

STUDIES ON THE LICHEN GENUS *BAEOMYCES* FROM INDIA

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Abstract

Four species of the lichen genus *Baeomyces* have been described, out of which *B. soreidiifer* is a new report from India.

Introduction

The lichen genus *Baeomyces* Pers. is characterized by two-fold type of thallus. The primary thallus is crustose, squamulose to foliose, from which an upright secondary thallus develops podetium. The podetium is simple, cylindrical, solid, without squamules on the surface, may be corticated or ecorticated; apothecia are apical on podetia; asci are 8-spored, and spores are colourless, simple, ellipsoid or oval.

Zahlbruckner (1926) and Hale (1967) included this genus in the lichen family Cladoniaceae, while Poelt (1973), Henssen and Jahns (1974) have segregated it into an independent family Baeomycetaceae.

About 80 species of *Baeomyces* are known so far (Zahlbruckner, 1922-40; Lamb, 1963). Out of the four species known from India, three are distributed in temperate regions of eastern Himalaya and one occurs in Palni hills.

The study is based on the specimens preserved in the lichen herbarium of Botany Department, Lucknow University, Lucknow (LWU) and personal collection of Awasthi (Awas). The TLC was done according to the method of Culberson (1972).

Morphology of thallus and apothecia

Crustose, squamulose and foliose-lobate type of thalli are present in the different species. The thallus is closely adherent to the substratum and is attached by haptera or hyphae. Irrespective of the nature of thalli, it is always anatomically distinguished into three layers—the upper cortex, the algal stratum and the medulla. The lower cortex is always lacking. The thallus in crustose form is 100-140 μm thick, but in foliose-lobate form it is up to 600 μm thick. The cortex is formed by \pm vertical conglutinate hyphae with prosoplectenchymatous types of cells. Sometimes medullary tissue has oil globules. In the sorediate taxon, the soredia are laminal or marginal.

The solid, cylindrical podetia are tipped with apothecia which may be simple or coalescent in clusters. The length of podetium is variable in the different taxa from 0.5 to 10 mm and is of diagnostic value. The corticated or ecorticated condition of the podetium is similarly helpful in the delimitation of the species. The colour of apothecium is variable in the different species, but is constant in the disappearance of proper margin, pale-dark brown epithecium. The hypothecium is hyaline or pale and the hyphae are conglutinate; hymenium is hyaline; asci are cylindrical or clavate, 8-spored; spores are irregularly biserially arranged in ascus, simple, hyaline, ellipsoid or oval; paraphyses are simple or rarely branched, apices capitate or clavate, 2-3 μm thick.

Chemistry

The following is a comparative representation of the chemical substances separated from the different taxa by TLC in solvent A (Benzene :1-4 Dioxane : Acetic acid)—

Species examined	baeomycesic acid	Stictic acid	thamnolic acid
1. <i>B. fungoides</i>	+	+	+
2. <i>B. pachypus</i>	—	+	—
3. <i>B. roseus</i>	+	—	—
4. <i>B. sorediifer</i>	+	+	—

Key to the species of *Baeomyces* from India

- 1a. Podetia corticate *B. pachypus*
 1b. Podetia lacking cortex 2
 2a. Primary thallus sorediate *B. sorediifer*
 2b. Primary thallus esorediate 3
 3a. Podetia 4-8 mm tall and up to 2.5 mm in diam. white, rough, non-translucent *B. fungoides*
 3b. Podetia 2-4 mm tall, reddish translucent *B. roseus*

1. *B. fungoides* (Sw.) Ach.

Meth. Lich., : 320. 1803.—*Lichen fungoides* Sw. *Nova Gener. Spec. Plant.*, : 146. 1788.

Pl. 2, fig. 1; Text-figs. 1-3

Primary thallus yellowish grey, crustaceous; cortex 25-33 μm ; algal layer 50-62 μm thick, medulla 100-250 μm thick.

Podetia 4-8 mm tall and 1-2.5 mm in diameter, white, simple, cylindrical, ecorticate, rough, not translucent. Apothecia white, subglobose to globose, 2-4 mm in diameter, disc convex, K+yellow; epithecium 9-13 μm ; hymenium 75-100 μm high, I+blue; hypothecium 50-66 μm ; asci 50-66 \times 7-10 μm ; spores 13-17 \times 3-5 μm .

Primary thallus and podetia K+yellow, C-, KC-, P+yellow; TLC: thamnolic acid, stictic acid, baeomycesic acid and undetermined yellowish grey spot at Rf class 5 (Rf value 0.65) present.

The taxon is distinguished by white, rough, ecorticate podetia with white, globose apothecia. It is close to *B. roseus* but the latter is distinguished by shorter, \pm translucent podetia with red apothecia and difference in chemistry.

Distribution—The species is distributed in temperate regions of the world. In India it is distributed in the Himalaya.

Specimens examined—West Bengal, Darjeeling District, near Palmajua, alt. ca. 2100 m, on hard soil, Awasthi 105 (Awasi); near Manibhanjang, alt. 2100 m, on hard soil by

road side, Awasthi 2510 (Awas); near Senchal lake, alt. ca 2250 m, on soil, Awasthi 3144 (Awas); Tiger hill and Senchal, alt. 2250-2400 m, on vertical side of road, on ground, Awasthi 3899 (Awas); Senchal, alt. 2250-2400 m, on ground and soft stones, Awasthi 3901 (Awas); Tiger hill, north face of the hill, alt. ca 2560 m, on hard sandy soil on exposed vertical side of road, Awasthi and Agarwal 67-1 (LWU).

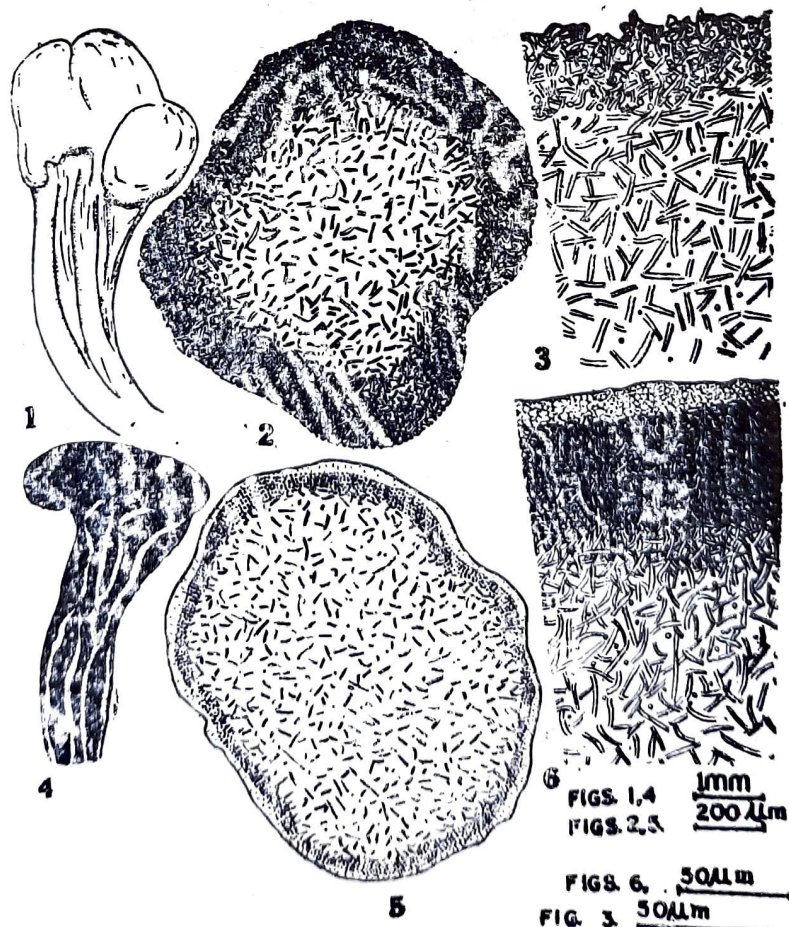
Earlier record—Mull. Arg. (1895) from Darjeeling and Hue (1892) from India.

2. *B. pachypus* Nyl.

Synop. Lich. 1 : 82. 1860.

Pl. 1, fig. 2; Text-figs. 4-6

Primary thallus yellowish grey, verruculose to foliose, lobate, lobes up to 8 mm long and 1.5-2.5 mm broad; closely adpressed; 130-560 μm thick; cortex 13-50 μm ; algal stratum 20-135 μm ; medulla 100-400 μm . Podetia up to 10 mm tall and 1-4 mm in diameter, grey, simple, cylindrical to compressed, corticate, cortex verruculose-areolate. Apothecia brown-black, glomerulose, 1-4 mm in diameter, disc convex, K-; epithecium 9-13 μm ; hymenium 80-165 μm , I+blue; hypothecium 50-60 μm , I-; asci 46-115 \times 7-13 μm ; spores 7-26+3-7 μm . Primary thallus and podetia K+yellow, C-, KC-, P-; TLC: stictic acid, an undetermined yellow brown spot at Rf class 1 (Rf value 0.17), yellow spot between Rf classes 1-2 (Rf value 0.32) present. The taxon is distinguished by squamulose-foliose primary thallus, long broad corticated podetia and glomerulose apothecia. It is close to *B. placophyllus* Ach., but the latter is distinguished by ecorticate podetia.



Text-fig. 1—Podetium of *Baeomyces fungoides* Ach.; 2. T. S. of podetium of *B. fungoides* Ach.; 3. One portion of T. S. of podetium of *B. fungoides* Ach., enlarged; 4. Podetium of *B. pachypus* Nyl.; 5. T. S. of podetium of *B. pachypus* Nyl.; 6. One portion of T. S. of podetium of *B. pachypus* Nyl., enlarged.

Distribution—The species is distributed in Eastern Himalaya.

Specimen examined—Sikkim, Rhotang Glacier, on soil, Bose 60-147 (Awas); West Bengal, Darjeeling District, near Sandakhpoo, alt. ca 2850 m, on hard soil, Awasthi 106 (Awas); alt. ca 3510 m, on soil by road side, Awasthi and Agarwal 67-360 (LWU); on way from Sandakhpoo to Phalut, alt. ca. 3600 m, on ground by road side, Awasthi and Agarwal 67-473 (LWU); on decaying wood stump, Awasthi and Agarwal 67-510 (LWU); near Tonglu, on hard soil, Awasthi 107 (Awas); Batasi to Palmajua, alt. 1800 m, on soil, Bose 60-58 (Awas).

Earlier record: Hue (1892) from India.

3. *B. roseus* Pers. *Neue Annl. Bot. 1. Stuck* : 19, 1794.

Pl. 1, fig. 3

Primary thallus grey; crustose to granular crustose, granules raised and spherical; 150-400 μm thick; cortex 16-33 μm ; algal stratum 30-100 μm ; medulla 100-250 μm . Podetia 2-4 mm tall and 0.5-1.5 mm in diameter, white to reddish white, simple, cylindrical, furrowed, ecorticate, \pm translucent. Apothecia flesh coloured to red, subspherical to flexous, 1-2.5 mm in diameter, disc convex, K + yellow; epithecium 7-12 μm ; hymenium 83-100 μm high, I + blue; hypothecium 45-60 μm ; asci 60-85 \times 7-10 μm ; spores 16-20 + 3.-7 μm . Primary thallus and podetia K + yellow, C-, KC-, P + yellow; TLC: baeomycesic acid, and an undetermined yellow spot between Rf class 2-3 (Rf value 0.38) present. The species is distinguished by flesh to red coloured apothecia and short + translucent podetia. It is close to *B. fungoides* but the latter is distinguished by white apothecia and longer (up to 8 mm), whitish, rough, podetia and presence of stictic and thamnolic acids.

Distribution—The species is widely distributed in temperate regions of world. In India it is distributed in Eastern Himalaya.

Specimens examined—West Bengal, Darjeeling District, Tiger hill, senchal lake area, alt. 2400 m, on soil, Awasthi 64-140 (Awas).

Earlier record—A. L. Smith (1931) Darjeeling, Chopra (1934) Darjeeling Himalaya.

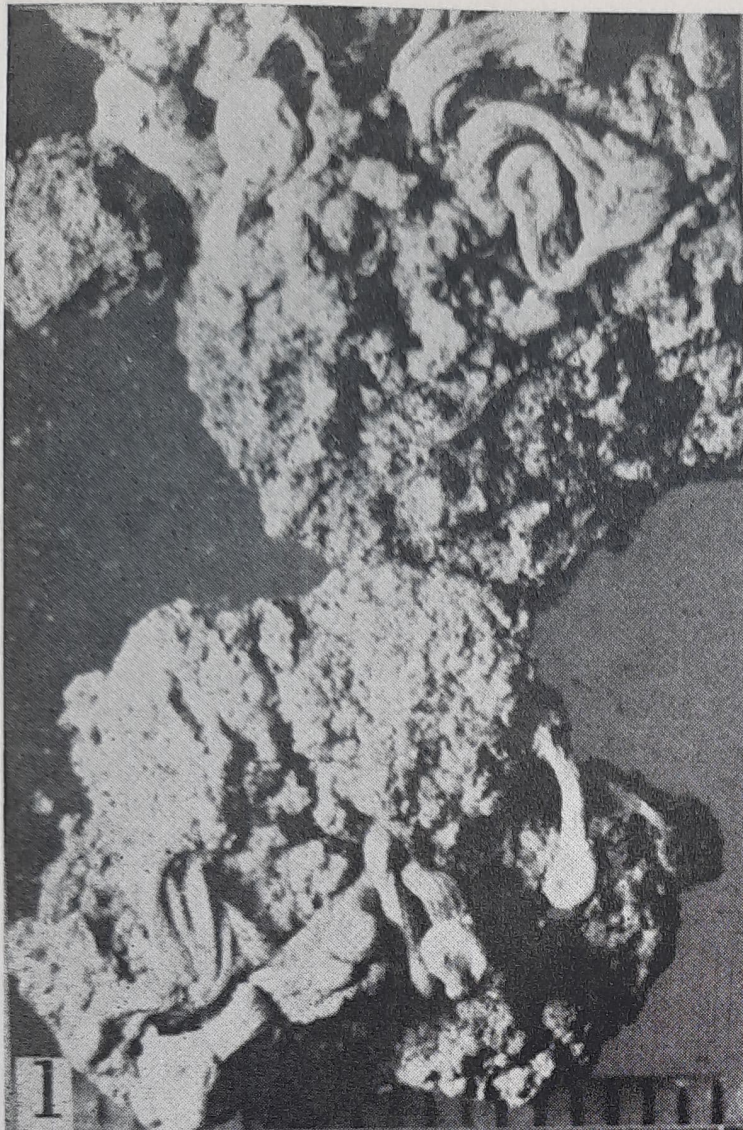
4. *B. soreidifer* Nyl. *Acta Soc. Sci. Fenn.* 26 (10) : 5. 1900.

Pl. 1, fig. 4

Primary thallus grey, crustose to verruculose, soreidiate, soreidia granular, marginal or laminal; primary thallus 200-400 μm thick; cortex 33-40 μm ; algal layer 60-90 μm ; medulla 100-240 μm , interspersed with oil globules. Podetia 0.5-1.5 mm long and 0.5-1 mm in diameter, grey, simple, cylindrical, ecorticate, opaque. Apothecia flesh coloured to light brownish, peltate, less than 0.5 mm in diameter, disc convex, K + yellow; epithecium 7-13 μm ; hymenium 40-100 μm , I-; hypothecium indistinct; asci 60-90 \times 7-13 μm ; immature, spores not developed. Primary thallus and podetia K + yellow, C-, KC-, P + yellow; TLC; stictic acid, baeomycesic acid, and an undetermined yellow spot between Rf classes 2-3 (Rf value 0.4) present. The species is distinguished by soreidiate primary thallus with flesh coloured to brownish apothecia with very short ecorticate podetia. It is close to *B. roseus* and *B. fungoides*, but both have esoreidiate primary thallus with larger podetia.

This taxon has so far been reported from Ceylon but not from India. Thus it is a new record from India.

Specimen examined—Tamil Nadu, Madurai District, Shambaganur, below S. H. College, along old ghat road, alt. 1710-1800 m, on soft sandy stone, Awasthi 4379 (Awas.)



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Explanation of Plate

(Scale : 1 division = 1.0 mm).

1. Photograph of *B. fungoides* Ach.
2. Photograph of *B. pachypus* Nyl.
3. Photograph of *B. roseus* Pers.
4. Photograph of *B. sorediifer* Nyl.