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## New records of hyphomycetous fungi from North-Western Himalayas, India

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### ABSTRACT

Five –anamorphic fungi viz. *Spadicoides bina* –a new record for India, where as *Cladosporium cucumerinum*, *Cryptocoryneum rilstonii*, *Ellisembia leptospora* and *Nalanthamala madreya* as new records for the North - Western Himalayas are described, illustrated and discussed with remarks based on morphological characteristics.

**Key Words:** Anamorphic fungi, Himachal Pradesh, Taxonomy.

### INTRODUCTION

The latitudinal variation coupled with marked varied climatic conditions (from hot and sub-humid tropical to warm and temperate) of Himachal Pradesh favour luxuriant growth of fungi especially the anamorphic fungi. A number of asexual fungi have been recorded from this region (Adamčik *et al.* 2015, Prasher & Verma 2012a, b, 2014, 2015a, b, c, 2016; Prasher & Singh 2012, 2013, 2014a, b, 2015, Prasher & Sushma 2014). This paper is in continuation of our previous reports on anamorphic fungi.

### MATERIALS AND METHODS

The bark of different tree species were collected from different localities of Himachal Pradesh in ziplock plastic bags and taken to the laboratory. The specimens were mounted in 4%KOH, Lactophenol and Cotton blue 0.01% in lactophenol (Kirk *et al.* 2008). The specimens were studied microscopically under Matrix stereo trinocular microscope (VL-Z60) and transmission microscope

(VRS-2f) for macroscopic and microscopic characters. All the measurements were taken with the help of Pro MED software. The specimens were deposited in the herbarium of Botany Department, Panjab University, Chandigarh, India (PAN).

### RESULTS AND DISCUSSION

*Spadicoides bina* (Corda) Hughes, 1958, as 'binum', Can. J. Bot., 36: 806. **Fig. 1(a-g)**

*Colonies* hairy, blackish brown. *Mycelium* immersed, composed of septate brown coloured hyphae. *Stroma* none, *Setae* absent. *Conidiophores* erect, light brown to brown, paler towards the apex, 2–3.5µm wide. *Conidiogenous cells* polytretic, terminal and intercalary, determinate, brown. *Conidia* solitary, oblong, occasionally ellipsoidal, mid pale to dark brown, 1- septate, dark blackish brown or black band at the septum, 7–10 × 3–5µm, hilum unthickened.

**Collection Examined:** India, Himachal Pradesh, Chamba, on dead and decaying twigs, 19 June 2014, Manju, PAN (34602).

**Remarks:** *Spadicoides* Hughes is characterized by macronematous, mononematous, single, unbranched or branched conidiophores with polytretic, terminal and intercalary conidiogenous cells producing solitary, terminal and lateral, obovoid to ellipsoid, euseptate conidia (Hughes 1958). Goh and Hyde (1996) reviewed and accepted 21 species in the genus. Till to date 42 species of the genus are described (*vide* Index fungorum last accessed on 31.05.2016). The genus is represented in India by four species *viz.* *S. aggregata* Subram. & Vittal (Subramaniam and Vittal 1974) from Narasapur (Andhra Pradesh), *S. atra* (Corda) S. Hughes from Jog Falls (Karnataka), *S. verrucosa* V. Rao & de Hoog (Rao and Hoog 1986) from Adilabad (Andhra Pradesh) and *S. cordanoides* Goh & K.D. Hyde (Patil *et al.* 2015) from Maharashtra. None of these species have been recorded from North India or Himalayas so far. Therefore, *Spadicoides bina* is being reported for the first time from India (Bilgrami *et al.* 1991 and Jamaluddin *et al.* 2004).

***Cladosporium cucumerinum*** Ellis & Arthur, Bull. Indiana Agric. Stat. 19: 9 (1889) **Fig. 2 (a-d)**  
 = *Cladosporium cucumeris* A.B. Frank, Z. PflKrankh. 3: 31 (1893)  
 = *Cladosporium scabies* Cooke, Gard. Chron., Ser. 3, 34: 100 (1903)  
 = *Macrosporium melophthorum* (Prill. & Delacr.) Rostr., Gartner-Tidende 24: 189 (1893)  
 = *Scolicotrichum melophthorum* Prill. & Delacr., Bull. Soc. mycol. Fr. 7(1): 219 (1891).

*Colonies* effuse, pale greyish olive, velvety. *Mycelium* immersed. *Setae* and *hyphopodia* absent. *Conidiophores* macronematous, septate, lower half subhyaline and upper half is hyaline, up to 210 µm long, 4.8–6.4 µm thick, pale olivaceous brown, smooth. *Conidia* in chains, mostly aseptate, cylindrical rounded at the ends, smooth, 10.7–20.2 × 3.1–5.2 µm, hilum thickened.

**Collection Examined:** India, Himachal Pradesh, Hamirpur, on fallen leaves of *Grewia optiva*, 16 October 2014, Sushma, PAN (31502).

**Remarks:** *Cladosporium* was established by Link in 1816 with *C. herbarum* as type species. In total 993 names have been assigned to *Cladosporium* s. lat., including *Heterosporium* (854 in *Cladosporium* and 139 in *Heterosporium*) [Bensch *et al.* 2012]. The above described species matches well with *Cladosporium cucumerinum*. Earlier it was reported from Madhya Pradesh and Punjab (Bilgrami *et al.* 1991 & Jamaluddin *et al.* 2004), so this constitutes a new record for North-Western Himalayas.

***Cryptocoryneum rilstonii*** M.B. Ellis, Mycological Papers 131: 2 (1972). **Fig. 2 (e-g)**

*Sporodochia* dark blackish brown to black. *Mycelium* mostly immersed. *Conidiophores* smooth, septate, unbranched, often obscured by the pendent arms of the conidia, 2.87–4.62 µm wide. *Conidia* solitary, cheiroid, with black cap cells firmly united together and 6–9 pendulous arms, each arm 7–9 septate, 16.45–34.10 µm long, 4.02–5.75 µm thick.

**Collection Examined:** India, Himachal Pradesh, Chamba, Dalhousie, on fallen twigs, 19 June 2014, Sushma, PAN (31531).

**Remarks:** *Cryptocoryneum* was described by Fuckel (1865) with type species *C. fasciculatum*. This genus comprises of 9 species worldwide (www.speciesfungorum.org, accessed 03.05.2016). The above described species showing very much similarities with *Cryptocoryneum rilstonii* M.B. Ellis. Earlier this species was reported from Nilgiri, Tamil Nadu (Bilgrami *et al.* 1991 & Jamaluddin *et al.* 2004). Therefore, this is the first report from the North-Western Himalayas.

***Ellisembia leptospora*** (Sacc. & Roum.) W.P. Wu, in Wu & Zhuang, Fungal Diversity Res. Ser. 15: 140 (2005) **Fig. 3 (a-j)**

= *Helminthosporium leptosporum* Sacc. & Roum. [as 'Helmisporium'], in Roumeguère, Revue mycol., Toulouse 2(8): 191 (1880)  
 = *Imicles leptospora* (Sacc. & Roum.) Shoemaker & Hambl., Can. J. Bot. 79(5): 598 (2001)  
 = *Sporidesmium leptosporum* (Sacc. & Roum.) S. Hughes, Can. J. Bot. 36: 808 (1958)

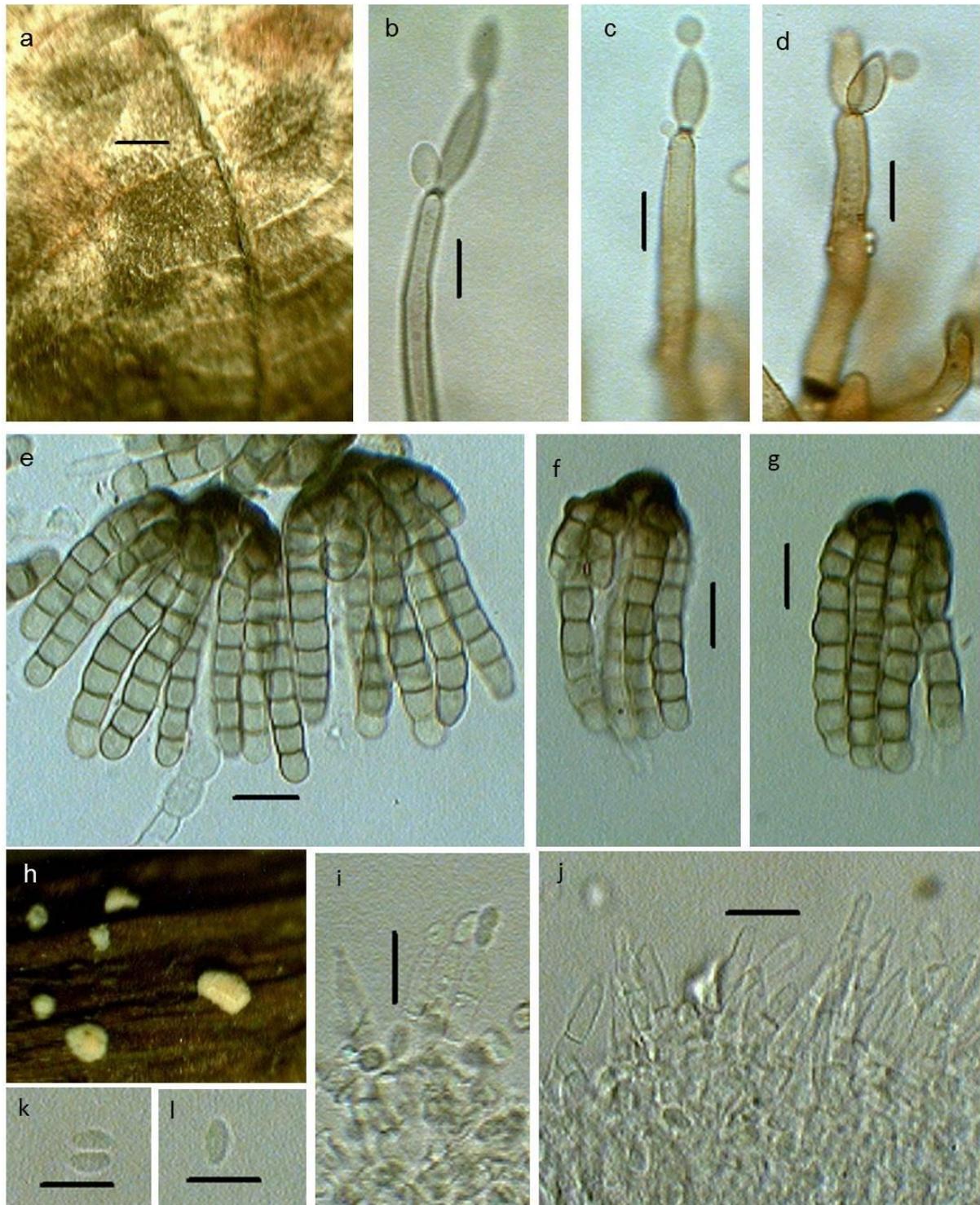
*Colonies* dark brown, hairy. *Mycelium* mostly immersed. *Conidiophores* mid to dark brown, often percurrent up to 70 µm in length and 4.10–6.31 µm wide. *Conidiogenous cell* monoblastic, terminal and intercalary. *Conidia* narrowly obclavate, truncate or conico-truncate at the base, subhyaline to pale straw coloured, often brown at the base, pseudoseptate, 27.44–77.32 × 6.38–8.33 µm, 3.16–4.54 µm wide at the base.

**Collection Examined:** India, Himachal Pradesh, Kangra, on rachis of *Cycas*, 8 November 2013, Sushma, PAN (31540).

**Remarks:** Subramanian (1992) established the genus *Ellisembia* with type species *E. coronata* (Fuckel) Subram. This genus is represented by 51 species worldwide (www.speciesfungorum.org, accessed 03.05.2016). The above described species matches well with the description of *Ellisembia leptospora* (Sacc. & Roum.) W.P. Wu. Earlier this species was reported on dead wood of *Dendrocalamus* sp. from Mt. Abu, Rajasthan as *Sporidesmium leptosporum* (Panwar & Chouhan 1976). Hence, the species is being first time reported from North-Western Himalayas.



**Figure 1.** *Spadicoides bina*. a) Hyphae. b) Basal part of the conidiophore. c-e) Conidiophores- conidiogenous cells and conidia. f & g) Conidia. Bars a-g = 10 $\mu$ m.



**Figure 2.** *Cladosporium cucumerinum*. a) colonies on natural substratum. b–d) Conidia, conidiogenous cell attached to conidiophore. *Cryptocoryneum rilstonii*. e) Conidia with conidiophore. f, g) Conidia. *Nalanthamala madreeya*. h) Sporodochia on natural substrate. i, j) Conidiophores and conidia. k, l) Conidia. Bars a = 1 mm; b–g, i–l = 10  $\mu\text{m}$ .



**Figure 3.** *Ellisembia leptospora*. a) Colony on natural substrate. b–d) Developing conidia on conidiophores. e, f) Conidiophores. g–j) Conidia. Bars b–j = 10  $\mu$ m.

*Nalanthamala madreya* Subramanian, J. Indian bot. Soc. 35: 478 (1956). **Fig. 2 (h-l)**

*Sporodochia* somewhat button like, scattered, separate, superficial, hemispherical to subglobose, pale white in colour, composed of a conspicuous, somewhat hemispherical, pseudoparenchymatous tissue of variable size which is covered over by conidiophores and conidia. *Conidiophores* arising from the upper layers of the pseudoparenchymatous tissue, of variable length, hyaline, septate. *Conidia*

produced in simple chains, hyaline, smooth, 1-celled,  $4.67\text{--}6.12 \times 2.13\text{--}3.01$   $\mu$ m.

**Collection examined:** India, Himachal Pradesh, Shimla, Tara Devi, on dead and decaying twigs of angiospermic tree, 16 September 2015, Sushma, PAN (31536).

**Remarks:** *Nalanthamala* was established by Subramanian (1956) with *N. madreya* as type species. A total of 6 species have been accepted worldwide in this genus ([www.speciesfungorum.org](http://www.speciesfungorum.org), accessed 03.05.2016). The above described species matches well with the

description of *Nalanthamala madreeya* Subramanian. Earlier it has been reported from Tamil Nadu and Poona (Maharashtra) (Bilgrami *et al.* 1991 & Jamaluddin *et al.* 2004). Therefore, it is a new record for North-Western Himalayas.

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