

# New records to Indian lichen flora

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## ABSTRACT

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During field excursions in different regions of India, a number of interesting lichen species were collected. The identification of the specimens revealed occurrence of *Amandinea subduplicata* (Vain.) Marbach, *Graphis crebra* Vain., *Graphis nuda* (Magn.) Staiger & Lücking, *Lecanora subjaponica* L. Lu & H. Y. Wang and *Solorina spongiosa* (Ach.) Anzi., as new additions to Indian lichen flora.

**Key-words:** Lichens, biodiversity, north-eastern Himalaya and western Himalaya.

## INTRODUCTION

In India, the lichens are represented by more than 2300 species (Singh & Sinha 2010). The eastern Himalayan region and Western Ghats in southern part of India harbor the rich diversity of lichens. Both the regions are well explored for their lichen wealth in the past. The central Indian region represents scarce lichen diversity but exhibits occurrence of unique lichen elements. The present study deals with five new records of lichens from eastern and western Himalaya while a single species from central Indian region in Madhya Pradesh.

## MATERIAL AND METHODS

The morphological characters were examined using Leica S8APO stereo zoom microscope and Leica DM 500 micro-system. Spot tests were done using 10% KOH (K), calcium hypochlorite (C), para-phenylenediamine (P) and iodine (I) solutions. The sections of thalli and ascomata were examined using compound microscope (x100) mounting in water and 10% KOH (K). Lichen substances were analyzed by

standard technique of thin-layer chromatography in solvent system A, B, and C (Walker & James 1980, Orange et al. 2001). The specimens were also examined under UV light (360 nm). Cited specimens were deposited in the herbarium of CSIR-National Botanical Research Institute, Lucknow (LWG), India.

## RESULTS AND DISCUSSION

1. *Amandinea subduplicata* (Vain.) Marbach,  
Biblioth. Lichenol. 74: 101. 2000.

Plate 1, figures 1A-C

**Description:** Thallus saxicolous, crustose, often dispersed, smooth to verrucose; prothallus absent, upper surface white, whitish-grey, grey or yellow-brown, esorediate. Apothecia 0.4-0.9 mm diam., lecideine, immersed to adnate; disc black, plane to concave, non-pruinose; proper margin broad. Proper exciple 50-70 µm thick, K-, outer zone pale to dark brown, slightly darker than the hypothecium, inner zone colourless; Epithymenium 5-10 µm thick, dark brown to olive brown, K-; hymenium 80-120 µm, not-inspersed, with few scattered oil droplets in lower parts;

hypothecium 60-120  $\mu\text{m}$  thick, pale brown. Ascus 8-spored, spores *Buellia*-type, brown, ellipsoidal, 19-21  $\times$  7-9  $\mu\text{m}$ , 1 septate, septum thin, often slightly curved, outer spore wall strongly ornamented. Pycnidia 0.1 mm wide, brown, pycnospores filiform, 24-27  $\times$  0.6-0.8  $\mu\text{m}$ . Thallus UV-; K+ yellow; P-, C-; atranorin present in TLC.

**Remarks:** This saxicolous species is mainly characterized by dispersed whitish-grey, grey, pale yellow or yellow thalli, *Buellia*-type ascospores with strongly ornamented outer walls, the colourless inner zone of the proper exciple and presence of atranorin. The species is close to *A. pillagaensis* Elix & Kantvilas, but the latter has ascospores with subapical and apical wall thickenings and constriction at the septum. The species is cosmopolitan. Earlier, the species was known from North and South America, Asia as well as from Australia (Elix 2013). It is a new record for Indian lichen flora.

**Specimen examined:** India, Madhya Pradesh: Betul district, Bordehi Village, near Deepa manderi, on rock, 16 Oct. 2009, S. Mohabe 09-011826 (LWG).

**2. *Graphis crebra*** Vain., Hedwigia 38: 256. 1899.

Plate 1, figures 2A-C

**Description:** Thallus crustose, corticolous corticated, dull to somewhat shiny, pale grey, isidia and soredia absent. Apothecia erumpent to prominent, lirellate, with lateral thalline margin; lirellae broad, elongate, not branched, or very sparsely branched; labia thin, entire, black, not pruinose; disc typically wide open, white pruinose; exciple laterally carbonized, open below; hymenium hyaline, inspersed; ascospores hyaline, I+ bluish violet, 8 per ascus, ellipsoid to oblong, 20-30  $\times$  7-9  $\mu\text{m}$ , transversely septate, 9-12 celled. Medulla K+ yellow turning red, C-, KC-, P+ yellow; Norstictic acid.

**Remarks:** The species appears close to *G. handelii* Zahlbr. in having norstictic acid in medulla, lirellae with thalline margin and laterally carbonized excipulum but differs in non-pruinose lirellae in the latter species. The species was earlier known from Galapagos Islands, Central and South America (Lücking et al. 2009) and is a new record for Indian lichen flora.

**Specimen examined:** India, West Bengal: Darjeeling district, Mungpoo, at 1642 m asl, on bark, 16 April 2014, R. Bajpai 14-022060 (LWG).

**3. *Graphis nuda*** (Magn.) Staiger & Lücking, Bibliotheca Lichenol. 85: 245. 2002.

Plate 1, figures 3A-C

**Description:** Thallus crustose, corticolous, epiperidermal, thin, continuous, creamy-white, grey to light-brownish, surface smooth, shiny, not pruinose; medulla crystalline. Apothecia prominent, lirellate; lirellae sessile, lacking pigments, short, never branched, lacking thalline margin (nude); labia thick, entire, black; excipulum completely carbonized; hymenium clear; ascospores I+ bluish violet, 8 per ascus, muriform, 20-50  $\times$  8-12  $\mu\text{m}$  long. Medulla K-, C-, KC-, P-; No lichen substance present in TLC.

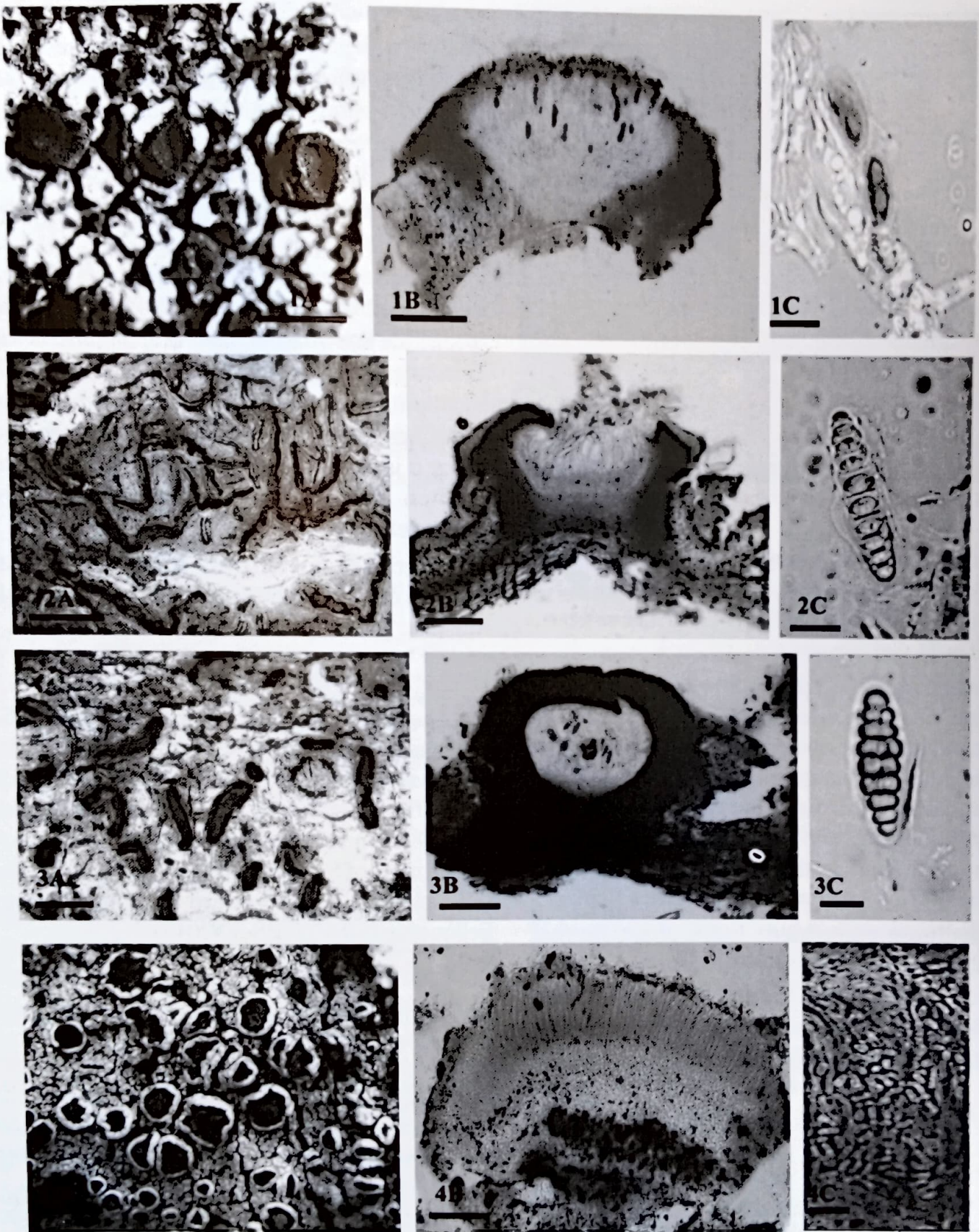
**Remarks:** *Graphis nuda* (Magn.) Staiger & Lücking exhibits its close resemblance to *G. seminuda* Müll. Arg., *G. emersa* Müll. Arg. and *G. pedunculata* Bungartz & Aptroot in having prominent, short and unbranched lirellae and lacking thalline margin but all the latter three species differ in having transversely septate ascospores. The species was earlier reported from America, Africa and Asia (Lücking et al. 2009). It is a new record for Indian lichen flora.

**Specimen examined:** India, West Bengal: Darjeeling district, Kalimpong, Dello hills, at 1630 m asl, on twigs, 18 April 2014, R. Bajpai 14-022294/B (LWG).

**4. *Lecanora subjaponica*** L. Lu & H. Y. Wang, Lichenologist 44 (4): 465-468. 2012.

Plate 1, figures 4A-C

**Description:** Thallus corticolous, crustose, grey to yellow-grey, continuous, rough to verruculose, lacking soredia, margin definite; prothallus absent. Apothecia sessile to adnate, 0.5-1.6 mm diam., lecanorine; disc reddish brown to dark brown, concave to plane, shiny; margin whitish grey, persistent, smooth. Amphithecium with small crystals, soluble in K; cortex hyaline, 50-75  $\mu\text{m}$  thick. Epithymenium reddish brown, 7.5-12.5  $\mu\text{m}$  thick, without granules. Hymenium hyaline, lacking oil droplets, 50-62  $\mu\text{m}$  thick; subhymenium hyaline, 10-15  $\mu\text{m}$  high. Hypothecium hyaline, 37-50



### Plate 1

1A. *Amandinea subduplicata* (Vain.) Marbach, 1B. Section through apothecia, 1C. Spores; 2A. *Graphis crebra* Vain., 2B. Section through lirellate apothecia, 2C. Spores; 3A. *Graphis nuda* (Magn.) Staiger & Lüicking, 3B. Section through lirellate apothecia, 3C. Spores; 4A. *Lecanora subjaponica* L. Lu & H. Y. Wang, 4B. Section through apothecia, 4C. Spores; Bar scale: 1A = 0.5 mm; 2A, 3A, 4A = 2 mm; 1B, 2B, 3B, 4B = 0.2 mm; 1C, 2C, 3C, 4C = 0.05 mm.

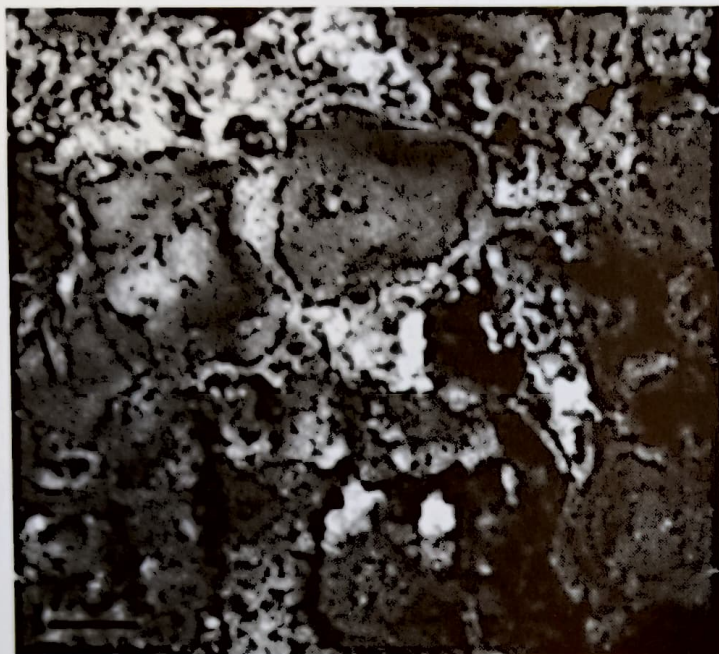


Figure 5. *Solorina spongiosa* (Ach.) Anzi. Bar scale: 2 mm.

$\mu\text{m}$  thick; paraphyses simple, asci clavate, 16-32 spored; ascospores simple, hyaline, ellipsoid, 8-12  $\times$  4-6  $\mu\text{m}$ . Medulla K-, C-, KC-, P-; no lichen substance present in TLC.

**Remarks:** The species appears close to *L. japonica* Müll. Arg. in red-brown apothecial disc and non-granular epihymenium but differs in asci with 16-32 spores. The Indian specimen of *L. subjaponica* is chemotypically different from type specimen of *L. subjaponica* described from China as it lacks zeorin and atranorin. Earlier, the species was known from China and is a new record for Indian lichen flora.

**Specimen examined:** India, West Bengal: Darjeeling district, 3 km away from Mungpoo, at 1606 m asl, on twigs, 16 April 2014, R. Bajpai 14-025064 (LWG).

**5. *Solorina spongiosa* (Ach.) Anzi, Lich. Lang. 2: 46. 1861.**

#### Figure 5

**Description:** Thallus terricolous, squamulose to granulose, greenish to greyish brown, often densely coralloid-warted or nodulose, gelatinous when wet, partially buried in substrate; external cephalodia forming a spongy cushion 1-3 mm thick, containing cyanobacteria *Nostoc*, occurring in patches 2-10 cm in diam., surrounding large urceolate apothecia, dark

reddish brown in colour, 1-5 mm in diam., primary thallus (with green algae *Coccomyxa*) is reduced to a thin ring around apothecia; hymenium hyaline, 160-200  $\mu\text{m}$  thick; paraphyses unbranched, asci clavate, 4 spored; ascospores brown, 1-septate transversally, ellipsoid, 30-50  $\times$  18-24  $\mu\text{m}$  long with warted, furrowed surface. Medulla K-, C-, KC-, P-; no lichen substance present in TLC.

**Remarks:** The lichen genus *Solorina* is represented by 10 species world-wide, of which 3 species are known from India. *S. spongiosa* is widely distributed in Arctic-alpine regions of Europe, North and South America and New Zealand (Ryan & Vitikainen 2004). It is a new record for lichen flora of India. It is close to *S. biospora* Nyl. and *S. saccata* (L.) Ach., but both the latter species differ in having well developed foliose thallus.

**Specimen examined:** India, Uttarakhand: Chamoli district, Hemkund area, at ca. 2700 m asl, on soil, Oct. 1995, A. Saklani s.n. (LWG).

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