100 µm; *M, O, P, Q* 50 µm; *K, L, N* 20 µm.

Moorella speciosa P. RAG. RAO & D. RAO, Mycopath. Mycol. Appl. 22: 52 (1964) (*Pezizomycotina*) (Figs. 1 E, 3 e, f)

Colonies: on natural substratum effuse, blackish brown, velvety. Mycelium partly superficial, partly immersed. Setae and hyphopodia absent. Conidiophores: mac-

ronematous, erect, straight or slightly flexuous, septate, dark brown, smooth, with numerous short, brown branches formed in verticils at intervals along the stipe, 220–278 μm long, 7.8–10 μm wide at base, 5–6.5 μm wide at apex.

Conidiogenous cells: polyblastic, integrated and terminal on the stipe and branches or rarely discrete, superficial or ellipsoidal, denticulate. **Conidia:** solitary, dry, developing several at a time or successively from a pale brown, thin-walled protrusion at the apex of the conidiogenous cell, simple, helicoid, septate, hyaline or subhyaline, smooth, 1–1.5 times coiled, 4–6-septate, 8–10 μm diam., with filament 4–4.5 μm thick.

Material examined: On unidentified stem litter, K. Gudi, 2th October 2014, BSI WRC 202190. On unidentified stem litter, Manjikedde, 3th October 2014, BSI WRC 197600.

Notes: Bark of *Eucalyptus globosus*, Jabalpur, M.P. (SHARMA 1979); bark of unidentified trunk, Nizamabad, Andhra Pradesh (RAO 1964); on dead wood of plants, Karnataka (SUTTON 1973); on dead wood of plants, Rajasthan (PANWAR & Chouhan 1977); associated with *Lannea grandis*, Andhra Pradesh (SUTTON 1973); associated with *Eucalyptus globulus*, Madhya Pradesh (SHARMA 1979); associated with *Mangifera indica*, Madhya Pradesh (GUPTA 1988) (Herb IMI Fungal Database).

Neopestalotiopsis asiatica (MAHARACHCH. & K. D. HYDE) MAHARACHCH., K. D. HYDE & CROUS, Stud. Mycol. 79: 136 (2014) (*Pestalotiopsidaceae*) (Figs. 1 H, 3 d)

Conidiophores: indistinct.

Conidiogenous cells: hyaline, simple, filiform, 3–12 μm long.

Conidia: 22.6–27.5 (av. 25.085) μm $\times$ 6.2–7.27 (av. 6.9) μm , fusiform, straight to slightly curved, 4-septate; basal cell conical, hyaline, thin and verruculose, 3–5 μm long (av. 4.2 μm); three median cells 11–14.5 μm long, dark brown, verruculose, septa and periclinal walls darker than the rest of the cell, versicoloured, second cell from base pale brown, 3.2–5.5 μm (av. 4.5 μm); third cell darker brown, 4–5 μm ; fourth cell darker, 4–5 μm ; apical cell 3.5–5 μm long, hyaline, conical to cylindrical, comprising 2–4 appendages (mainly 3); apical appendages 13.57–16.11 μm long (av. 14.74 μm), tubular, arising from the apex of the apical cell; basal appendage 4–8 μm long (av. 5.15 μm), filiform.

Material examined: On unidentified leaf litter, Hoonahmatti coffee estate, 9th September 2015, BSI WRC 202279.

Notes: This is a new record of the species to Karnataka.

Podosporiella faureae ELLIS & EVERH., Proc. Acad. Nat. Sci. Philadelphia 46(3): 385 (1895) [1894] (*Pezizomycotina*) (Fig. 2 J, K)

Sporodochia: epiphyllous, scattered, cylindrical, dark blackish brown to black, up to 1400 μm high, 111–115 μm thick.

Stroma: partly immersed but with a large, spongy columnar superficial part made up of branched and anastomosing hyphae.

Conidiophores: growing out from the sides of the superficial stromatic column, brown, septate, often rough or wrinkled especially near their tips where they bear a few small scars, septate, up to 60 μm long, 3–6 μm thick.

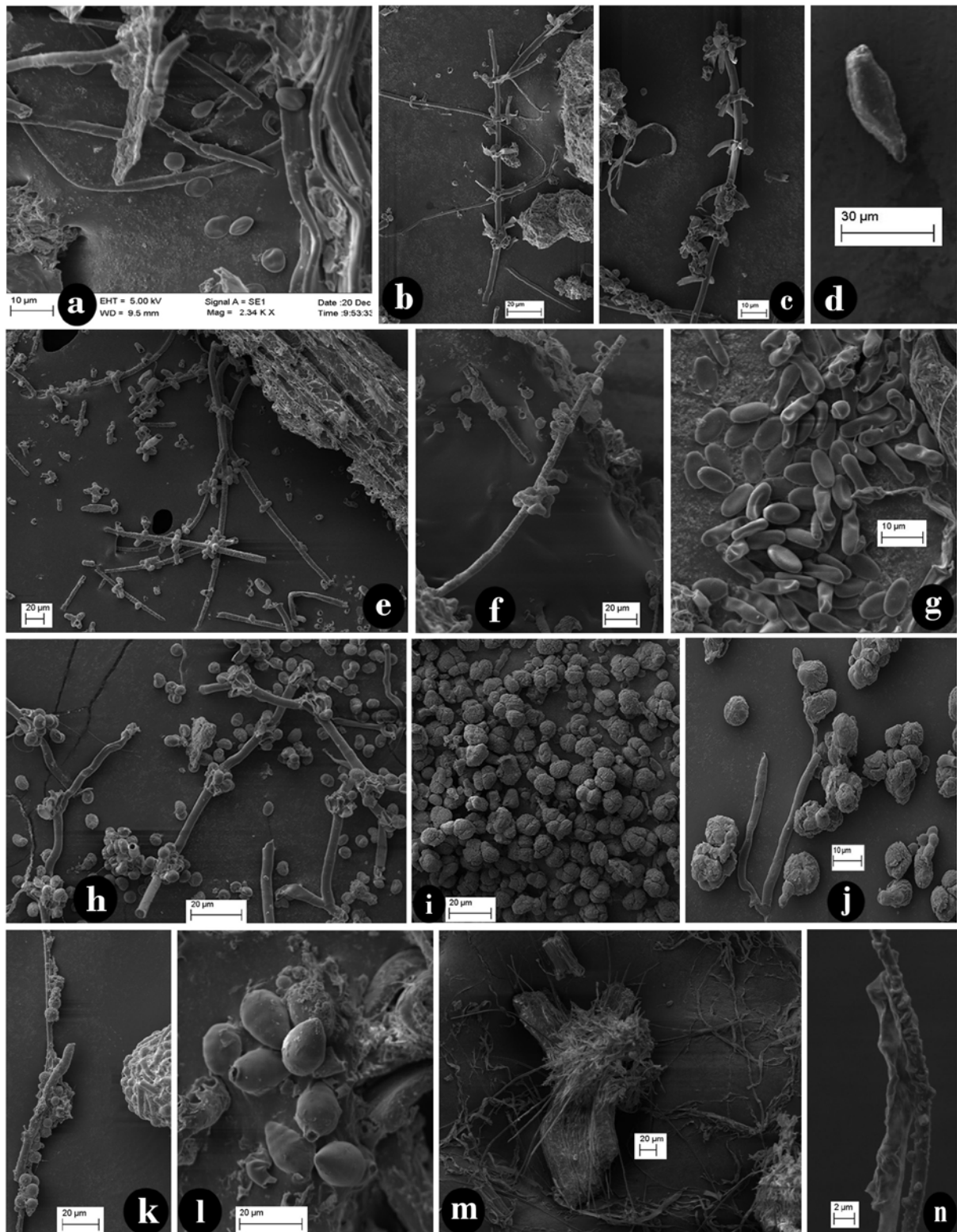


Fig. 3. Scanning electron microscopic images of rare asexual morphs. *a* *Arthrimum urticae*, colony with spores; *b, c* *Gonytrichum macrocladum*, erect stipe like conidiophores and small, globose conidia; *d* *Neopestalotiopsis asiatica* conidia; *e, f* *Moorella speciosa* conidiophores with numerous short branches in verticils; *g* *Triadelphia heterospora* with two types of spores; *h* *Stachybotrys proliferatus* with proliferating conidiophores and conidia; *i, j* *Trimmatostroma scutellare* colony and conidia; *k, l* *Virgariella globigera*, *k* conidia attached to the conidiophores, *l* subspherical to broadly ellipsoidal conidia; *m, n* *Volutina concentrica* *m* sporodochia, *n* hyaline conidia attached to conidiophores. Bars: *d* 30 µm; *b, e, f, h, i, k–m* 20 µm; *a, c, g, j* 10 µm, *n* 2 µm.

Conidia: cylindrical to narrowly obclavate, 2–4-septate, very pale brown or olivaceous, smooth, when mature 20–35 (av. 30) μm long, 4–7 (av. 4.8) μm thick in the widest part.

Material examined: On unidentified leaf litter, Manjigede, 5th September 2015, BSI WRC 202290.

Notes: This is the first report of *Podosporiella faureae* from Karnataka.

Stachybotrys proliferatus K. G. KARAND., S. M. KULK. & PATW., Biovigyanam 18(2): 79 (1992) (*Stachybotryaceae*) (Figs. 2 L, M, 3 h)

Colonies: grey to brown, mycelium immersed.

Conidiophores: solitary, unbranched, brown, paler towards apex, smooth, septate, 60.15–88.3 (av. 76.06) $\times$ 3.67–5.06 (av. 4.44) μm with globose base; phialides terminal and intercalary due to characteristic proliferation of growing apex. Growing apex proliferating 2–4 times through bearing phialides.

Phialides: 6–8, obovoid, subhyaline, smooth, 7.04–9.13 (av. 8.27) $\times$ 2.5–4.2 (av. 3.2) μm . **Conidia:** solitary, dark brown to black, reniform, 7.03–8.8 (av. 7.76) $\times$ 5.09–6.09 (av. 5.41) μm .

Material examined: On unidentified leaf litter, Manjigede, 3rd October 2014, BSI WRC 197596.

Notes: New record for Karnataka.

Triadelphia heterospora SHEARER & J. L. CRANE, Mycologia 63(2): 247 (1971) (*Pezizomycotina*) (Figs. 2 N, 3 g)

Sporodochium like structures: formed on natural substrate or in culture. Submerged hyphae hyaline, thin-walled, smooth, septate, ramified, 1–2 μm wide.

Conidia: of four different forms: (a) cylindrical or slightly obclavate, pale brown to brown, 15–23 $\times$ 5–8.5 μm , wall smooth, 0.3 μm thick, 0–2-septate, the distal septum covered by a dark, 2.5 μm wide band, tip and base rounded, hilum inconspicuous. Conidiogenous cells clavate, flask-shaped or cylindrical, hyaline when young, becoming pale brown when mature, 5–8 $\times$ 3–4 μm ; (b) broad to ellipsoid conidia are not found in the sample. (c) allantoid or reniform, hyaline or pale brown, 0–1-septate, smooth, thin-walled, rounded at both ends, 8.5–15 $\times$ 3–5 μm , arising from unicellular, flask-shaped, hyaline conidiogenous cells; (d) obovate to large ellipsoidal, pale brown, unicellular, smooth and thin-walled, hilum inconspicuous, 6–8 $\times$ 4–5 μm .

Material examined: On unidentified stem litter, Bodipadaga, 8th September 2015, BSI WRC 202284.

Notes: Dead bark, Mt. Abu, Rajasthan (PANWAR & CHOUHAN 1977). New record for Karnataka.

Trimmatostroma scutellare (BERK. & BROOME) M. B. ELLIS, More Dematiaceous Hyphomycetes (Kew): 28 (1976) (*Helotiales*) (Figs. 2 O, 3 i, j)

Sporodochia: pulvinate, black, shining. Stromata erumpent up to 250 μm wide and 150 μm high, dark brown, pseudoparenchymatous.

Conidiophores: pale to mid brown, pseudoparenchymatous, smooth or wrinkled, up to 30 μm long, 1–4 μm thick.

Conidia: in simple or branched chains, easily fragmenting, very variable in shape, deeply lobed, mostly multicellular, pale to mid brown, smooth, the individual cells often very dark at their tips or along the edge, gradually shading inwards, 10–30 $\times$ 8–25 μm .

Material examined: On unidentified dried stem, Jodigede, 1st April 2014, BSI WRC 202194.

Notes: Unidentified dead wood, Dehradun, Uttar Pradesh (BEGUM & al. 1978).

Virgariella globigera (SACC. & ELLIS) S. HUGHES, Canad. J. Bot. 31: 654 (1953) (*Pezizomycotina*) (Figs. 2 P, 3 k, l)

Colonies: effuse dark brown to black, often hairy. Mycelium partly superficial but mostly immersed. Setae and hyphopodia absent.

Conidiophores: macronematous, mononematous, scattered, erect, unbranched, straight or flexuous, dark brown, smooth, thick-walled, $80\text{--}180 \times 3.2\text{--}5\ \mu\text{m}$.

Conidiogenous cells: polyblastic, integrated, terminal, sympoidal, cylindrical.

Conidia: solitary, dry, acropleurogenous, simple, broadly ellipsoidal, subspherical or spherical, dark brown, smooth, thick-walled, aseptate, $7.5\text{--}9 \times 4\text{--}6.5\ \mu\text{m}$.

Material examined: On unidentified stem litter, Malkibetta, 4th October 2014, BSI WRC 202192.

Notes: On leaves of *Helicteres isora*, Maharashtra; on leaves of *Memecylon umbellatum*, Maharashtra (DUBEY & SENGUPTA 2015). This is the first report of occurrence of *Virgariella globigera* from Karnataka state.

Volutina concentrica PENZ. & SACC., Malpighia 15(7–9): 257 (1902) [1901] (*Nectriaceae*)(Figs. 2 Q, 3 m, n)

Sporodochia: gregarious, sessile, slightly narrowed at base, black in centre, greenish outline, $200\text{--}220 \times 33\text{--}166\ \mu\text{m}$ diam. Setae radiating, pointed, septate, hyaline, thickwalled, $200\text{--}211.76 \times 3.5\text{--}6\ \mu\text{m}$. Sporodochial hyphae radiating, diverging, forming concentric layers superimposed over one another, compact.

Conidiophores: hyaline $7.05\text{--}11 \times 2\text{--}3.5\ \mu\text{m}$.

Conidia: cylindrical, truncate at both ends, hyaline, catenulate, $6\text{--}7.05 \times 3.52\ \mu\text{m}$.

Material examined: On unidentified stem litter, Mudigudi, 5th September 2015, BSI WRC 202280.

Notes: Dead straw, Madras, Tamil Nadu (SUBRAMANIAM 1953); On *Parthenium hysterophorus*, Poona, Maharashtra (DESAI & PATWARDHAN 1974); *Eucalyptus tereticornis*: India (VITTAL & DORAI 1991). (Herb IMI Fungal Database). This is a new record for Karnataka.

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References

- BAKSHI, B. K., SINGH, S., 1956: Wilt disease of Shisam (*Dalbergia sissoo* Roxb)-III. Studies on soil fungi excluding *Aspergillus* & *Penicillium*. – Ind. Phytopathol. **9**: 114–124.
- BEGUM, R., MANOHARACHARY, C., RIZWANA, A. R., 1978: Additions to the fungi of India. – Acta Bot. Indica **6**: 190–191.
- BILLS, G. F., POLISHOOK, J. D., 1994: Abundance and diversity of microfungi in leaf litter of a lowland rain forest in Costa Rica. – Mycologia **86**(2): 187–198.
- CASTAÑEDA-RUIZ, R. F., 2005: Metodología em el estudio de los hongos anamorfos. – Anais do V Congresso Latino Americano de Micología, Brasília, pp. 182–183.

- DESAI, S. H., PATWARDHAN, P. G., 1974: Addition to Hyphomycetes of Maharashtra. – J. Univ. Poona **46**: 127–133.
- DUBEY, R., SENGUPTA, S., 2015: Some new host records of fungi from India. – J. New Biol. Rep. **4**(2): 177–179.
- GHOSH, G. R., DUTTA B. G., 1962: Soil fungi from the Paddy fields of Orissa. – Proc. 49th Indian Sci. Congr. III: 244.
- GUPTA, D. K., 1988: New host records of fungi from India. – Indian Phytopathol. **41**(3): 506.
- HAWKSWORTH, D. L., 1974: Mycologist's Handbook. – Commonwealth Mycological Institute, Kew.
- HOSAGOUDAR, V. B., 2012: *Asterinales* of India. – Mycosphere **2**(5): 617–852.
- HOSAGOUDAR, V. B., ABRAHAM, T. K., 2000: A list of *Asterina* LEV. species based on the literature. – J. Econ. Taxon. Bot. **24**: 557–587.
- KAR, A. K., GHOSH, S. N. 1986: New *Asterina* species from West Bengal. – Indian Phytopathol. **39**: 204–220.
- KAR, A. K., MAITY, M. K., 1970: New *Asterina* spp. from West Bengal. – Trans. Brit. Mycol. Soc. **54**: 435–444.
- KUMARA, H. N., RATHNAKUMAR, S., SASI, R., SINGH, M., 2012: Conservation status of wild mammals in Biligiri Rangaswamy Temple wildlife sanctuary, the Western Ghats, India. – Curr. Sci. **103**: 933–940.
- PANWAR, K. S., CHOUHAN, J. S., 1977: Hyphomycetes of Ml. Abu-Ili. – Indian Phytopathol. **30**: 353–357.
- RANGASWAMI, G., SESHADRI, V. S., CHANNAMMA, K. A. L., 1970: Fungi of South India. – University of Agricultural Sciences, Bangalore.
- RAO, P. R., 1964: Some Helicosporae from Hyderabad-I. – Mycopath. Mycol. Appl. **22**: 47–54.
- RAO, V. G., VERGHESE, M. K. L., 1981: Some new or interesting Hyphomycetes from India. – Proc. Nat. Acad. Sci. India **51**(B): 240–244.
- SARBHOY, A. K., LAL, G., VARSHNEY, J. L., 1971: Fungi of India (1967-71). – New Delhi: Navyug Traders.
- SHARMA, A. D., MUNJAL, R. L., 1978: The genera *Ceratocladium* and *Gonytrichum* in India. – Indian Phytopathol. **31**: 318–322.
- SHARMA, A. D., MUNJAL, R.L., 1981: Additions to the mycoflora of Himachal Pradesh XI. – Ind. J. Mycol. Pl. Pathol. **11**: 153–155.
- SHARMA, A. D., MUNJAL, R. L., 1982: Additions to mycoflora of Himachal Pradesh XII. – Ind. J. Mycol. Pl. Pathol. **12**: 26–31.
- SHARMA, N. D., 1979: Some records of fungi from India. – Indian Phytopathol. **32**: 518–522.
- SUBRAMANIAM, C. V., 1953: Fungi imperfecti from Madras-V. – Proc. Ind. Acad. Sci. **38**(B): 27–39.
- SUBRAMANIAM, C. V., BHAT, D. J., 1987: Hyphomycetes from south India I. Some new taxa. – Kavaka **15**: 41–74.
- SUTTON, B. C., 1973: Hyphomycetes from Manitoba and Saskatchewan, Canada. – Mycol. Papers **132**: 1–143.
- VITTAL, B. P. R., DORAI, M., 1991: Three new Deuteromycetes from *Eucalyptus* leaf litter. – Mycol. Res. **95**: 501–503.

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