New species and new records of *Parmotrema* (*Parmeliaceae*) from India

P. K. DIVAKAR and D. K. UPRETI

**Abstract:** The paper deals with six species of *Parmotrema* from India. *Parmotrema awasthii* Divakar & Upreti and *Parmotrema upretii* Divakar are described as new to science. *Parmotrema defectum* (Hale) Hale, *P. ravum* (Krog & Swinscow) Sérus., *P. stuhlmannii* (C.W. Dodge) Krog & Swinscow and *P. tsavoense* (Krog & Swinscow) Krog & Swinscow, are new records for the Indian lichen flora.

© 2003 The British Lichen Society. Published by Elsevier Science Ltd. All rights reserved.

**Key words:** India, new records, new species, *Parmotrema*.

---

**Introduction**

The lichen genus *Parmotrema* A. Massal., a segregate of *Parmelia* Ach. s.l., was erected by Massalongo (1860), but for many years his concept was not adopted by other lichenologists. Vainio (1890) treated this segregate under subgenus *Euparmelia* of *Parmelia* and added the section *Amphigymnia* Vain., but he did not designate a type. Dodge (1959) subsequently elevated section *Amphigymnia* Vain. to subgeneric level. Hale (1965), Awasthi (1976) and Krog & Swinscow (1981) treated all Parmelioid taxa bearing large thalli with broad rotund lobes, usually with a broad, naked marginal zone on the lower surface; simple, sparse rhizines; substipitate to stipitate apothecia; large, thick walled, ellipsoid spores and sublageniform or filiform conidia under the genus *Parmelia* subgenus *Amphigymnia* (Vain.) Dodge. However, Hale (1974) followed the concept of Massalongo (1860) and resurrected the genus *Parmotrema* A. Massal.


**Materials and Methods**

This study is primarily based upon collections in LWG (including LWG-AWAS and LWG-LWU). The morphology, anatomy and chemistry of the specimens were studied.

All the phenolic metabolites encountered were identified by TLC methods as described by Culberson (1972) and Walker and James (1980). The chromatograms were developed in solvent system A (toluene:1,4-dioxane:acetic acid, 180:60:8 ml); for separation of lecanoric and gyrophoric acid solvent system, E. A. (diethylether:acetic acid, 200:2 ml) was used.

**The Species**

1. *Parmotrema awasthii* Divakar & Upreti sp. nov.

Thallus saxicola, laxe adnatus, c. 7-0 cm latus, lobis rotundatis, 4-0-6-0 mm latis, 1-0-3-0 mm longis, margin lobulatis, ciliatis, ciliis simplicibus, niger, superfine albocinereus, usually with a broad, naked marginal zone on the lower surface; simple, sparse rhizines; substipitate to stipitate apothecia; large, thick walled, ellipsoid spores and sublageniform or filiform conidia under the genus *Parmelia* subgenus *Amphigymnia* (Vain.) Dodge. However, Hale (1974) followed the concept of Massalongo (1860) and resurrected the genus *Parmotrema* A. Massal.


**Materials and Methods**

This study is primarily based upon collections in LWG (including LWG-AWAS and LWG-LWU). The morphology, anatomy and chemistry of the specimens were studied.

All the phenolic metabolites encountered were identified by TLC methods as described by Culberson (1972) and Walker and James (1980). The chromatograms were developed in solvent system A (toluene:1,4-dioxane:acetic acid, 180:60:8 ml); for separation of lecanoric and gyrophoric acid solvent system, E. A. (diethylether:acetic acid, 200:2 ml) was used.

**The Species**

1. *Parmotrema awasthii* Divakar & Upreti sp. nov.

Thallus saxicola, laxe adnatus, c. 7-0 cm latus, lobis rotundatis, 4-0-6-0 mm latis, 1-0-3-0 mm longis, margin lobulatis, ciliatis, ciliis simplicibus, niger, superfine albocinereus, planus, emaculatus, sorediis isidisque destitutus, pustulatus, medulla alba, sublus niger, sparse rhizinosus, ambitus nudus, brunneus. Apothecia
et pycnidia ignota. Atranorinum, acidum alectoronicum et acidum α-collatolicum continens.

Typus: India, Karnataka, Chikmagalure District, Dattatryapetta, on iron-rich rocks, alt. 1650 m, 2 May 1979, D. D. Awasthi, D. K. Upreti & U. Misra 79.540 (LWG-LWU—holotypus).

(Fig. 1)

*Thallus* loosely adnate, coriaceous, c. 7 cm wide. *Lobes* rotund, 4–6 mm wide, 120–150 μm thick; margins dissected into lobules, ciliate. *Cilia* black, simple to furcate, 1–3 mm long. *Upper surface* mineral grey, smooth, dull, emaculate or faintly maculate on older lobes, without isidia and soredia, pustulate. *Pustules* sparse, marginal to submarginal, erupting apically but not forming soredia. *Lobules* dense near margins, 1–2 mm wide, ciliate; cilia short, up to 1 mm long. *Medulla* white, 90–100 μm thick. *Lower surface* minutely wrinkled, black, with a 2–4 mm wide, dark brown, naked, shiny marginal zone, sparsely rhizinate. *Rhizines* restricted to the central part of the thallus, simple, black, 1–1.5 mm long.

*Apothecia* and pycnidia not seen.


**Etymology.** *Parmotrema awasthii* is named in honour of Dr D. D. Awasthi, an eminent Indian lichenologist and collector of the specimen.

**Ecology and distribution.** The species is saxicolous and occurs on iron-rich rock at c. 1650 m elevation. At present it is known only from the type locality.

**Discussion.** This new species appears to be related to *Parmotrema mellissii* (C. W. Dodge) Hale, reported from India (Awasthi 2000), but is separated by the presence of lobules and pustules, which break open apically but do not form soredia, whereas *P. mellissii* has distinct marginal soralia and lacks lobules. It is also similar to *P. kamatii* Patw. & A.V. Prabhu, reported for India (Awasthi 2000), but the latter has sorediate pustules, a corticolous habit and lacks lobules. In the type description of *P. kamatii*, Patwardhan and Prabhu (1977) mentioned the presence of pustules on marginal lobules, but we observed that the type material of *P. kamatii* has pustulate soralia on dissected margins and that lobules are absent.
2. Parmotrema upretii Divakar sp. nov.

Thallus saxicola, laxe adnatus, c. 10 cm latus, lobis rotundatis, 5–10 mm latis, margine eciliatus, superne albinereus, planus, emaculatus, isidiato-lobulatus, medulla alba, subtus niger, sparse rhizinosus, ambitus nudus, brunneus. Apothecia et pycnidia ignota. Atranorinum et acidum gyrophoricum continens.

Typus: India, Himachal Pradesh, Kullu district, near Banjar, on rock, alt. 1700 m, 6 June 1999, D. K. Upreti 217547 (LWG—holotypus).

\[\text{(Fig. 2)}\]

Thallus loosely adnate, c. 10 cm across. Lobes rotund, 5–10 mm wide, 150–170 μm thick; margins eciliate. Upper surface mineral grey, smooth, emaculate, lobulate-isidiate. Lobules laminal, more rarely marginal, initially granular, black-tipped, resembling isidia but soon becoming flat, dorsiventral, horizontal, up to 1.5 mm wide and 1 mm high; margins ± dichotomously divided, margin eciliate. Medulla white, 75–100 μm thick. Lower surface smooth, black, with a 4–6 mm wide, shiny, erhizinate, pale brown marginal zone, centre sparsely rhizinate. Rhizines present in the centre, black, simple, up to 1 mm long.

Apothecia and pycnidia not seen.

Chemistry. Cortex K+ yellow; medulla K−, C+ red, KC+ red, P−. TLC: atranorin and gyrophoric acid.

Etymology. Parmotrema upretii is named in honour of the Indian lichenologist Dr D. K. Upreti, the collector of the specimen.

Ecology and distribution. The species occurs over rocks in exposed areas at c. 1700 m elevation. At present it is known only from its type locality.

Discussion. This new species resembles Parmotrema tinctorum (Despr. ex Nyl.) Hale, but differs in having a lobulate rather than an isidiate upper surface, and by the presence of gyrophoric instead of lecanoric acid. Parmotrema fasciculatum (Vain.) Hale and P. ramuscula (Hale) Hale also have marginal, coralloid clusters of lobules, but both can be separated by their different medullary chemistry (P. fasciculatum has protocetraric acid while P. ramuscula has salazinic acid). Morphologically it is also similar to Parmotrema thailandicum Elix & Poopprang, but the latter can be separated by the presence of protocetraric instead of gyrophoric acid and a yellow-orange pigmented medulla adjacent
to the lower cortex (Pooprang et al. 1999). In its chemistry P. upretii is similar to P. lophogenum (dess Abb.) Hale, but the latter differs in having ciliate margins and pustulate-isidia instead of eciliate margins and lobulate isidia.

3. Parmotrema defectum (Hale) Hale

Chemistry. Cortex K+ yellow; medulla K+/p1, C+ red, KC+ red, P+/p1. TLC: atranorin and lecanoric acid.

Discussion. This species is characterized by sorediate lobes, eciliate margins and containing lecanoric acid. Parmotrema defectum has often been confused with saxicolous forms of P. austrosinense (Zahlbr.) Hale, another eciliate, sorediate species with lecanoric acid. However, P. austrosinense has a loosely attached thallus, broader (10–15 mm wide), suberect lobes, with a pale zone below.

Distribution and ecology. This saxicolous species is reported from Uganda, South Africa, Madagascar (Hale 1965), East Africa (Krog and Swinscow 1981) and Lord Howe Island (Louwhoff & Elix 1998). The present study extends its distribution to India where it occurs on rocks at c. 700 m elevation. However, Krog & Swinscow (1981) reported it from elevations between 1700–2100 m.

Specimen examined. India: Tamil Nadu: Madurai District, Highwawys, Meghamalai, checkpoint, alt. 700 m, on rock, S. Nayaka 307/A (LWG).

4. Parmotrema ravum (Krog & Swinscow) Sérus.

Chemistry. Cortex K−; medulla K−, C−, KC−, P+ orange-red. TLC: usnic acid (major) atranorin (in trace), protocetraric acid and zeorin.

Discussion. Parmotrema ravum is characterized by the pale yellow-grey thallus, eciliate lobes, grey, marginal soralia, with protocetraric acid and zeorin in the medulla and usnic acid and atranorin (in trace) in the cortex. It is similar to the African species P. apricum (Krog & Swinscow) Krog & Swinscow, which can be distinguished by the bright yellow thallus (usnic acid only in the cortex). Parmotrema ravum is also similar to P. dilatatum (Vain.) Hale (reported for India—Awasthi 2000) which has additional echinocarpic acid in the medulla and also has larger spores (25–27 μm cf. 18–22 μm long). Parmotrema dominicanum (Vain.) Hale can be distinguished from P. ravum by its grey upper cortex, yellow soralia, smaller spores (16–18 μm cf. 25–27 μm long) and sublageniform conidia 6 μm long.

Distribution and ecology. Previously this species was considered to be endemic to East Africa, being known from Angola, Ethiopia, Kenya, Mozambique, Malawi, Tanzania, Uganda, Congo Dem. Republic, and Zimbabwe (Krog & Swinscow 1981) as well as from Rwanda and Burundi (Sérusiaux 1984). The present study extends its distribution to India where it is corticolous and occurs on Rhododendron arboreum at c. 1650 m elevation.

Specimen examined. India: Arunachal Pradesh: Rahung, hill top behind rest house, alt. 1650 m, on Rhododendron arboreum tree, R. S. Rao 7502 (LWG-AWAS).

5. Parmotrema stuhlmannii (C. W. Dodge) Krog & Swinscow

Chemistry. Cortex K+ yellow; medulla K−, C+ red, KC+ red, P−. TLC: atranorin, lecanoric and olivetoric acids (major).

Discussion. Parmotrema stuhlmannii resembles P. pseudotinctorum (Abbayes) Hale.
in that both produce coarse, thick isidia, eciliate lobe margins and lecanoric acid. However, *P. stuhlmannii* can be distinguished by smaller lobes (6–8 mm cf. 8–12 mm wide), strongly attached thalli and strictly saxicolous habitat. It is considered to be closely related to the primary species *P. soyauxii* (Müll. Arg.) Hale, which lacks isidia and soredia (Krog & Swinscow 1981). The lobes of the Indian specimens are smaller in size (2–4 mm wide) than those of the African specimens (6–12 mm wide) and contain additional olivetoric acid.

**Distribution and ecology.** This species was previously considered to be endemic to Africa (Krog & Swinscow 1981). The present study extends its distribution to India where it is saxicolous and occurs at c. 700 m elevation. However, Krog & Swinscow (1981) reported the species at higher elevations of 1500–2100 m.

**Specimen examined.** India: Tamil Nadu: Madurhai District, Highways (Meghamalai) checkpoint, alt. 700 m, on rocks, S. Nayaka 307/B (LWG).

6. **Parmotrema tsavoense** (Krog & Swinscow) Krog & Swinscow


**Chemistry.** Cortex K+ yellow; medulla K−, C−, KC+ rose, P−. TLC: atranorin, physodic and oxyphysodic acids.

**Discussion.** This species is characterized by the tightly adnate, saxicolous thallus, eciliate, dactylate lobes and by physodic acid. *Parmotrema tsavoense* closely resembles *P. stuhlmannii*, but can be distinguished from it by the presence of physodic and oxyphysodic acids instead of lecanoric and olivetoric acids.

**Distribution and ecology.** Previously this species was known only from the type locality in Kenya (Krog & Swinscow 1981), but is now reported from India. In India it is saxicolous, occurring in exposed areas at 1500–1600 m elevation.

**Specimen examined.** India: Kerala: Idukki District, Munnar, Rajamalay area, along border of tea plantation, alt. 1500–1600 m, on rocks, D. D. Aawasthi, R. Tewari & R. Mathur 85.63 (LWG-LWU).

The authors thank the Director at the National Botanical Research Institute, Lucknow, for providing laboratory facilities to work.

**References**


Accepted for publication 28 October 2002