

***Cercospora* and allied genera from Laos – 1: Notes on *Zasmidium* (*Stenella* s. lat.)**

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Abstract – Leaf spots or lesions on living plants were collected from the Vientiane area and Bolikhamxay Province of Laos. Any cercosporoid taxa present were recorded, their macroscopic characters observed, cultures were isolated from single spores, and microscopic characters were observed under the microscope. Five *Zasmidium* species have presently been identified and five of these are new species. In this paper we introduce the taxonomic novelties *Zasmidium aporosae*, *Z. jasminicola*, *Z. pavettae* and *Z. suregadae*. Furthermore, *Stenella manihotis*, *S. meynae-laxiflorae* and *S. pseudoramularia* are assigned to *Zasmidium*.

anamorphic fungi / cercosporoid hyphomycetes / South East Asia / taxonomy / new species

INTRODUCTION

Studies on the biodiversity of the previously poorly studied fungi from various habitats in northern Thailand and Laos have been carried out (e.g. insects: Aung *et al.*, 2008; leaf litter: Duong *et al.*, 2008; wood: Kodsueb *et al.*, 2008a, b; monocotyledons; Pinruan *et al.*, 2007; Thongkantha *et al.*, 2008). There is considerable interest in the cercosporoid fungi and recently there have been several publications from Australasia and Asia (Braun & Crous, 2007; Kirschner & Chen, 2007; Nakashima *et al.*, 2007). Cercosporoids have been shown to be a polyphyletic group (Crous *et al.*, 2007a) comprising numerous genera with partly unsettled phylogeny and taxonomy (Crous *et al.* 2007b). In this paper we deal with *Stenella*-like hyphomycetes from the Lao PDR (Lao People Democratic Republic). The genus *Stenella* was described by Sydow (1930) and recognized by Ellis (1971, 1976), who reduced *Biharia* Thirum. & Mishra (Thirumalachar &

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Mishra, 1953) to synonymy with this genus. Deighton (1979) followed this concept of *Stenella* and differentiated it from *Mycovellosiella* based on the formation of verruculose superficial hyphae and usually rough-walled, catenate conidia. Up to the present time about 150 species have been assigned to *Stenella*. The main characters of this genus are: formation of verruculose superficial secondary mycelium; conidia formed singly or catenate, amero- to scolecosporous, mostly verruculose. However, in phylogenetic examinations on *Ramichloridium* and allied genera Arzanlou *et al.* (2007) demonstrated that *Zasmidium cellare* (Pers.: Fr.) Fr., the type species of the older genus *Zasmidium*, clustered within the *Mycosphaerellaceae* together with former *Stenella* species. With regard to morphology and conidiogenesis, *Zasmidium* agrees well with *Stenella* species by forming verruculose, pigmented aerial hyphae, giving rise to solitary conidiophores and thickened, darkened conidiogenous loci. Most former *Stenella* species belong to the *Mycosphaerellaceae* as well, but *Stenella arguata* Syd., the type species, clusters within the *Teratosphaeriaceae*, i.e. this species is phylogenetically distinct. Furthermore, *Stenella* anamorphs of the *Mycosphaerellaceae* have conidiogenous loci and hila that are planate as in other cercosporoid genera, whereas the loci and hila in *S. arguata*, *Teratosphaeriaceae*, are pileate (see David 1993). There are several possible solutions of this generic issue, viz. the recognition of a single polyphyletic genus for *Stenella*-like hyphomycetes (either, following the rules of priority, under the oldest name *Zasmidium* or under *Stenella*, provided that the latter name would be conserved over *Zasmidium*) or two monophyletic genera, i.e. *Zasmidium* (*Mycosphaerellaceae*) and *Stenella s. str.* (*Teratosphaeriaceae*). In any case, the oldest name *Zasmidium* is available for the whole complex. Furthermore, there is a strong tendency to end up with monophyletic genera when possible. Therefore, *Stenella s. str.* should be confined to anamorphs of the *Teratosphaeriaceae*. All *Stenella* species have to be proven and reassessed, either by molecular methods or by detailed examinations of the scar structure. In this paper we introduce four new species of *Zasmidium* from Laos.

MATERIALS AND METHODS

Sample collection

Leaves of plants with leaf-spots or other lesions were collected during numerous field trips. Photos of the symptoms, including the fungal colonies or fruit bodies were taken. The specimens were collected in the Vientiane Capital and Bolikhamxay Province areas of Central Laos.

General information

- **Vientiane** is the capital city of Laos, situated in the Mekong Valley and it is located at 17°58' North, 102°36' East (17.9667, 102.6). Vientiane consists of an area 3,920 km².

- **Bolikhamxay** (or Bolikhamsay) Province is located in central Laos in the narrow "neck", with moderately high mountains sloping Southwest into the Mekong River valley. Bolikhamxay can be reached by bus, 150 km or about 3 hours leaving from the Morning Market bus station. Bolikhamxay consists of an area 14,863 km².

Examination of fungal structures

Macroscopic characters were observed using a stereoscope to check (1) lesions/leaf spots (shape, size, colour, margin), and (2) colonies/caespituli (with details, e.g., amphigenous/epiphyllous, punctiform/pustulate/inconspicuous, effuse, loose, dense, brown/blackish, etc.).

Measurements

Where sufficient material was available, 30 measurements of mycelia (internal, external), hyphae (branched or not, width, septation, colour, wall thin/thick, smooth/verruculose), stromata (location, e.g., substomatal, intraepidermal; shape, size, colour; cells, angular or rounded in outline, size, wall thick/thin), conidiophores (formation, solitary/fasciculate/sporodochial, arising from internal/external hyphae/stromata, erumpent/through stomata; shape; size; septation; colour; wall, thin/thick, smooth/verruculose), conidiogenous cells (integrated, terminal/intercalary; length, shape, e.g., cylindrical/geniculate/sinuuous), conidiogenous loci [scars] (shape, size, thickened, darkened/pigmented or unthickened or inconspicuous, etc.), and conidia (formation, solitary/catenate; shape; size; septation; colour; wall, thin/thick, smooth/verruculose, apex; base; hila, size, thickened/unthickened, pigmented or not) have been carried out and the **standard variation** has been estimated by using the formula:

$$(\bar{x} = \frac{\sum x}{n}, n = y),$$

Notes: x = is an average of the size of each components

y = is a number of components

Herbarium specimens

Dried specimens were prepared and stored at the MFLU and the Biology Department, Faculty of Sciences, National University of Laos. Duplicates of collections and syntypes are preserved at the herbarium of the Institute of Biology, Geobotany and Botanical Garden, Halle (Saale), Germany (HAL) and MFLU.

RESULTS

Five new *Zasmidium* species were identified:

Table 1. *Zasmidium* species recorded from Laos.

Rank	Fungi species	Vientiane Capital			Bolikhamsay Province		
		MD	DD	UT	MD	DD	UT
1	<i>Zasmidium aporosae</i> sp. nov.		x			x	
2	<i>Zasmidium jasminicola</i> sp. nov.	x	x	x			
3	<i>Zasmidium pavettae</i> sp. nov.	x		x			
4	<i>Zasmidium meynae-laxiflorae</i> comb. nov.		x				
5	<i>Zasmidium suregadae</i> sp. nov.	x		x			

Note: MD = Mixed deciduous forest, DD = Dry dipterocarp forest, UT= Unstock forest.

Taxonomy

1. *Zasmidium aporosae* P. Phengsintham, K.D. Hyde & U. Braun, **sp. nov.**

(Figs 1-2)

Mycobank, MB 513397

Stenellae bischoffiae-javanicae similis, sed conidiis in vivo angustioribus, 2-3 μm latis, levibus vel subtiliter verruculosus.

Description: **Leaf spots** variable, typically deep brown to black, more or less irregularly orbicular, 1-15 mm in diam. **Caespituli/colonies** amphigenous, but chiefly hypophyllous. **Mycelium: internal hyphae** not observed; **external hyphae** often constricted at the septa, pale olivaceous-brown, almost smooth to verruculose, 1-7 μm wide (\bar{x} = 2.57 μm , n = 30), distances between septa 5-29 μm (\bar{x} = 11.67 μm , n = 30), thick-walled approximately 0.30-1 μm (\bar{x} = 0.61 μm , n = 30). **Stromata** absent. **Conidiophores** borne on external mycelial hyphae, unbranched, septate, mid pale golden brown, smooth, 2-5-septate, thin-walled, 0.50-1 μm (\bar{x} = 0.80 μm , n = 30), (6-)29-76(-83) \times 3-4 μm (\bar{x} = 43.1 \times 3.2 μm , n = 30); **conidiogenous cells** intergrated, terminal or rarely intercalary, 7-15 \times 1-3 μm (\bar{x} = 10.3 \times 2.8 μm , n = 30), **conidiogenous loci** forming minute, dark or refractive scars on lateral and terminal denticles, 1-2 μm wide (\bar{x} = 1.72 μm , n = 30), planate, giving rise to branched conidial chains, occasionally terminally swollen. **Conidia** solitary or catenulate, pale olivaceous, small conidia ellipsoid-ovoid to subcylindrical, but most conidia longer and slightly obclavate to obclavate-subcylindrical, straight or slightly curved or sinuous, smooth or finely verruculose, thin-walled, rounded or subtruncate at the ends with thickened, planate hila, short obconically truncate at the base, variable in length and shape, occasionally with lateral branchlets (germ tubes), 0-3-septate, (5-)6-38(-39) \times 2-3 μm (\bar{x} = 17.47 \times 2.3 μm , n = 30).

Known hosts: *Aporosa villosa* (Lindl.) H. Baill.

Known distribution: Laos.

Material examined: Laos, Vientiane Capital, Xaythany District, Nonh Saengchanh Village, on leaf of *Aporosa villosa* (Euphorbiaceae), 19 April 2006, P. Phengsintham, (NOUL P8, **holotype**); *ibid.*, 22 January 2007, (NOUL P201); *ibid.*, 25 May 2007 (NOUL P171); *ibid.*, Bolikhamxay Province, 5 May 2007 (NOUL P274).

Cultural characteristics: **Colonies** on PDA after three weeks at 25°C with spreading mycelium, surface ridged, black and wavy in the centre and grey margin, reaching 10-27 mm diam. **Hyphae** often constricted at the septa, distances between septa 4-20 μm (\bar{x} = 10.97 μm , n = 30), thin-walled approximately 0.5-1 μm (\bar{x} = 0.68 μm , n = 30), hyaline, smooth or verruculose, forming lateral and terminal minute, dark or refractive denticle-like scars, 1-2 μm diam., giving rise to branched conidial chains, width of mycelial hyphae gradually decreasing from primary to secondary and any later colonies. **Conidia** solitary or catenulate, greenish, verruculose, more variable in length and shape than those from leaves, 17-66 \times 3-4 μm (\bar{x} = 41.94 \times 3.3 μm , n = 18).

Remarks: The young conidia of *Z. aporosae* can be minutely verruculose, more evident than in adult conidia. Several species of the genus *Stenella* are known from hosts belonging to the Euphorbiaceae, but all of them are distinct from the new species *Z. aporosae*. *Stenella bischoffiae-javanicae* R.K. Chauhary, Tripathi, P.N. Singh & S. Chaudhary (Chaudhary *et al.* 2001), described from India on *Bischofia javanica*, differs in having usually solitary conidia, up to 5 μm wide, with 2-6 septa and a surface with loosely scattered coarse warts. *S. brideliicola* K. Srivast., A.K. Srivast. & Kamal on *Bridelia stipularis* in India (Srivastava *et al.* 1994) has much longer conidiophores, up to 310 \times 5-7 μm , and broader conidia 4-7 μm , formed singly. *Zasmidium manihotis* (U. Braun &

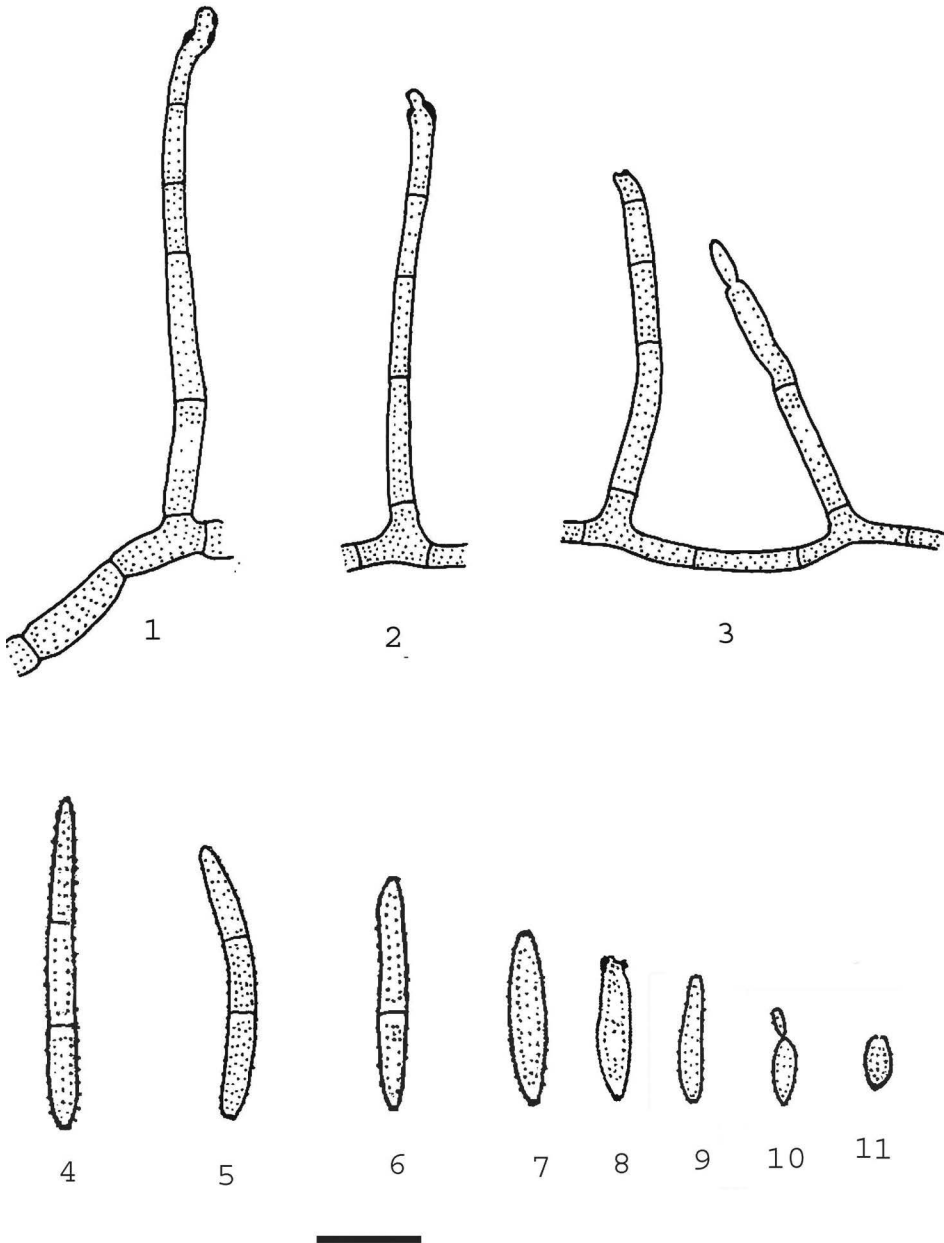


Fig. 1-11. *Zasmidium aporosae* sp. nov. on *Aporosa villosa*: 1-3. External hyphae with attached conidiophores. 4-11. Conidia. Bar: 1-11 = 10 μ m.

F.O. Freire) U. Braun **comb. nov.** (Bas.: *Stenella manihotis* U. Braun & F.O. Freire, Cryptog. Mycol. 25: 240, 2004), MycoBank, MB 513397, known on *Manihot* sp. in Brazil, is characterized by having solitary as well as fasciculate conidiophores and much longer conidia, $25\text{-}160 \times 3\text{-}4 \mu\text{m}$, 2-16-septate, usually formed singly. *S. gorakhpurensis* (Kamal & P. Kumar) de Hoog (de Hoog *et al.* 1983) on *Glochidion multiloculare* in India is characterized by having colorless hyphae and smooth, very small, 1-3-septate conidia.

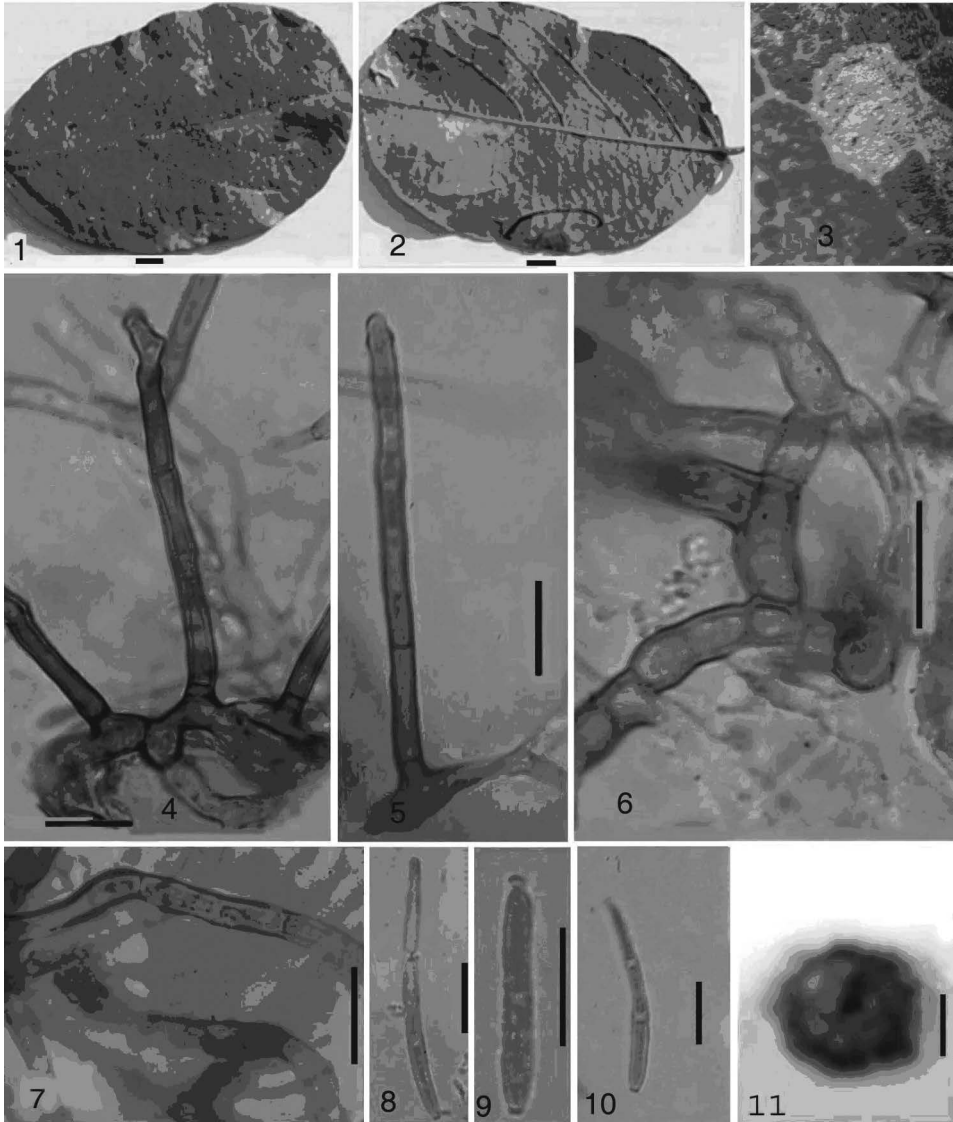


Fig. 2. 1-11. *Zasmidium aporosae* sp. nov. on *Aporosa villosa* from leaf spots/Lesions: 1-2. Lesions on host leaves (1. Upper surface, 2. Lower surface). 3. Caespituli. 4-5. Conidiophores. 6-7. External hyphae. 8-10. Conidia. 11. Culture. Bar: 1-2 = 10 mm. 4-10 = 10 μm . 11 = 10 mm.

2. *Zasmidium jasminicola* P. Phengsintham, K.D. Hyde & U. Braun, **sp. nov.**
(Figs 3-4)

Mycobank, MB 513398

Differt a *Zasmidio pseudoramulario* conidiophoris in vivo semper ex hyphis superficialibus oriundis et conidiis latoribus, (4-)5-42(-47) × (2-)3-5(-6) μm, 0-6-septatis.

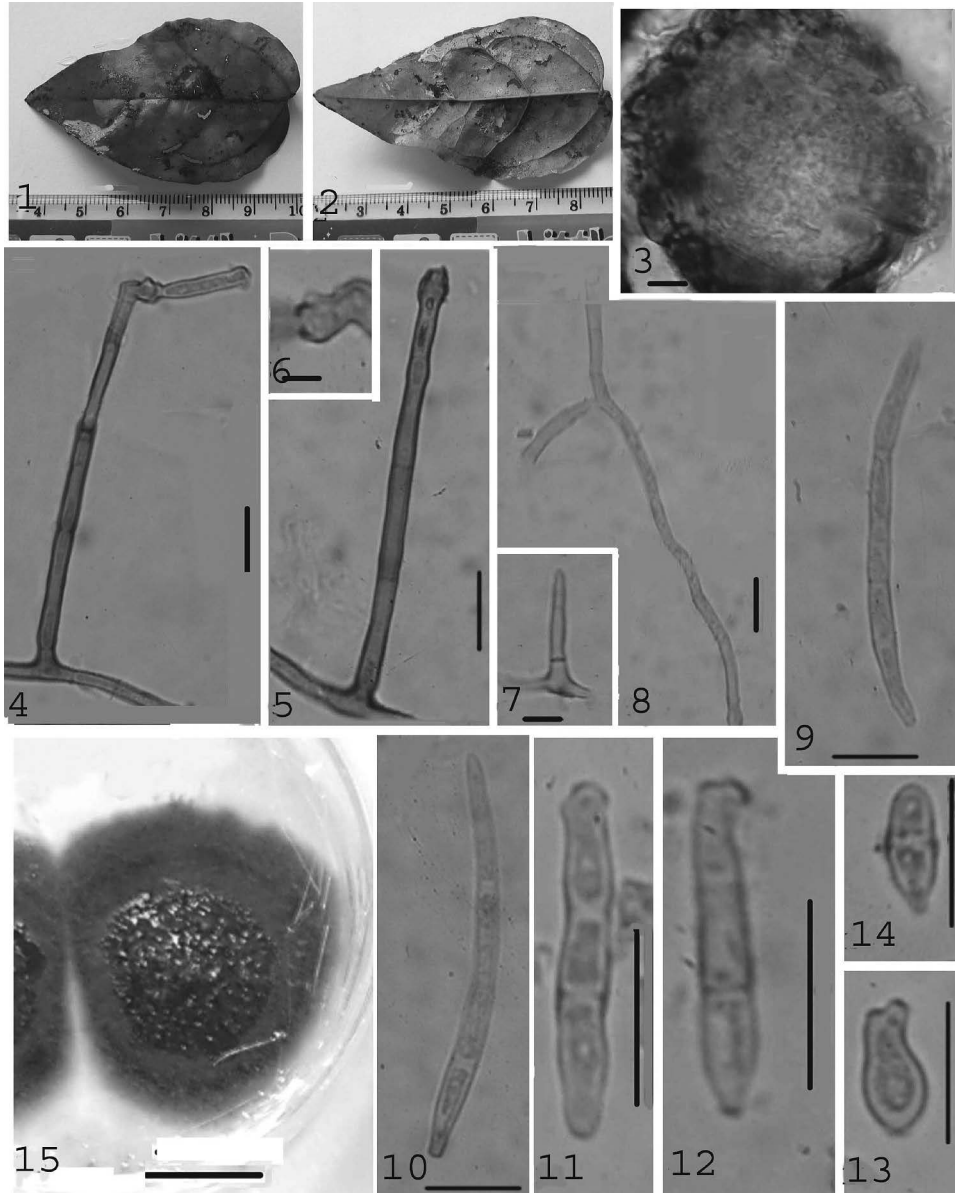


Fig. 3. 1-11. *Zasmidium jasminicola* sp. nov. on *Jasminum undulatum*: 1-4. Conidiophores. 5-11. Conidia. Bar: 1-11 = 10 μm.

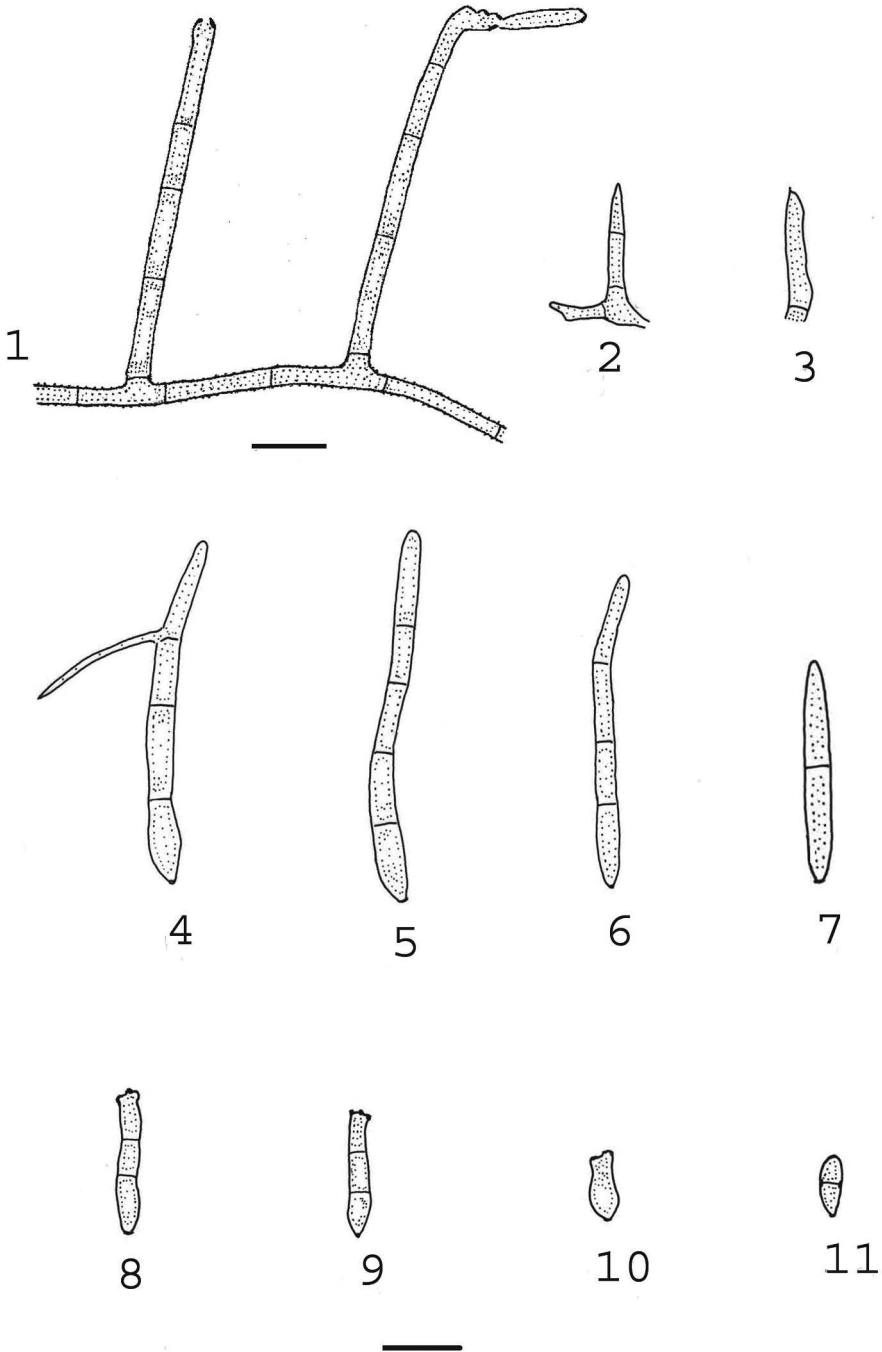


Fig. 4. 1-15. *Zasmidium jasminicola* sp. nov. on *Jasminum undulatum* from leaf spot: 1-2. Lesions on host leaves (1. Upper surface and 2. Lower surface). 3-4. Stromata. 5-8. Conidiophores. 9-14. Conidia. 15. Culture. Bar: 1-2 = 10 mm, 3-14 = 10 μ m, 15 = 10 mm.

Description: **Leaf spots** variable, typically deep brown, more or less irregularly orbicular, up to 10 mm. diam. **Caespituli/colonies** amphigenous. **Mycelium: internal hyphae** not observed; **external hyphae** verruculose, often constricted at the septa, pale olivaceous-brown, 1-2 μm wide, distances between septa 7-15 μm , thin-walled, approximately 0.50-0.80 μm . **Stromata** well-developed, brown, 6-40 μm diam. **Conidiophores** borne on external mycelial hyphae, unbranched, septate, mid pale golden brown, smooth, thin-walled, approximately 0.50-0.80 μm , up to 3-septate, 10-46 \times 2-4 μm (\bar{x} = 21.54 \times 2.31 μm , n = 13); **conidiogenous cells** intergrated, terminal or rarely intercalary, 7-15 \times 2-3 μm , **conidiogenous loci** forming minute, dark or refractive scars on lateral and terminal denticles, 2-3 μm diam., planate, giving rise to branched conidial chains, occasionally terminally swollen. **Conidia** solitary or catenulate, pale olivaceous, ellipsoid-ovoid or subcylindrical but mostly slightly obclavate, straight or slightly curved or sinuous, smooth or finely verruculose, thin-walled, rounded or subtruncate at the ends, with thickened hila, 1-2 μm wide, planate, short obconically truncate at the base, about 0.5-1.5 μm wide, variable in length and shape, some conidia occasionally with a lateral branchlet (germ tube), 0-6-septate, (4-)5-42(-47) \times (2-)3-5(-6) μm (\bar{x} = 13.98 \times 2.09 μm , n = 30).

Known hosts: *Jasminum undulatum* Ker-Gawl. (this paper).

Known distribution: Laos (this paper).

Material examined: Laos, Vientiane Capital, Xaythany District, Xay Village, on leaf of *Jasminum undulatum* (Oleaceae), P. Phengsintham, 19 April 2006, (NOUL P 10, **holotype**).

Cultural characteristics: **Colonies** on PDA after three weeks at 25 °C with spreading mycelium, surface ridged, black and wavy in the centre and grey margin, reaching 10-27 mm diam. **Hyphae** often constricted at the septa, distances between septa (2-)6-27 μm (\bar{x} = 14.93 μm , n = 30), thin-walled, approximately 0.5 μm , hyaline, smooth or verruculose, forming minute, dark or refractive scars on lateral and terminal denticles, 1.5-2 μm diam., giving rise to branched conidial chains, width of mycelial hyphae gradually decreasing from primary to secondary and any later colonies, 1-5 μm wide (\bar{x} = 2.8 μm , n = 30). **Conidia** solitary or catenulate, greenish, verruculose, more variable in length and shape than those from leaves, 5-29 \times 1.5-2.5 μm (\bar{x} = 10.5 \times 2.08 μm , n = 30).

Remarks: *Zasmidium pseudoramularia* (U. Braun) U. Braun **comb. nov.** (Bas.: *Stenella pseudoramularia* U. Braun, Nova Hedwigia 73: 431, 2001), MycoBank, MB 513398, the second species of *Stenella* on a host belonging to the Oleaceae, described from Indonesia on *Nyctanthes arbor-tristis* (Braun 2001), is distinguished from *S. jasminicola* by forming solitary or loosely aggregated (subfasciculate) conidiophores arising from immersed hyphae and much narrower (6-35 \times 1-3 μm *in vivo*), 0-1(-2)-septate conidia. The young conidia of *S. jasminicola* can be minutely verruculose, more evident than in adult conidia.

3. *Zasmidium pavettae* P. Phengsintham, K.D. Hyde & U. Braun, **sp. nov.**

(Figs 5-6)

MycoBank, MB 513399

Stenellae canthii similis, sed stromatibus formatibus, conidiophoris fasciculatis et solitariis, conidiis solitariis et catenatis, leniter brevioribus et angustioribus, (5-)6-59(-65) \times 2-4 μm . Differt a *S. meynae-laxiflorae* conidiophoris in fasciculis parvioribus, brevioribus, ad 34 μm longis, conidiis brevioribus, (5-)6-59(-65) μm longis.

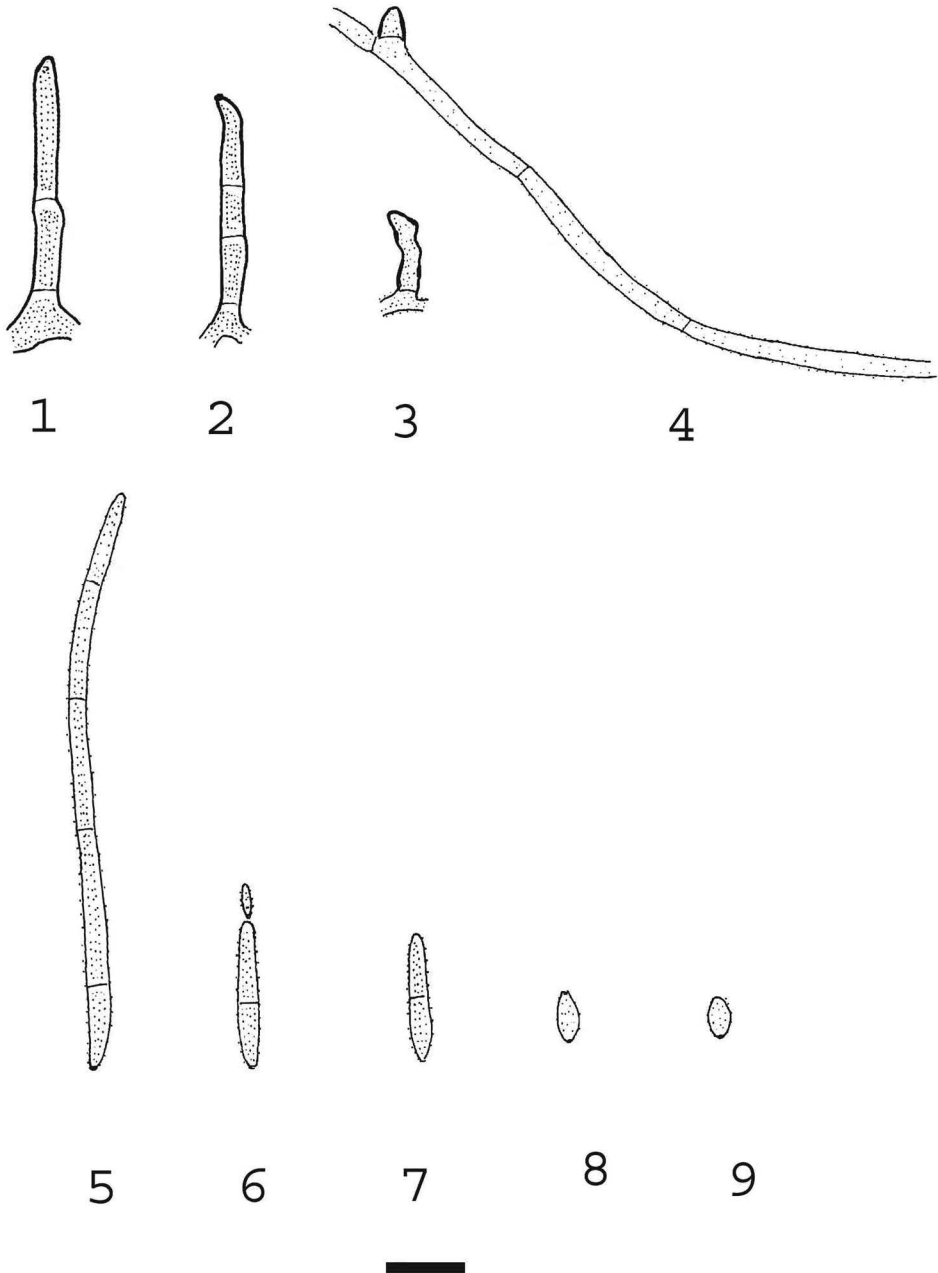


Fig. 5. 1-9. *Zasmidium pavettae* sp. nov. on *Pavetta indica*: 1-3. Conidiophores. 4. External mycelium with attached conidiophores. 6-9. Conidia. Bar: 1-9 = 10 μ m.

Description: **Leaf spots/lesions** circular to irregular, 3-8 mm in diam., grey-brown in the centre, and with greyish margin. **Caespituli/colonies** amphigenous, inconspicuous. **Mycelium** internal and external: **internal hyphae** inconspicuous; **external hyphae** branched, 2-3 μm wide (\bar{x} = 2.8 μm , n = 17),

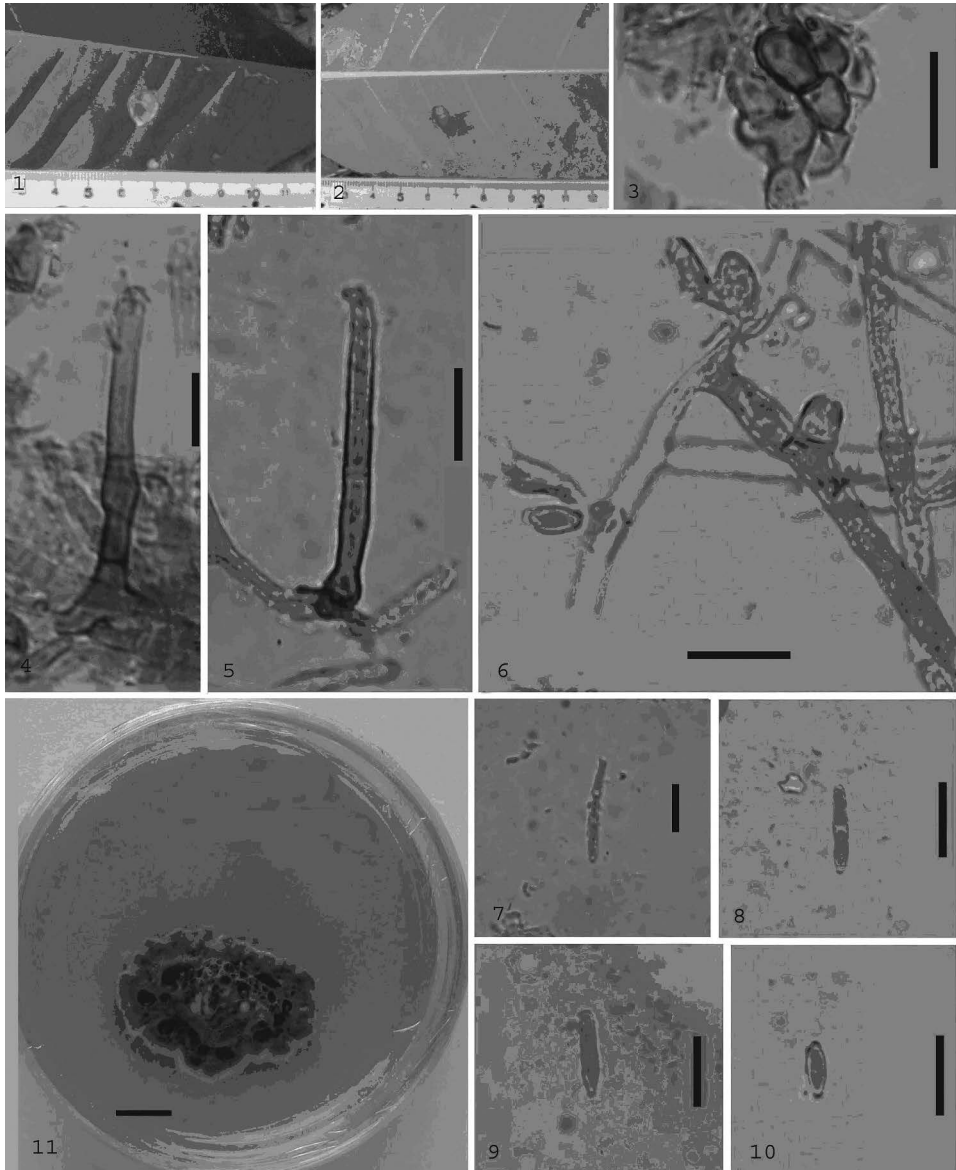


Fig. 6. 1-11. *Zasmidium pavettae* sp. nov. on *Pavetta indica* from leaf spot: 1-2 Lesions on host leaves (1. Upper surface and 2. Lower surface). 3. Stroma. 4-5. Conidiophores. 6. External mycelium with attached young conidiophores. 7-10. Conidia. 11. Culture. Bar: 1-2 = 10 mm, 3-10 = 10 μm , 11 = 10 mm.

septate, constricted at the septa, distances between septa 9-24 μm (\bar{x} = 15.5 μm , n = 17), pale olivaceous-brown, wall approximately 0.25-0.50 μm wide (\bar{x} = 0.44 μm , n = 17), verruculose. **Stromata** not well-developed, subglobose, approximately 23 μm in diam., brown, stromatal cells oval, ellipsoidal to angular in outline, 3-5 μm wide (\bar{x} = 3.75 μm , n = 8), brown to dark brown, wall approximately 0.50-0.80 μm wide (\bar{x} = 0.54 μm , n = 8), smooth. **Conidiophores** fasciculate or solitary, arising from stromata and borne on external mycelial hyphae, unbranched, cylindrical, 12-34 \times 3-4 μm (\bar{x} = 16.8 \times 3.5 μm , n = 5), 1-septate, brown, wall approximately 0.80 μm , smooth; **conidiogenous cells** integrated, terminal or intercalary, 19-20 \times 3-4 μm , cylindrical, paler at the apex; **conidiogenous loci** forming minute, dark or refractive scars on lateral and terminal denticle-like protuberances, giving rise to branched conidial chains, 1-2 μm wide, planate, wall approximately 0.8-1 μm wide, thickened, darkened. **Conidia** solitary or catenulate, sometimes subcylindrical but mostly slightly obclavate, straight or slightly curved or sinuous, (5-)6-59(-65) \times 2-4 μm (\bar{x} = 20 \times 2.75 μm , n = 20), 0-5-septate, pale olivaceous, wall approximately 0.25-0.50 μm wide (\bar{x} = 0.36 μm , n = 20), smooth or finely verruculose, apex rounded or subtruncate, with a conspicuous hilum, base short obconically truncate, hila approximately 1 μm wide, wall approximately 0.6-0.8 μm thick.

Known host: *Pavetta indica* L.

Known distribution: Laos (this paper).

Material examined: Laos, Vientiane Capital, Xaythany District, Houang Den Meuang and Dong Mak Khai villages, on leaf of genus *Pavetta indica* (Rubiaceae), 26 April 2006, P. Phengsintham (NOUL P 24, **holotype**); *ibid.* 10 March 2007 (NUOL P 261, **paratype**).

Cultural characteristics: **Mycelial colonies** on PDA after three weeks at 25°C spreading surface ridged, black and brown in the centre, grey margin, reaching 10 mm in diam., hyphae 1-4 μm wide (\bar{x} = 2.6 μm , n = 30), septate, constricted at the septa, distances between septa 6-16 μm (\bar{x} = 11 μm , n = 30), brownish to subhyaline, wall approximately 0.25-0.50 μm (\bar{x} = 0.44 μm , n = 30), smooth or verruculose. **Conidiophores** and **conidia** not formed in the culture.

Remarks: Several *Stenella* species, all described from India, have been recorded on hosts belonging to the Rubiaceae. *Stenella canthii* J.M. Yen, A.K. Kar & B.K. Das (1982a), described from West Bengal on *Canthium dedymum*, is morphologically close to the fungus on *Pavetta indica*, but this species is distinguished by lacking stromata, consistently solitary conidiophores and somewhat longer, wider conidia, 18-112 \times 3-4.5 μm . *S. meynae-laxiflorae* K. Srivast., A.K. Srivast. & Kamal (Srivastava *et al.* 1995) is another similar species, but it is distinct by its much longer conidiophores, up to about 90 μm in length, often formed in well-developed fascicles of 9-20 stalks. Most of the other *Stenella* species on Rubiaceae are characterized by having much longer pluriseptate conidia, viz., *S. coffeae* J.M. Yen, A.K. Kar & B.K. Das (conidia 33-200 \times 3-5(-6) μm , see Yen *et al.* 1982a), *S. hyptiantherae* S.K. Singh, Archana Singh & Kamal (conidia 18-177 \times 3-5 μm , see Singh *et al.* 1997), *S. plectroniae* Ponnappa (conidia 40-210 \times 2-3.5 μm , see Ellis 1976), *S. vangueriae* (Thirum. & Mishra) Deighton (conidia 30-258 \times 3-4.5 μm , see Thirumalachar & Mishra 1953), and *S. xeromphigena* J.M. Yen, A.K. Kar & B.K. Das (conidia 20-156 \times 3-4 μm , see Yen *et al.* 1982b). *Stenella naucleae* A.K. Das (Das 1990) differs in having larger, well-developed stromata with large fascicles composed of 7-55 conidiophores, and much longer, pluriseptate conidiophores, 33-115 \times 3-5 μm .

4. *Zasmidium meynae-laxiflorae* (K. Srivast., A.K. Srivast. & Kamal)

P. Phengsintham, K.D. Hyde & U. Braun, **comb. nov.** (Figs 7-8)

MycoBank, MB 513400

Bas.: *Stenella meynae-laxiflorae* K. Srivast., A.K. Srivast. & Kamal, in Srivastava *et al.*, Mycol. Res. 99: 235, 1995.

Description: **Leaf spots/lesions** circular to irregularly angular, 1-12 mm in diam., brown to dark brown in the centre and with yellowish margin. **Caespituli/colonies** amphigenous, small, scattered, brown. **Mycelium** internal and external: **internal hyphae** inconspicuous; **external hyphae** branched, 2-3 μm wide (\bar{x} = 2.5 μm , n = 12), septate, constricted at the septa, distances between septa 5-18 μm (\bar{x} = 11.92 μm , n = 12), pale olivaceous-brown, wall approximately 0.3-0.8 μm wide (\bar{x} = 0.52 μm , n = 12), verruculose. **Stromata** well-developed, subglobose, approximately 10-41 μm in diam., brown; stromatal cells oval, ellipsoidal to angular in outline, 3-9 μm wide (\bar{x} = 5.67 μm , n = 30), brown to dark brown, wall approximately 0.5-1 μm wide (\bar{x} = 0.74 μm , n = 30), smooth. **Conidiophores** fasciculate, arising from stromata (9-20 per fascicle) and solitary, borne on external mycelial hyphae, unbranched, cylindrical, (14-)15-93(-98) \times 3-4 μm (\bar{x} = 51.8 \times 3.37 μm , n = 30), 0-7-septate, distances between septa 4-23 μm (\bar{x} = 11 μm , n = 30), brown to dark brown, wall approximately 0.5-1 μm (\bar{x} = 0.63 μm , n = 30), smooth, 0-2-geniculate; **conidiogenous cells** polyblastic, integrated, terminal or intercalary, 9-23 \times 3-4 μm , cylindrical, pale at the apex; **conidiogenous loci** forming minute, dark or refractive scars on lateral and terminal denticle-like protuberances giving rise to branched conidial chains, 1-1.5 μm wide (\bar{x} = 1.68 μm , n = 13), wall approximately 0.5-1 μm wide (\bar{x} = 0.81 μm , n = 13), thickened, darkened, with a minute central pore. **Conidia** solitary or catenulate, sometimes subcylindrical but mostly slightly obclavate, straight or slightly curved or sinuous, (4-)16-87 \times 2-4 μm (\bar{x} = 30.57 \times 3.4 μm , n = 14), 0-6-septate, pale olivaceous, wall approximately 0.25-0.5 μm wide (\bar{x} = 0.3 μm , n = 14), smooth or finely verruculose, apex rounded or subtruncate with a thickened hilum, base short obconically truncate, with a basal hilum, approximately 1-1.5 μm wide (\bar{x} = 1.32 μm , n = 9), wall thickened, approximately 0.5-0.8 μm wide (\bar{x} = 0.54 μm , n = 9).

Known hosts: *Meyna laxiflora* Robyns., *M. pubescens* (Kurz.) Robyns.

Known distribution: India, Laos (this paper).

Materials examined: Laos, Vientiane Capital, Xaythany District, Houay Den Meuang and Dong Mak Khai villages, on leaf of *Meyna pubescens* (Rubiaceae), 26 April 2006, P. Phengsintham, (NOUL P 29); *ibid.* 10 March. 2007, (NOUL P 295)

Cultural characteristics: **Mycelial colonies** on PDA after three weeks at 25°C spreading surface ridged, black and brown in the centre, grey margin, reaching 25 mm in diam. 1-8 μm wide (\bar{x} = 3.38 μm , n = 30), septate, constricted at the septa, distances between septa 4-20 μm (\bar{x} = 14.2 μm , n = 30), brownish to subhyaline, wall approximately 0.25-0.80 μm (\bar{x} = 0.45 μm , n = 30), smooth or verruculose. **Conidiophores** and **conidia** not formed in the culture.

Remarks: The collection from Laos is very similar to the type collection from India which is, according to the original description, characterized as follows: Conidiophores superficial, 16-52 \times 3-5.5 μm . Conidia cylindrical, obclavate, 12-92 \times 2.5-4 μm , olivaceous-brown, verruculose. *Meyna pubescens* is a new host species of this fungus. The relation of *Stenella meynae-laxiflorae* and *S. vanguardiae* (Thirum. & Mishra) Deighton (1979), both species described from India on *Meyna laxiflora* (= *Vangueria spinosa*), is not quite clear. The two taxa are similar, but the latter species was described with much longer and somewhat wider conidia, 30-258 \times 3-4.5 μm , formed singly, sometimes with lateral branchlets.

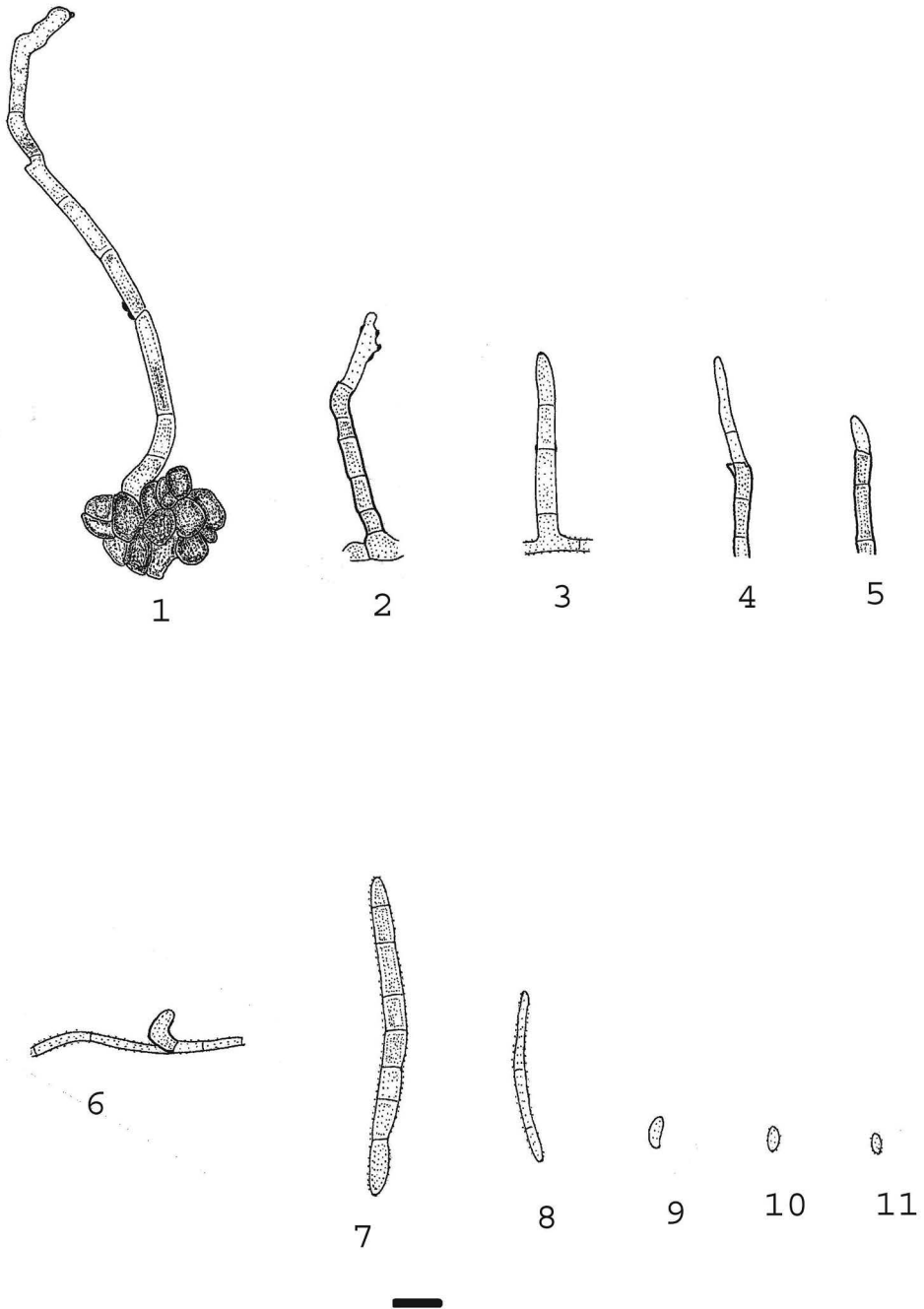


Fig. 7. 1-11. *Zasmidium meynae-laxiflorae* on *Meyna pubescens*: 1. Stroma with attached conidiophore. 2-3. External mycelia with attached conidiophores. 4-5. Conidiophores. 6. External mycelium with attached young conidiophore. 7-11. Conidia. Bar: 1-11 = 10 μ m.

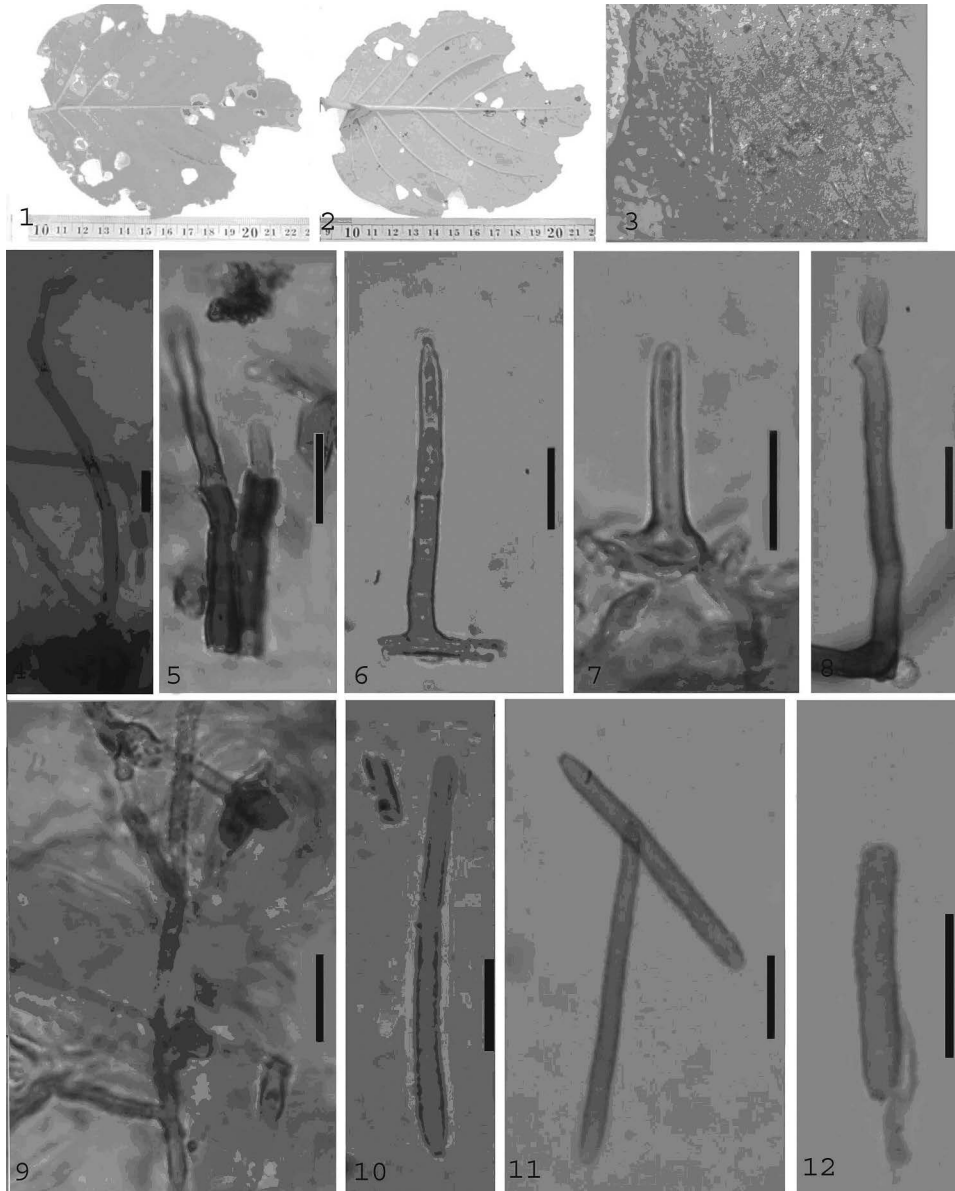


Fig 8. 1-12. *Zasmidium meynae-laxiflorae* on *Meyna pubescens* from leaf spot: 1-2 Lesions on host leaves (1. Upper surface and 2. Lower surface). 3. Caespituli. 4. Stroma with attached conidiophores. 5. Conidiophores. 6-7. External mycelia with attached conidiophores. 8. Conidiophore with attached young conidia. 9. External with attached young conidiophores. 10-12. Conidia. Bar: 1-2 = 10 mm, 4-12 = 10 μm.

5. *Zasmidium suregadae* P. Phengsintham, K.D. Hyde & U. Braun **sp. nov.**

(Figs 9-10)

Mycobank, MB 513401

Stenellae ateramnae similis, sed maculis formantibus et conidiis pallide olivaceis, brevioribus, (16-)17-128(-153) × 2-4 µm, 1-10-septatis.

Description: **Leaf spots/lesions** circular to irregular, 1-3 mm diam., grey to grey-brown in the centre, and with yellow-green margin. **Caespituli/colonies** amphigenous, small, scattered, brown. **Mycelium** internal and external; **internal hyphae** branched, 2-4 µm wide (\bar{x} = 2.92 µm, n = 13), septate, constricted at the septa, distances between septa 4-19 µm (\bar{x} = 10.08 µm, n = 13), pale olivaceous-brown, wall approximately 0.3-0.5 µm wide (\bar{x} = 0.39 µm, n = 13), smooth; **external hyphae** superficial, branched, 1-4 µm wide (\bar{x} = 2.67 µm, n = 30), septate, constricted at the septa, distances between septa 6-22 µm (\bar{x} = 11.78 µm, n = 30), pale olivaceous-brown, wall approximately 0.3-0.5 µm wide (\bar{x} = 0.44 µm, n = 30), almost smooth to verruculose. **Stromata** well-developed, subglobose, approximately 35-70 µm diam., brown, stroma cells oval, ellipsoidal to angular in outline, 3-10 µm wide (\bar{x} = 6.37 µm, n = 30), brown to dark brown, wall approximately 0.5-1 µm wide (\bar{x} = 0.74 µm, n = 30), smooth. **Conidiophores** fasciculate, arising from stromata (9-34 per fascicle) and solitary, borne on external mycelial hyphae, unbranched, cylindrical, (34-)40-86(-110) × 3-4 µm (\bar{x} = 65.8 × 3.3 µm, n = 30), 2-9-septate, distances between septa 7-20 µm (\bar{x} = 13.3 µm, n = 30), brown to dark brown, wall approximately 0.5-0.8 µm (\bar{x} = 0.58 µm, n = 30), smooth, 0-2 times geniculate; **conidiogenous cells** polyblastic, integrated, terminal or intercalary, 8-20 × 2-3 µm (\bar{x} = 15.8 × 3.14 µm, n = 30), cylindrical, pale at the apex; **conidiogenous loci** small, conspicuous, subplanate to planate, 1-1.5 µm wide (\bar{x} = 1.15 µm, n = 10), wall approximately 0.5-1 µm wide (\bar{x} = 0.76 µm, n = 10), thickened, darkened. **Conidia** solitary or catenulate, sometimes subcylindrical, but mostly slightly obclavate, occasionally with lateral branches, straight or slightly curved to sinuous, (16-)17-128(-153) × 2-4 µm (\bar{x} = 74.13 × 2.8 µm, n = 30), 1-10-septate, pale olivaceous, wall approximately 0.3-0.5 µm wide (\bar{x} = 0.36 µm, n = 30), smooth or finely verruculose, apex rounded or subtruncate, at the end of some conidia with a thickened hilum, base truncate, hila slightly thickened and darkened, approximately 1-1.5 µm wide (\bar{x} = 1.04 µm, n = 13), wall approximately 0.5-0.8 µm wide (\bar{x} = 0.52 µm, n = 13).

Known hosts: *Suregada multiflora* (Juss.) H. Baill.

Known distribution: Laos (this paper).

Material examined: Laos, Vientiane Capital, Xaythany District, Houay Den Meuang village, on leaf of *Suregada multiflora* (Euphorbiaceae), 8 May 2006, P. Phengsintham, (NOUL P 36, **holotype**).

Cultural characteristics: **Mycelial colonies** on PDA after three weeks at 25 °C spreading surface ridged, grey-brown in the centre, margin greenish black, reaching 11 mm diam., hyphae 1-4 µm wide (\bar{x} = 2.8 µm, n = 30), septate, constricted at the septa, distances between septa 6-18 µm (\bar{x} = 11.9 µm, n = 30), greenish to brownish, wall approximately 0.25-0.50 µm (\bar{x} = 0.34 µm, n = 30), smooth or verruculose. **Conidiophores** and **conidia** not formed in the culture.

Remarks: Five *Stenella* spp. have been recorded on other hosts of the family Euphorbiaceae, but there is no record from *Suregada* spp. *Stenella bischofia-javanicae* R.K. Chaudhary *et al.* (Chaudhary *et al.* 2001), *S. brideliicola* K. Srivast. *et al.* (Srivastava *et al.* 1994), *S. gorakhpurensis* (Kamal & P. Kumar) de Hoog (Kamal & Kumar 1980, de Hoog *et al.* 1983) as well as *Zasmidium aporosae*, described above, are distinct from the new species by having

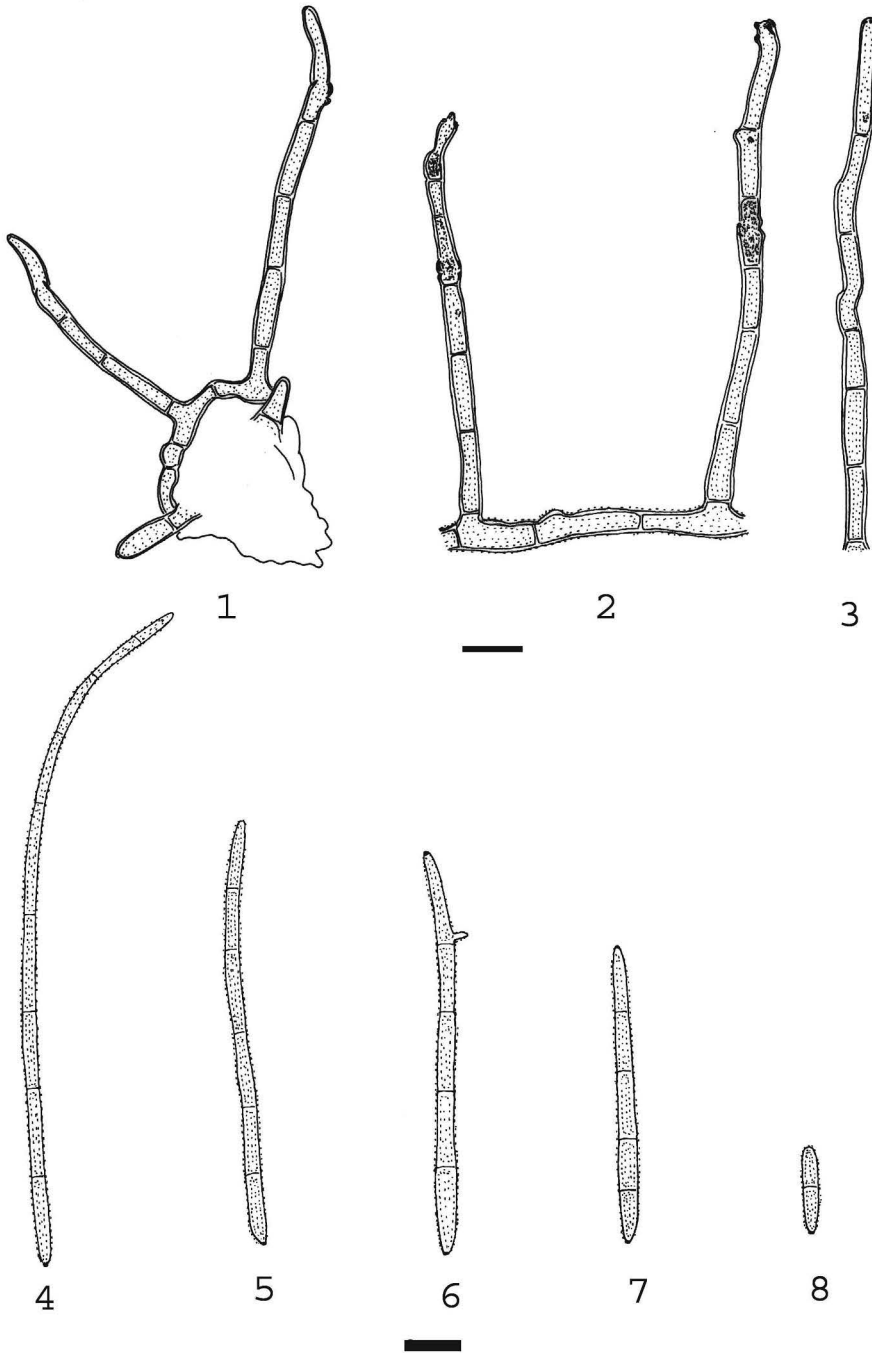


Fig. 9. 1-8. *Zasmidium suregadae* sp. nov. on *Suregada multiflorae*: 1. Stroma with attached conidiophores. 2. External hypha with attached conidiophores. 3. Conidiophore. 4-8. Conidia. Bar: 1-8 = 10 μ m.

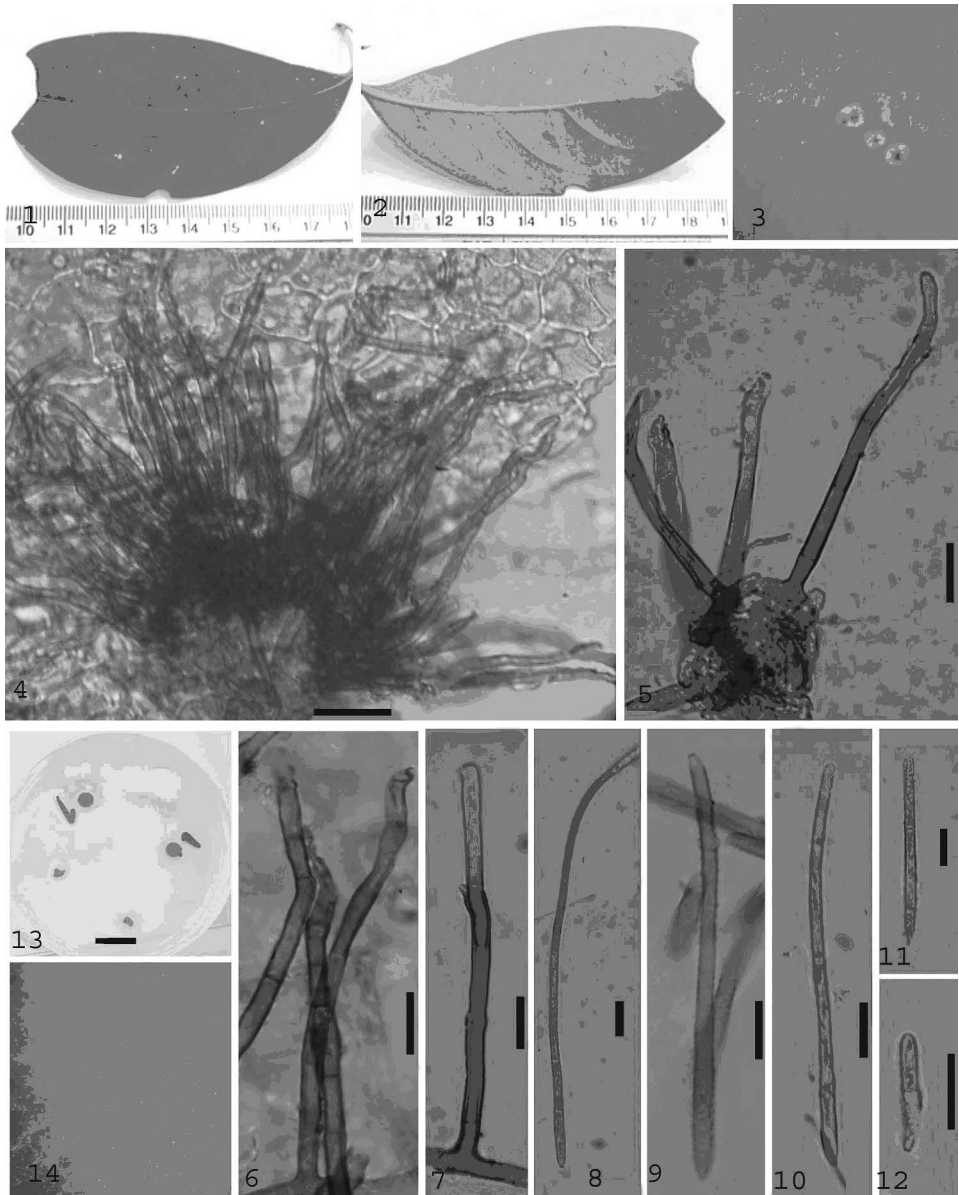


Fig. 10. 1-14. *Zasmidium suregadae* sp. nov. on *Suregada multiflora* from leaf spots: 1-2 Lesions on host leaves (1. Upper surface and 2. Lower surface). 3. Caespituli. 4-5. Stromata with attached conidiophores. 6. Conidiophores. 7. External hypha with attached conidiophore. 8-12. Conidia. 13. Culture. 14. Mycelia. Bar: 1-2 = 10 mm. 4-12 = 10 μm. 13 = 10 mm. 14.

conidiophores which are consistently formed singly, i.e. stromata and fasciculate conidiophores are lacking. *Zasmidium manihotis* (\equiv *Stenella manihotis*, Braun & Freire 2004), described from Brazil on *Manihot* sp., is a similar species with solitary as well as fasciculate conidiophores, but the stromata are much smaller, 10-25 μ m diam., or even lacking, the conidiophores are formed in small fascicles, they are wider, 3-7 μ m, and the conidia are also wider, 3-6 μ m. *S. ateramnæ* R.F. Castañeda & B. Kendr. (Castañeda & Kendrick 1991), described from Cuba on *Ateramnus lucidus*, is close to the new species by having large stromata, 50-80 \times 25-45 μ m, with numerous conidiophores in fascicles, but the brown conidia are much longer, up to 280 μ m, with up to 20 septa. Furthermore, the latter species has been described from fallen leaves (lesions lacking) with usually internal mycelium (verruculose external hyphae not described).

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