

# New records of lichens growing on monuments of Central India

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## ABSTRACT

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The monuments and historical buildings, owing to their peculiar substrate, provide unique habitat for certain lichen taxa to colonise. Two such peculiar lichen species, viz. *Dimelaena tenuis* (Müll. Arg.) H. Mayrhofer & Wippl and *Peltula placodizans* (Zahlbr.) Wetmore, are recorded for the first time from India.

**Key-words:** Taxonomy, placodioid lichens, *Dimelaena*, *Peltula*, India.

## INTRODUCTION

Madhya Pradesh, in central India, is bestowed with three heritage zones, Khajuraho in Chhatarpur district and Sanchi and Bhimbetka rock shelter in Raisen district, together with 600 other ancient monuments. Among various groups of plants growing in and around the monuments, the lichens grow directly on the surface of the monuments. The lichens have an ability to grow on wide range of substrates. The dry, sterile exposed substrates, which are impermeable and uninviting for most of the plant groups, are suitable for many lichen taxa to grow.

Lichens are known to actively decompose substrates either physically or chemically. The taxonomic identification and ecological property of each species growing on a substrate is necessary since different species contribute to the process of degradation in a different way. Little is known about the systematic and ecological studies of lichens growing on monuments of India and particularly central India.

During assessment of lichen diversity over the monuments in central India, the lichens growing on the monuments of Dhar, Katni and Raisen districts are recently enumerated (Bajpai 2008, Bajpai et al. 2008a,

b). From the specimens collected from different monuments and nearby rocks of the area, two taxa of lichens are described in the present communication as new records for Indian lichen flora.

## MATERIAL AND METHOD

The present study is based on lichen specimens collected from the monuments of central India and are housed at LWG. The morphological characters were examined on dry material under a dissecting microscope (x40). Thin hand-cut sections of thallus and ascomata were examined under a compound microscope (x1000, in oil immersion). The sections for anatomical details were mounted in water. All measurements were made in water, but the paraphyses were studied after replacing water with 25% KOH (Wetmore 1994). Chemicals used in identification were 10% KOH (K), calcium hypochlorite (C), para-phenylenediamine (P) and iodine (I). Secondary metabolites were identified by TLC as described by Walker and James (1980). The chromatograms were developed in solvent systems A (toluene: 1, 4-dioxane: acetic acid) and B (hexane: diethyl ether: formic acid). Terminology for tissues is after Nash III and Gries (2002).

## TAXONOMIC DESCRIPTION

### *Dimelaena tenuis* (Müll. Arg.) H. Mayrhofer & Wippel

Plate 1, figure 1

Mycotaxon 58: 304. 1996.

**Description:** Thallus saxicolous, placodioid, thick to thin, determinate, orbicular to  $\pm$  irregular in outline, tightly adnate, zonate, 1-7 mm in diam., often coalescing with other thalli to cover large areas, dark brown, smooth and glossy; lobes flat to convex, linear to regular, flabellate, tips rotund, margins entire, regular to  $\pm$  irregularly branched, anisotomic, (0.5-) 1-2.5 (-4) mm long, 0.2-0.4 mm wide, central portion areolate, areoles plane to slightly convex, 0.4-0.8 mm wide; upper cortex well developed, epinecral layer present, 10-15  $\mu$ m thick, yellowish; algal layer continuous, 45-79  $\mu$ m thick; medulla composed of loosely interwoven hyphae with globose to elongate cells with numerous air spaces, white; lower cortex absent; prothallus and hypothallus absent. Apothecia infrequent, adnate, restricted to central portion of the thallus, rarely marginal, usually one per areolae, lecanorine at first, becoming biatorine to lecideine, 0.1-0.5 mm diam; disc brownish black to black, dull, persistently plane, margin concolorous to thallus; epihymenium brown, 10-15  $\mu$ m high; hymenium hyaline, 50-80 (-100)  $\mu$ m high, I+ blue; hypothecium hyaline, 80-100  $\mu$ m high. Paraphyses simple or weakly branched. Asci cylindrical, 8-spored; ascospores brown, 1-septate, 9-13 x 5.5-7  $\mu$ m. Pycnidia immersed, obpyriform; conidia hyaline, simple, bacilliform, 5-6 x 1  $\mu$ m.

**Chemistry:** Thallus K-, C-, KC-, P-; gyrophoric acid in TLC.

**Distribution:** South America, South Africa, Australia, New Caledonia, Papua New Guinea, Brazil (Mayrhofer et al. 1996).

**Remarks:** The taxon is characterized by dark brown and glossy placodioid thallus with contrasting apothecial disc, hyaline hypothecium and 1-septate,

brown ascospores. The species shows a tropical distribution and is found growing between an elevation of 150-500 m over siliceous rocks of Bhimbetka World Heritage Zone situated in Raisen district and Rewa and Katni districts in Vindhyan Range of Madhya Pradesh. It grows in association with *Caloplaca cinnabarina* (Ach.) Zahlbr. and *Peltula* spp., and is often confused with *D. australiensis* H. Mayrhofer & Sheard, *D. thysanota* (Tuck.) Hale & W. L. Culb. and *D. elevata* Elix, Kalb & Wippel. *Dimelaena australiensis* differs from *D. tenuis* in having short and broadly-ellipsoid ascospores (7-10 x 5-7  $\mu$ m), aeruginose epihymenium and presence of sulphurellin in TLC. Likewise, *D. thysanota* differs in chemistry (sphaerophorin) and having temperate distribution, while *D. elevata* differs in having dark hypothecium.

**Specimens examined:** Madhya Pradesh, Raisen district, Bhimbetka, Bhimbetka Main Cave area, on rock, 10.10.2004, D. K. Upreti & Y. Joshi 04-004453 (LWG); Rang Mahal Area, on rock, Nov. 2004, Y. Joshi 04-004522/C, 04-004541 (LWG); Katni district, Bahoriband, on rocks, 22.02.2009, G. K. Mishra & S. Mohabe 09-010622/B, 09-010625 (LWG); Rewa district, Govindgarh, Chuiya Ghati, on exposed siliceous rocks, 18.02.2009, G. K. Mishra & S. Mohabe 09-010645/B (LWG).

### *Peltula placodizans* (Zahlbr.) Wetmore

Plate 1, figure 2

Ann. Missouri Bot. Gard. 57: 196. 1971.

**Description:** Thallus saxicolous, placodioid, determinate, orbicular to  $\pm$  irregular in outline, tightly adnate, zonate, 1-5 (-13) mm in diam., often coalescing with other thalli to cover large areas, olivaceous brown to greenish-brown, glossy; lobes flat to convex, linear to regular, flabellate, tips rotund, margins entire, regularly to irregularly branched, anisotomic, (0.5-) 2-3 (-5) mm long, 0.2-0.4 mm wide, central portion lobate to areolate, sorediate, soredia marginal, labriiform, later on spreading entirely over the areolae, farinose to

## Plate 1

1. *Dimelaena tenuis* (Müll. Arg.) H. Mayrhofer & Wippel. 2. *Peltula placodizans* (Zahlbr.) Wetmore. Scale bar = 4 mm.

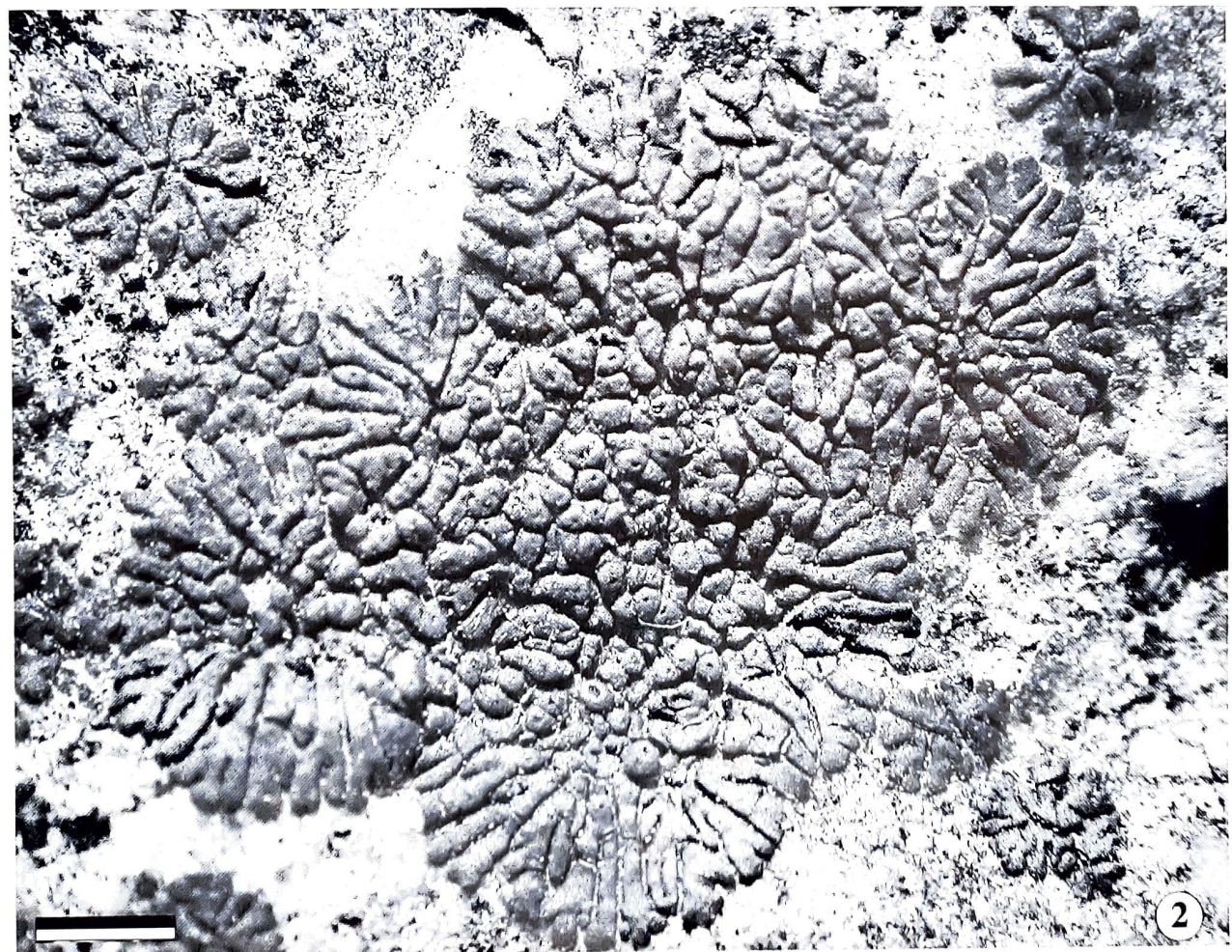
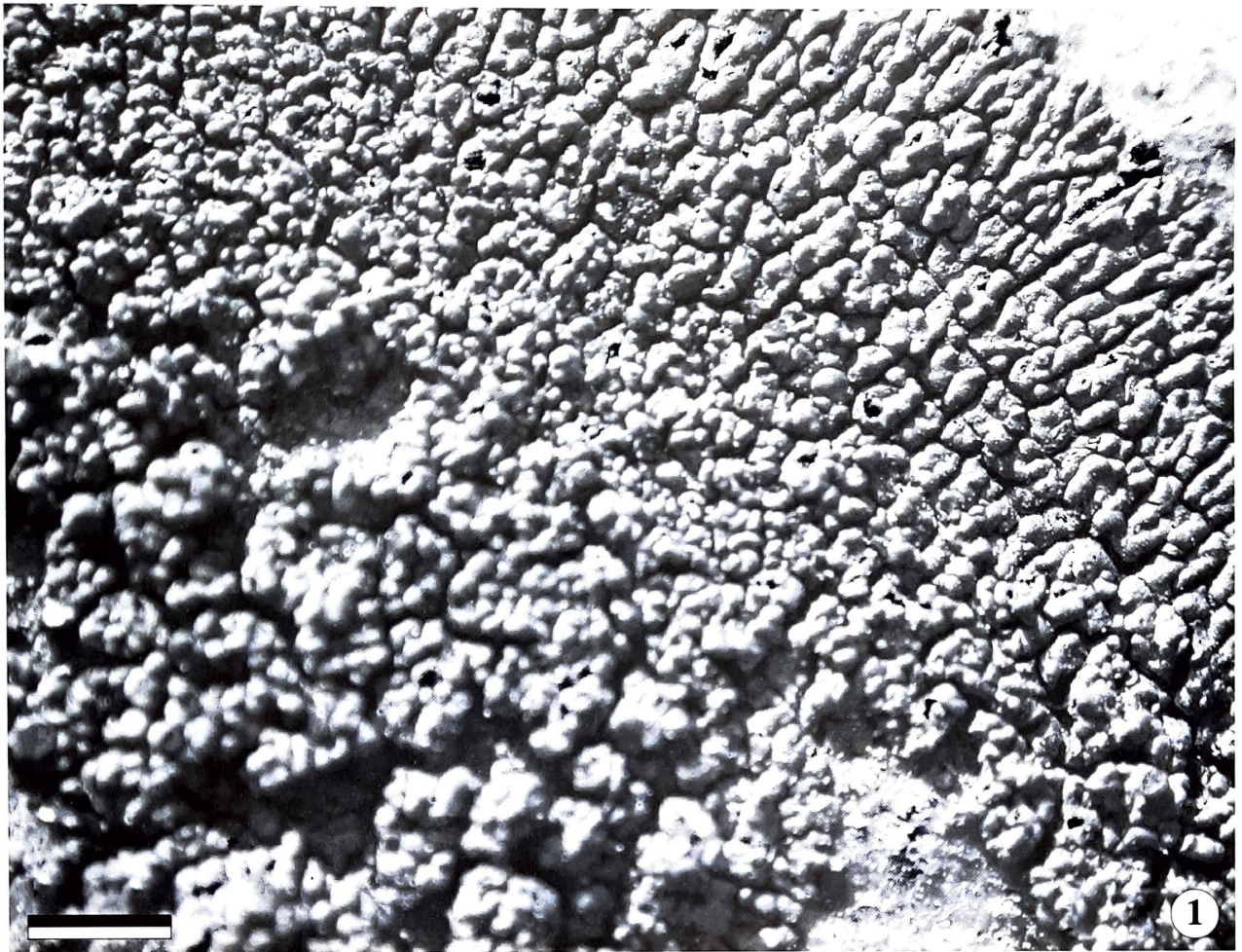


Plate 1

± subgranular, greyish-black; thallus 150-244 µm thick; upper cortex not developed; epinecral layer present, 8-15 µm thick, yellowish; photobiont layer continuous, 50-90 µm thick; medulla composed of loosely interwoven hyphae with globose to elongate cells with numerous air spaces, white; lower cortex poorly developed, paraplectenchymatous, 20-40 µm thick; prothallus and hypothallus absent. Apothecia rarely present, restricted to central portion of the thallus, cryptolecanorine, immersed to ± sessile, usually 1 per squamule/areole, round, disc punctiform to 0.3 mm diam., yellowish-brown to brownish-black, proper margin absent, thalline margin present, thin to moderate, smooth, concolorous to the thallus; epihymenium pale golden brown, 10-12 µm high; hymenium hyaline, 50-120 (-165) µm high, I+ wine-red; hypothecium hyaline, of isodiametric cells, oil globules ± present; parathecium thin, paraplectenchymatous, photobiont layer continuous below the hypothecium and extends up to amphithecium, crystals present in amphithecium. Paraphyses thick with upper 2-3 cells swollen. Asci clavate to obclavate, walls orange in iodine, blue after pre-treatment with K; ascospores more than 64 per ascus; globose to subglobose to ellipsoidal, (3-) 4.5-7.6 (-8) x 3-4.5 µm. Pycnidia present, immersed, conidia fusiform, 3.1-3.7 x 1.5-1.8 µm.

**Chemistry:** Thallus, medulla, apothecial disc and epihymenium K+ purple, C-, P-. No secondary metabolites found in solvent system A and B in TLC.

**Distribution:** Australia, South America, south-western North America, Africa, Europe (Wetmore 1970, Büdel 2001).

**Remarks:** The taxon is found growing along with *Peltula euploca* (Ach.) Poelt in arid habitats at the elevations of 300-600 m over siliceous rocks receiving some shade. It is characterised by a bigger orbicular, olivaceous brown, lobate thallus having lobes 2-5 mm long and marginal soralia which are paler than the thallus.

**Specimens examined:** Madhya Pradesh, Dhar district, Mandav, Lohani Caves, 20.01.2007, on rock, Y. Joshi & R. Bajpai 07-007397 (LWG); Jali Mahal, 20.01.2007, on rock, Y. Joshi & R. Bajpai 07-007398 (LWG); Chisti Khan's Mahal, 20.01.2007, on rock, Y. Joshi & R. Bajpai 07-007383 (LWG); Lal Mahal, 20.01.2007, on rock, Y. Joshi & R. Bajpai 07-007407 (LWG).

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