



## REVISION OF THE LICHEN GENUS *Physconia* POELT FAMILY PHYSCIACEAE FROM INDIA

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### ABSTRACT

The paper reports seven species of the lichen genus *Physconia* Poelt from India along with a key for identification of different Indian species. Out of these, one species, *Physconia distorta* (Withering) J. Laundon is reported for the first time from India.

**KEYWORDS:** *Physconia*, Lichens, Key, New Record, Distribution

During the course of revisionary studies on the lichen family Physciaceae under “Flora of India” project, several lichen specimens collected earlier from Eastern, North-Eastern, Western and Southern regions of India have been investigated. Although, six species of the lichen genus *Physconia* Poelt have been listed from India by Awasthi (1988). The lichen genus *Physconia* was separated from *Physconia* sansilato by Poelt (1965) on the basis of ascospore type, larger size, stronger tendency to form pruina and absence of atranorin. Of these characters the ascospore type was regarded as the most important; on the other hand Kashiwadani (1975) regarded the structure of the upper cortex to be more significant. There are two types, paraplectenchymatous and scleroplectenchymatous upper cortex found within the genus. The first type has been found in *Physconia enteroxantha*, *P. grisea*, *P. muscigena* and the second type in *P. deterosa*, *P. perisidiosa*, *P. pulverulenta* (Poelt, 1966). Squarrose rhizinae are typical for *Physconia* and are characterized by the tips of hyphae forming more or less right-angled branches, which are distributed over the rhizinae (Hale, 1967). The present study reported one new record to Indian lichen flora and provides information on present status of the dealt taxa and their distribution in India and also given a detail taxonomic description and key for easy identification of different Indian species of studied taxa.

### MATERIALS AND METHODS

This study is based on consultation of herbarium materials that are preserved in different lichen herbarium at Agharkar Mycological Herbarium (AMH), Agharkar Research Institute, Pune; National Botanical Research Institute, Lucknow (LWG); Botanical Survey of India, Eastern Circle, Shillong (ASSAM). The materials were brought on loan from the above lichen herbariums to

Botanical Survey of India, Central Circle, Allahabad (BSA).

The specimens were investigated morphologically, anatomically and chemically. The colour tests were performed with the usual reagents i.e. K (5% Potassium hydroxide), C (aqueous solution of hypochlorite) and PD (Paraphenylene diamine). Lichen substances were investigated with thin layer chromatography (TLC) in solution A (180 toluene: 60 dioxane: 8 acetic acid) using the technique of Culberson (1972) and Walker and James (1980).

### Key to the Indian species

- 1a. Thallus with isidia or soredia.....2
- 1b. Thallus without isidia or soredia.....5
- 2a. Thallus isidiate, isidia granular and modified into soredia.....*P. grisea*
- 2b. Thallus sorediate.....3
- 3a. Soredia lip shaped, on apices of lobes.....*P. perisidiosa*
- 3b. Soredia marginal, not lip shaped.....4
- 4a. Soredia and medulla yellowish.....*P. enteroxantha*
- 4b. Soredia and medulla white.....*P. deterosa*
- 5a. Thallus bullate to verrucose in central part of lobes, disc and margin of apothecia densely covered with white pruina, ascospores 26 – 37 x 15 – 18µm .....*P. distorta*
- 5b. Thallus lobes radiating, narrow, disc and margin of apothecia slightly covered with pruina, ascospores 31 – 34 x 15 – 18 µm.....*P. pulverulenta*
- 6a. Thallus terricolous on mosses, lobes ascending and

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densely covered with pruina.....*P. muscigena*

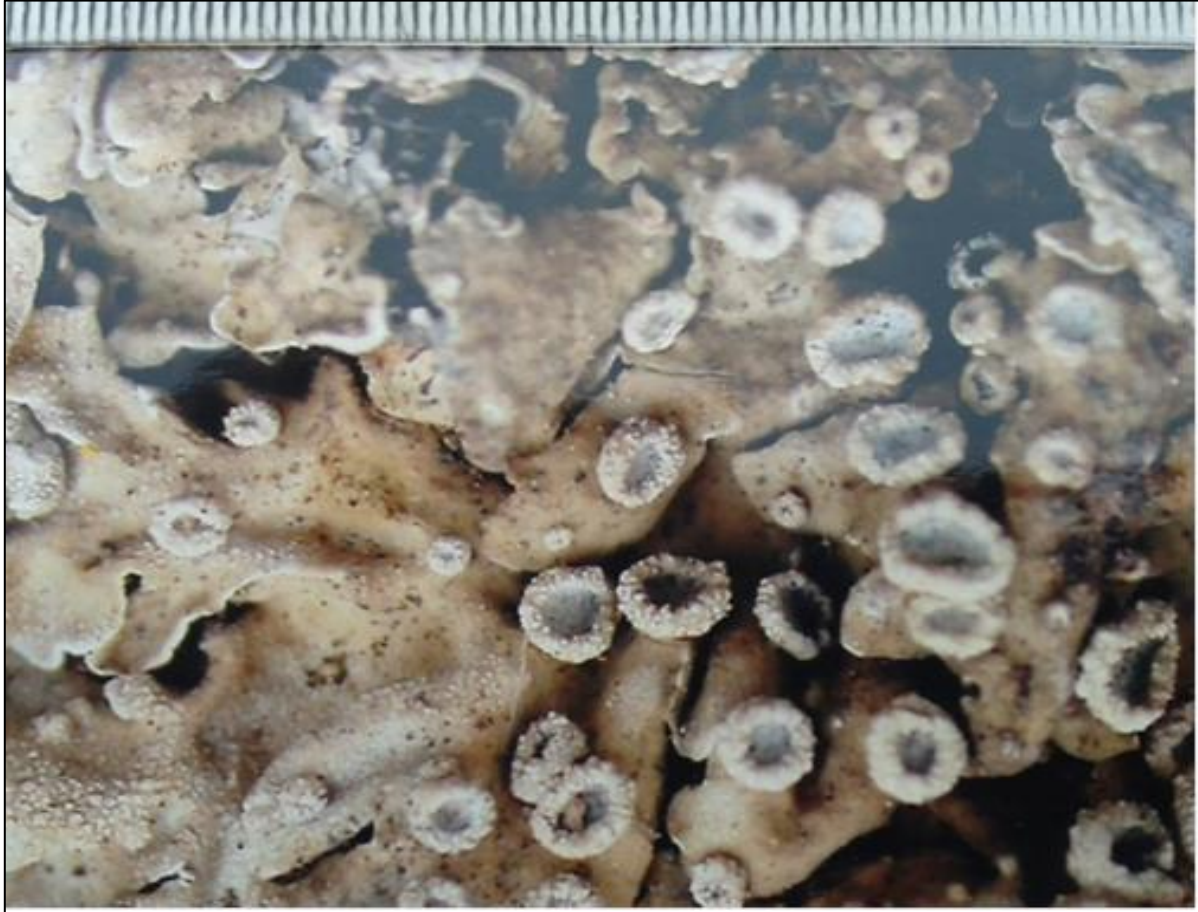
**Bot. 7(6): 719-728. 1987; *Lichen distortus* Withering 1776: 711. (Figure 1)**

**RESULTS AND DISCUSSION**

**Taxonomic Descriptions**

**Type:** Holotype: Germania, Lipsia in Tilia, 1767 Schreber (M). Lectotype (Loundon 1984): Dillenius 1742, Tab. 24, Figure. 72A (not seen).

*Physconia distorta* (Withering) J. Laundon, Nord. J.



**Figure 1: *Physconia distorta* (Withering) J. Laundon**

This species can be easily characterized by its grey to greyish brown thallus, bullate to verrucose in central parts, usually covered with a dense white pruina, non sorediate and non isidiate, corticated, upper cortex scleroplectenchymatous and lower cortex prosoplectenchymatous, brown lower surface with squarrosly branched, dark brown to black rhizinae, absence of atranorin, apothecia covered with densely white pruina and 1-septate, ellipsoid, brown, *Physconia* type of ascospores. No chemical substances (TLC). In external morphology, this species resembles *Physconia pulverulenta* in the absence of soredia and isidia but the latter species differs in the presence of bullate to verrucose in central part of thallus and apothecia usually covered with densely white pruina. It is widely distributed in East Africa, Ethiopia, Kenya and Uganda. In India it grows in moist exposed conditions on bark of trees in tropical and subtropical forests.

**Selected Specimens Examined:** India, Jammu &

Kashmir State, Pahalgam, on way to Anne, alt. 2400 m, 28.6.1977 Dange 77.185, 77.259; on way from Chandanwari to Sheshnag upto Pissu top, alt. 2700–3360 m, 30.6.1977 Dange 77.398 (LWG); Anantang district, Baltal, alt. 2700 m, 29.8.1982 Singh and Upreti 13941 (LWG); Srinagar, Badamibag hill side, Nagarkar 80.326 (AMH); Uttarakhand, Uttarkashi district, on way to Gangotri Jhula, 22.4.1962 Singh 97276 (LWG).

***Physconia detersa* (Nyl.) Poelt, Nova Hedwigia 9: 30. 1965; *Parmelia pulverulenta* var. *detersa* Nyl., Syn. Lich. 1: 420. 4860; *Physcia detersa* (Nyl.) Nyl., Flora 52: 332. 1869; Awasthi, D. D., J. Ind. Bot. Soc. 39(1): 11. 1960.**

**Type:** Finland orient. Nylander (Lectotype: H, herb, Nyl. n. 32402, N. B. wrong cited by Poelt s. n. 32402 (not seen).

Thallus corticolous, foliose, ± loosely attached to substratum, 4-6 cm across, orbicular to irregular,

lobulated, lobes radiating, pruinose, sorediate, isidia absent, medulla greyish white 60-75  $\mu\text{m}$  thick, upper cortex scleroplectenchymatous 39-42  $\mu\text{m}$  thick, lower surface brown, corticated, lower cortex prosoplectenchymatous 27-30  $\mu\text{m}$  thick, rhizinate, rhizinae brown to black, squarrosly branched, 0.5-1.0 mm long. Apothecia laminal, sessile 1.0-2.0 mm diam., disc concave, dark brown with white pruina, margin entire, epithecium brown 15-23  $\mu\text{m}$  thick, hymenium hyaline 93-109  $\mu\text{m}$  high, hypothecium pale brown 62-73  $\mu\text{m}$  thick, thalline exciple 73-93  $\mu\text{m}$  thick, paraphyses hyaline, unseptate, unbranched, asci 8-spored, unitunicate, cylindrical to clavate 66-73 x 13-16  $\mu\text{m}$ , 1-septate, brown, 16-18 x 8-10  $\mu\text{m}$ , *Physconia* type of ascospores.

**Chemistry:** Thallus  $\text{K}^+$  yellow, medulla  $\text{K}^-$ ,  $\text{KC}^-$ ,  $\text{C}^-$ ,  $\text{PD}^-$ ; no chemical substances (TLC).

**Remark:** *Physconia detersa* resembles *Physconia enteroxantha* in presence of marginal soredia but differs in white colour soredia and medulla of lobes.

**Distribution:** India (Himachal Pradesh, Jammu & Kashmir State and Uttarakhand); Japan, Sweden, Norway and Finland.

**Selected Specimens Examined:** India, Himachal Pradesh, Kinnaur district, Chitkul forest area, alt. 3900-4000 m., 4.12.2003 Upreti and Srivastava 03.002724/B (LWG); Kullu district, Great Himalayan National Park, on way from Dhela to Lapoh, alt. 3000 m., 8.9.1999 Upreti 99.5051/C (LWG); Jammu and Kashmir State, Pahalgam, at Baisaran, alt. 2440 m., Dange 77.102, 77.1333; on way to Chandanwari, alt. 2700 m., 29.6.1977 Dange 77.447; on North-West side, alt. 2560-2650 m., 2.7.1977 Dange 77.480 (LWG); Uttarakhand, Tehri Garwal district, Gangotri, 24.4.1962 A. Singh 97511, 97517 (LWG); Yamunotri, 9.9.1982 Patwardhan 82.606 (AMH); Uttarkashi district, on way to Gangotri, 3 km. from Bhairown Ghati, alt. 9700ft. 29.6.1976 Awasthi and S. R. Singh 8139 (LWG); Gomukh area, right bank, 6<sup>th</sup> Moraine, alt. 12500 ft. 5.7.1976 Awasthi and S.R.Singh 8586, 8592 (LWG). Gangotri towards Kedartal, alt. 3100 m., 8.9.2002 Chatterjee and Divaker 02-000401, 02-000424, 02-000426/A (LWG).

***Physconia enteroxantha* (Nyl.) Poelt, Nova Hedwigia 12: 125. 1966; *Physcia enteroxantha* Nyl., Flora 56: 196. 1873.**

**Type:** France, Pyrenaeis orientalis, Collioure, prope Prortum, Veneris, 1872 Nylander (Holotype: H, herb. Nyl. n. 32398) (Not seen).

Thallus corticolous, foliose,  $\pm$  loosely attached to substratum, 4-4.5 cm across, orbicular to irregular,

lobes 135-217  $\mu\text{m}$  thick, lacinulate, lacinia dichotomously to irregularly branched, 0.5-1.0 mm broad, white pruina in apical region, sorediate, soredia marginal, yellow, isidia absent, medulla yellow 73-93  $\mu\text{m}$  thick, upper cortex scleroplectenchymatous 46-62  $\mu\text{m}$  thick, lower surface brown, corticated, lower cortex prosoplectenchymatous 31  $\mu\text{m}$  thick, rhizinate, rhizinae brown, simple, 0.5-1.0 mm long. Apothecia laminal, sessile 1.0-1.5 mm diam., disc concave, dark brown with white pruina, margin entire, epithecium brown 15-23  $\mu\text{m}$  thick, hymenium hyaline 93-109  $\mu\text{m}$  high, hypothecium pale brown 124-150  $\mu\text{m}$  thick, thalline exciple 73-93  $\mu\text{m}$  thick, paraphyses hyaline, unseptate, unbranched, asci 8-spored, unitunicate, cylindrical to clavate, 1-septate, brown, 30-36 x 13-20  $\mu\text{m}$ , *Physconia* type of ascospores.

**Chemistry:** Thallus  $\text{K}^+$  yellow, medulla  $\text{K}^-$ ,  $\text{KC}^-$ ,  $\text{C}^-$ ,  $\text{PD}^-$ ; no chemical substances (TLC).

**Remark:** *Physconia enteroxantha* resembles *Physconia detersa* in presence of marginal soredia but differs in yellow colour soredia and medulla of lobes.

**Distribution:** India (Jammu & Kashmir State and Uttarakhand); Sweden, Norway and Finland.

**Selected Specimens Examined:** India, Jammu & Kashmir State, Pahalgam, on way to Baisaran, alt. 2438 m., 27.6.1977 Dange 77.4, 77.77, on way to Anne, alt. 2400 m., 28.6. 1977 Dange 77.210 (LWU-LWG). Gulmarg, alt. 2700 m., 12. 9. 1982 Upreti 11655 (LWG). Uttarakhand, on way to Gomukh, 6 km., from Gangotri, alt. 11000ft., 30.6.1976 Awasthi and S. R. Singh 8299, 8301; Gomukh area, right bank, 6<sup>th</sup> Moraine, alt. 12500ft., 5. 7. 1976 Awasthi and S. R. Singh 8586, 8592 (LWU-LWG). Uttarkashi district, on way to Gangotri, 4 km. from Bhairown Ghati, alt., 10,000 29.6.1976 Awasthi and S. R. Singh 8178B (LWU-LWG). Pithoragarh district, Goriganga Catchment, Kauli, alt., 1300-1600 m., 3.11.2002 Pant 02.000882, 02.000742/B (LWG).

***Physconia grisea* (Lam.) Poelt, 1965: 30; *Lichen griseus* Lam., 1789: 480; *Physcia grisea* (Lam.) Zahlbr., 1912: 177.**

**Type:** Paris? In truncis aborum (P, herb. Lam) (not seen).

Thallus corticolous, foliose,  $\pm$  loosely attached to substratum, 3-5 cm across, grey to brownish grey, orbicular to suborbicular, lobes 170-249  $\mu\text{m}$  thick, radiating, dichotomously to irregularly branched, 0.5-2.5 mm broad, pruinose, pruina white, isidiate, isidia granulated and modified into soredia, medulla greyish white 118-131  $\mu\text{m}$  thick, upper cortex scleroplectenchymatous 39-52  $\mu\text{m}$  thick, lower surface brown, corticated, lower cortex prosoplectenchymatous 39  $\mu\text{m}$  thick, rhizinate, rhizines simple, concolorous with

the thallus, 0.5-1.0 mm long; apothecia not seen.

**Chemistry:** Thallus K<sup>+</sup> yellow, medulla K<sup>-</sup>, KC<sup>-</sup>, C<sup>-</sup>, PD<sup>-</sup>; no chemical substances (TLC).

**Remark:** *Physconia grisea* is easily characterized by broad lobes, brownish grey with maculiform pruina, isidiate to sorediate.

**Distribution:** India (Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir State and Uttarakhand); Sweden, Norway and Finland.

**Selected Specimens Examined:** India, West Siang district, Likor-Pugging foot track, alt., 1050 m., 13.12.1988 Singh 8857 (ASSAM); Himachal Pradesh, Parbati river valley, on way to Pulga from Manikaran, near bridge on Parbati, alt., 1950 m., 18.6.1975 Awasthi and Dange 75.073; 1 Km. below to Pulga, alt., 2100 m., 18.6.1975 Awasthi and Dange 75.105 (LWU-LWG); Jammu & Kashmir State, Gulmarg, at Gulmarg on South East side, alt., 2560-2800 m., 2.7.1977 Dange 77.457 (LWU-LWG); Uttarakhand, Uttarkashi district, Gangotri, alt., 3120 m., 26.9.1977 A. Singh 75378; Bhojwasa, alt., 3700 m., 5.9.2002 Chatterjee and Divaker 02-000203; Devwasa, alt., 3200 m., 7.9.2002 Chatterjee and Divaker 02-000257; on to Chirwasa, alt., 3500 m., 7.9.2002 Chatterjee and Divaker 02-000227 (LWG).

***Physconia muscigena* (Ach.) Poelt, Nova Hedwigia 9: 30. 1965; *Parmelia muscigena* Ach., Lich. Univ. 472. 1810; *Physcia muscigena* (Ach.) Nyl., Mem. Soc. Imp. Sci. Nat. Cherbourg 5: 107. 1857; Awasthi, D. D., J. Ind. Bot. Soc. 39(1): 14. 1960.**

**Type:** Switzerland, Salvan (H, herb. Ach. N. 1406), (not seen).

Thallus corticolous (upon mosses), foliose, ± loosely attached to substratum, 3-5 cm across, orbicular to irregular, grey to brownish grey, lobes 140-190 µm thick, lacinulate, lacinea, dichotomously to irregularly branched, 0.5-1.0 mm broad, pruinose, soredia and isidia absent, medulla greyish white 62-73 µm thick, upper cortex scleroplectenchymatous 46-62 µm thick, lower surface dark brown, corticated, lower cortex prosoplectenchymatous 15-31 µm thick, , rhizinate, rhizinae brown, squarrously branched, 0.5-1.0 mm long; apothecia not seen.

**Chemistry:** Thallus K<sup>-</sup>, medulla K<sup>-</sup>, KC<sup>-</sup>, C<sup>-</sup>, PD<sup>-</sup>; no chemical substances (TLC).

**Remark:** *Physconia muscigena* is easily characterized by absence of soredia, tips of marginal lobes ascending and growing on mosses always.

**Distribution:** India (Himachal Pradesh, Jammu &

Kashmir State and Uttarakhand); Ethiopia, Kenya, Tanzania, Sweden, Norway and Finland.

**Selected Specimens Examined:** India, Himachal Pradesh, Beas river valley, Kulu on Barahi road, 2 Km. from Kulu, alt. 1500 m., 16.6.1975 Awasthi and Dange 75045 (LWU-LWG); Jammu & Kashmir State, Pahalgam, on way to Baisaran, alt. 2134-2438 m., 27.6.1977 Dange 77.58 (LWU-LWG); Uttarakhand, Uttarkashi district, on way to Gangotri, 6 Km. from Bhairown Ghati, alt. 10200 ft., 29.6.1976 Awasthi 8199 (LWU-LWG); Gomukh area, right bank 2<sup>nd</sup> Moraine, alt. 12800 ft. 2.7.1976 Awasthi 8390; 3<sup>rd</sup> and 4<sup>th</sup> Moraine, alt. 12700 ft., 3. 7.1976 Awasthi and Singh 8445; 5<sup>th</sup> Moraine, alt. 12600 ft., 4.7.1956 Awasthi and S. R. Singh 8507, 8520; 6<sup>th</sup> Moraine, alt. 12,500 ft., 5.7.1976 Awasthi and S. R. Singh 8577; on way to Gomukh, 9 km. from Gangotri, alt. 11200ft., 30. 6.1976 Awasthi and S. R. Singh 8308 (LWU-LWG).

***Physconia perisidiosa* (Erichs.) Moberg, Symb. Bot. Upsal. 22(1): 90. 1977; *Physcia perisidiosa* Erichs. 57. 1930.**

**Type:** Germany, Schleswig-Holstein, Kr. Leuenburg, Siebenbaumen, Gut Castorf. 1916 Erichsen (Lectotype: HBN), (not seen).

Thallus corticolous, foliose, ± loosely attached to substratum, 4-5 cm across, orbicular to irregular, grey, lobes 166-226 µm thick, radiating, irregularly branched, 1.0-1.5 mm broad with densely white pruina, sorediate, soredia yellowish, lipshaped present at tip of lobes, isidia absent, medulla greyish white 73-93 µm thick, upper cortex scleroplectenchymatous 46-62 µm thick, lower surface dark brown to black, corticated, lower cortex prosoplectenchymatous 31-39 µm thick, rhizinate, rhizinae brown, squarrously branched, 0.5-1.0 mm long; apothecia not seen.

**Chemistry:** Thallus K<sup>+</sup> yellow, medulla K<sup>-</sup>, KC<sup>-</sup>, C<sup>-</sup>, PD<sup>-</sup>; no chemical substances (TLC).

**Remark:** *Physconia perisidiosa* resembles *Physconia enteroxantha* in presence of yellow colour soredia but differs by lip shaped soredia at tip of lobes.

**Distribution:** India (Himachal Pradesh and Jammu & Kashmir State); Ethiopia, Kenya, Sweden, Norway, Finland and Denmark.

**Selected Specimens Examined:** India, Kullu district, Great Himalayan National Park, Gusaini, alt. 1700 m., 4. 9. 1999 Upreti 99-52603 (LWG); Jammu & Kashmir State, Pahalgam, on way to Baisaran, alt. 2438 m., 27. 6. 1977 Dange 77.88; at Baisaran, alt. 2440 m., 27. 6. 1977 Dange 77.117; on way to Shikargah via Momleshwar, alt.

2250 m., 27. 6. 1977 Dange 77.164 (LWU-LWG).

***Physconia pulverulenta* (Haffm.) Poelt, Nova Hedwigia 9: 30, 1965; *Lichen pulverulenta*, Schreb. 1771.**

**Type:** Germany, Floerke, Deutsche, Lich. n. 172 (Neotype: UPS), (not seen).

Thallus corticolous, foliose, ± attached to substratum, 3-5 cm across, grey to grey brown, orbicular to irregular, lobes 103-140 µm thick, radiating, irregularly branched, 0.5-1.0 mm broad, white pruina in apical region, soredia and isidia absent, medulla greyish white 131-157 µm thick, upper cortex scleroplectenchymatous 52-65 µm thick, lower surface black, corticated, lower cortex prosoplectenchymatous 39-52 µm thick, , rhizinate, rhizinae dark brown to black, squarrosly branched, 1.0-1.5 mm long. Apothecia laminal, sessile 2.0-3.5 mm diam., disc concave, dark brown to black, slightly pruinose, margin entire sometimes lobulated, epithecium brown 26 µm thick, hymenium hyaline 170-184 µm high, hypothecium hyaline 65-78 µm thick, thalline exciple 369-382 µm thick, paraphyses hyaline, septate, unbranched, asci 8-spored, unitunicate, cylindrical to clavate, 1-septate, brown, 31-34 x 15-18 µm, *Physconia* type of ascospores.

**Chemistry:** Thallus K<sup>+</sup>, medulla K<sup>+</sup>, KC<sup>+</sup>, C<sup>+</sup>, PD<sup>+</sup> ; atranorin absent, terpenoid present (TLC).

**Remark:** *Physconia pulverulenta* is characterized by radiating, narrow lobes of thallus, disc and margin of apothecia without pruina.

**Distribution:** India (Jammu & Kashmir State); Sweden, Norway and Finland.

**Selected Specimens Examined:** India, Jammu & Kashmir State, Pahalgam, on way to Anne, alt. 2400 m., 28. 6. 1977 Dange 77.207, 77.211 (LWU-LWG); Kashmir, Sonamarg, alt. 7000ft., 30. 9. 1986 Awasthi

05187, 05188 (LWU-LWG).

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