

***Cercospora* and allied genera from Laos 3**

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Abstract – Comprehensive examinations of cercosporoid leaf-spotting hyphomycetes were carried out in the central and northern areas of Laos. Thirty-three species of *Cercospora*, *Passalora*, *Pseudocercospora*, *Scolecostigmina* and *Zasmidium*, including one new species are identified, described and illustrated. Taxonomic novelty is the new species *Zasmidium micromeli*.

INTRODUCTION

Cercospora sensu lato is one of the largest genera of hyphomycetes, which is almost cosmopolitan in distribution, causing leaf-spots and other lesions on a wide range of host plants. Species of this genus are important pathogens responsible for severe damage to beneficial plants such as maize, rice, grasses, vegetables, forest trees and ornamentals (Hsieh & Goh 1990, Crous & Braun 2003, Crous 2009).

Comprehensive attempts to examine and document the micromycetes, especially cercosporoid fungi of Laos have been carried out since 2003. Phengsintham & Hyde (2003a,b) recorded 20 ascomycetes on palms from Laos. Five new species of *Zasmidium* (*Stenella s. lat.*) were recorded by Phengsintham *et al.* (2009), 22 species of *Cercospora*, *Passalora* and *Pseudocercospora*, including two new species and a new variety of dematiaceous hyphomycetes were identified, described and illustrated by Phengsintham *et al.* (2010), and *Pseudocercospora bakeri*, causing leaf spots on *Ipomoeae* was recorded by Frank *et al.* (2010). The objective of this paper and planned subsequent contributions is to investigate the cercosporoid fungi of Laos and to provide data on Laos fungi in comparison with the diversity of these fungal groups in neighbouring countries.

We are studying the plant pathogens and other fungi in northern Thailand and Laos (Thongkantha *et al.*, 2008; Prihastuti *et al.*, 2009; Wulanderi *et al.*, 2009). This paper is a third in the series on cercosporoid fungi from these regions (Phengsintham *et al.*, 2009, 2010).

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MATERIALS AND METHODS

Sample collections

Leaves of plants with leaf-spots or other lesions were collected during the course of field trips in the central and northern areas of Laos and northern Thailand. Photographs of symptoms, including the fungal colonies or fruiting bodies, were taken.

Examination of fungal structures

Macroscopic characters were observed using a stereomicroscope 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, and others).

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, 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:

$$\left(\bar{x} = \frac{\sum M}{n} \mu m \right)$$

Notes: M = is a size of each components

n = is a number of components

Identification of fungi

The species of cercosporoid hyphomycetes from central and northern areas of Laos and northern Thailand have been determined based on the current relevant taxonomic publications cited in the list of references.

Herbarium specimens

Dried specimens were prepared and stored at the herbaria of the School of Science, Mae Fah Luang University, Chiang Rai, Thailand (MFU) and the Biology Department, Faculty of Sciences, National University of Laos (NUOL). Various duplicates are preserved at the herbarium of the Institute of Biology, Geobotany and Botanical Garden, Halle (Saale), Germany (HAL).

RESULTS

Thirty-three cercosporoid hyphomycetes were identified and assigned to species of the genera *Cercospora* (7), *Passalora* (6), *Pseudocercospora* (18), *Scolecostigmina* (1) and *Zasmidium* (1) including one new species: *Zasmidium micromeli* sp. nov.

Table 1 lists the cercosporoid species found in the particular agricultural and forest types.

Table 1. Summary of cercosporoid species

Fungal species	MD	DD	UT	RP	G	U	Stream
<i>Cercospora asparagi</i>						x	
<i>Cercospora bidentis</i>	x		x				
<i>Cercospora cocciniae</i>					x	x	
<i>Cercospora diplaziicola</i>							x
<i>Cercospora durantae</i>	x		x				
<i>Cercospora nasturtii</i>					x		
<i>Cercospora tacca</i>	x						
<i>Passalora aenea</i>			x				
<i>Passalora capsicola</i>						x	
<i>Passalora erythrinae</i>					x		
<i>Passalora haldinae</i>		x					
<i>Passalora perfoliati</i>	x		x				
<i>Passalora tithoniae</i>			x				
<i>Pseudocercospora baliospermi</i>			x	x		x	
<i>Pseudocercospora budleiae</i>			x				
<i>Pseudocercospora cassiae - occidentalis</i>					x	x	
<i>Pseudocercospora catappae</i>		x					
<i>Pseudocercospora combretigena</i>	x		x				
<i>Pseudocercospora duabangae</i>	x		x				
<i>Pseudocercospora gmelinae</i>	x		x				
<i>Pseudocercospora holarrhenae</i>			x				
<i>Pseudocercospora macarangae</i>	x		x				
<i>Pseudocercospora musae</i>						x	
<i>Pseudocercospora namae</i>				x			x
<i>Pseudocercospora ocimicola</i>					x	x	
<i>Pseudocercospora piperis</i>	x		x				
<i>Pseudocercospora sphaerellae-eugeniae</i>		x	x				
<i>Pseudocercospora tabernaemontanae</i>						x	
<i>Pseudocercospora testonicola</i>					x		
<i>Pseudocercospora tetramelis</i>	x						
<i>Pseudocercospora trematicola</i>			x				
<i>Scolecostigmina mangiferae</i>					x		
<i>Zasmidium micromeli</i> sp. nov.			x				

Note: MD = Mixed deciduous forest; DD = Dry dipterocarp forest; UT = Unstock forest or fallow forest; RP = Rice paddy; G = Garden; U = Urban area.

***Cercospora asparagi* Sacc., *Michelia* 1: 88 (1877).**

Notes: Crous & Braun (2003) considered *Cercospora asparagi* close to or identical with *C. apii* s. lat. In the Laos collection conidiophores were fasciculate and $28-63 \times 4-6 \mu\text{m}$ ($\bar{x} = 43.5 \times 4.56 \mu\text{m}$, $n = 10$) and conidia were hyaline and $54-112 \times 4-5 \mu\text{m}$ ($\bar{x} = 80 \times 4 \mu\text{m}$, $n = 5$), which is similar to those reported in Ellis (1976), Hsieh & Goh (1990) and Chupp (1954).

Known hosts: *Asparagus officinalis*, *Protasparagus sectaceus* [= *A. plumosus*] (Asparagaceae).

Known distribution: new to Laos (this paper), otherwise widespread, see Crous & Braun (2003).

Material examined: Laos, Vientiane Capital, Xaythany District, Xay Village, on leaves of *Asparagus officinalis* (Asparagaceae), 30 June 2006, P. Phengsintham (NUOL P57).

Cercospora bidentis Tharp, *Mycologia* **9**(2): 108 (1917).

Notes: The collection from Laos is characterized by forming conidiophores singly or only two in a small fascicle, which differs from other samples on *Bidens pilosa* with 3-20 conidiophores per fascicle (e.g. Hsieh & Goh, 1990).

Known on a wide range of hosts belonging to the family Compositae, widespread in the tropics and subtropics (see Crous & Braun 2003).

Known distribution: Laos (this paper) and many other countries (see Crous & Braun 2003).

Material examined: Laos, Luangprabang Province, Phoukhoun District, 18 June 2006, P. Phengsintham (NUOL P102); Northern Thailand, Chiang Rai Province, Muang District, Sri Pangxang Village, on leaf of *Bidens pilosa* (Compositae), 18 August 2009, P. Phengsintham (MFLU10 0283).

Cercospora cocciniae Munjal, Lall & Chona, *Indian Phytopathol.* **12**(1): 86 (1959).

Notes: Crous & Braun (2003) classified this species as morphologically distinct from *C. apii* s. str. by having obclavate conidia. The Laos collection has distinctly obclavate conidia, with long obconically truncate bases. The conidiophores and conidia as similar to those reported from Brunei (Braun & Sivapalan, 1999).

Known hosts: *Coccinia grandis* [= *C. indica*], *Momordica charantia* (Cucurbitaceae).

Known distribution: Brunei, Laos (this paper), India, Pakistan, Thailand.

Material examined: Laos, Vientiane Capital, Xaythany District, Xay Village, on leaf of *Coccinia indica* (Cucurbitaceae), 28 June 2006, P. Phengsintham (NUOL P106); *ibid.*, 28 December 2008, P. Phengsintham (NUOL P392).

Cercospora diplaziicola A.K. Das, *Indian J. Mycol. Res.* **27**(1): 37 (1989).

Notes: This species is distinct from *C. apii* s. lat. in having acicular to obclavate, 3-6 µm wide conidia, with an obconically truncate base (Crous & Braun 2003). The Laos collection is similar to material reported by Das (1989), but with conidia 3-5 µm wide.

Known hosts: *Diplazium esculentum* (Woodsiaceae).

Known distribution: India, Laos (this paper), Thailand (this paper).

Material examined: Laos, Luangprabang Province, Xiengneun District, Lak Ten Village, on a leaf of *Diplazium esculentum* (Woodsiaceae), 7 February 2007, P. Phengsintham (NUOL P252); Vientiane Province, Xaysomboun District, Lak 33 Village, 28 May 2009, P. Phengsintham (NUOL P410); Thailand, Chiang Rai Province, Muang District, Sri Pangxang Village, 31 August 2009, P. Phengsintham (MFLU10 0284).

Cercospora durantae Chupp & A.S. Mull., *Bol. Soc. Venez. Ci. Nat.* **8**: 43 (1942).

Notes: In the Laos collection conidiophores were 17-35 × 4-5 µm (\bar{x} = 23.1 × 4.6 µm, n = 11) and conidia were 24-59(-144) × 2-4 µm (\bar{x} = 52 × 3.35 µm, n = 10).

Known hosts: *Duranta mutisii*, *Duranta erecta* [= *D. repens*] (Verbenaceae).

Known distribution: Laos (this paper), Thailand, Venezuela.

Material examined: Laos, Xiangkhouang Province, Paek District, Phonsavane Village, on *Duranta erecta* 3 January 2010, P. Phengsintham (NUOL P515).

Cercospora nasturtii Pass., *Hedwigia* **16**(6): 124 (1877).

Notes: In the Laos collection the conidiophores are $20\text{--}134 \times 4\text{--}5 \mu\text{m}$ ($\bar{x} = 64.4 \times 4.9 \mu\text{m}$, $n = 15$) and the conidia are $22\text{--}75 \times 3\text{--}4 \mu\text{m}$ ($\bar{x} = 36.4 \times 3.7 \mu\text{m}$, $n = 10$), which is similar [conidiophores $35\text{--}90 \times 4\text{--}6 \mu\text{m}$, conidia $20\text{--}85 \times 3\text{--}4.5 \mu\text{m}$] to those reported in Hsieh & Goh (1990) and Chupp (1954) [conidiophores $20\text{--}100(-150) \times 4\text{--}6.5 \mu\text{m}$, conidia $20\text{--}85(-125) \times 4\text{--}5(-6) \mu\text{m}$].

Known on a wide range of hosts belonging to the Cruciferae, cosmopolitan (see Crous & Braun 2003).

Known distribution: new to Laos (this paper), otherwise widespread, see Crous & Braun (2003).

Material examined: Laos, Vientiane Capital, Xaythany District, Dong Dok Village, on leaf of *Nasturtium officinale* (Cruciferae), 2 February 2007, P. Phengsintham (NUOL P220), Xiangkhouang Province, Kham District, Napa Village, 3 January 2010, P. Phengsintham (NUOL P503).

Cercospora taccae (Syd. & P. Syd.) Chupp, *A Monograph of the fungus genus Cercospora*: 560 (1954).

Notes: This taxon is close to or identical with *Cercospora apii* s. lat. (Crous & Braun 2003). In the Laos collection, the conidiophores are $35\text{--}179 \times 4\text{--}6 \mu\text{m}$ ($\bar{x} = 98 \times 5.09 \mu\text{m}$, $n = 11$) and the conidia are $73\text{--}195 \times 3\text{--}6 \mu\text{m}$ ($\bar{x} = 115.25 \times 4.75 \mu\text{m}$, $n = 11$), i.e. they are longer than those reported in Chupp (1954) [conidiophores $25\text{--}75 \times 4\text{--}6 \mu\text{m}$, conidia $50\text{--}150 \times 2\text{--}4 \mu\text{m}$].

Known hosts: *Tacca chantrieri*, *T. integrifolia* [= *T. cristata*], *T. leontopetaloides* [= *T. involucrata*, *T. pinnatifida*], *T. macrantha*, *T. palmata*, *Tacca* sp. (Taccaceae).

Known distribution: new to Laos (this paper), further distribution see Crous & Braun (2003).

Material examined: Laos, Luangprabang Province, Xiengngeun District, Lak 10 Village, on leaves of *Tacca integrifolia* (Taccaceae), 7 February 2007, P. Phengsintham (NUOL P244).

Passalora aenea (Cif.) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and its anamorphs: 1. Names published in Cercospora and Passalora*. *CBS Biodiversity Series* **1**: 46 (2003).

= *Berteromyces aeneus* Cif., *Sydowia* **8**: 267. 1954.

Notes: The conidiophores ($15\text{--}140 \times 3\text{--}5 \mu\text{m}$) and conidia ($19\text{--}53 \times 4\text{--}6 \mu\text{m}$) in the collection from Laos are narrower than the data given in Ciferri's (1954) original description [conidiophores $46\text{--}57 \times 7\text{--}12 \mu\text{m}$ and conidia $60\text{--}75 \times 6\text{--}9 \mu\text{m}$]. This species is well characterized by having rather wide clavate conidiophores in compact fascicles.

Known hosts: *Cassia fistula*, *C. goratensis*, *C. grandis*, *C. javanica*, *C. marylandica*, *C. Cassia* sp., *Chamaecrista nictitans*, *Senna alata*, *S. bicapsularis*, *S. floribunda*, *S. hirsuta* (incl. var. *leptocarpa*), *S. macranthera*, *S. occidentalis*, *S. petersiana* (= *S. septemtrionalis*), *S. siamea* (Leguminosae).

Known distribution: Brazil, Barbados, Colombia, Ethiopia, India, Laos (this paper), Jamaica, Tanzania, Uganda, USA, Zambia (see Crous & Braun 2003).

Material examined: Laos, Vientiane Capital, Xaythany District, Xay Village, on leaf of *Senna siamea* (Leguminosae), 28 December 2008, P. Phengsintham (NUOL P399).

Passalora capsicola (Vassiljevsky) U. Braun & F.O. Freire, *Cryptog. Mycol.* **23**(4): 299 (2003) [2002]

Notes: The collection from Laos has conidiophores (13-34 × 4-6 µm) and conidia (14-92 × 3-6 µm) which are similar to those described in Ellis (1976) [conidiophores up to 70 × 3-5 µm and conidia 17-80 × 3-5 µm].

Known hosts: *Capsicum annuum* (= *C. frutescens*, *C. grossum*), *Capsicum* sp. (Solanaceae).

Known distribution: new to Laos (this paper), otherwise widespread (see Crous & Braun 2003).

Material examined: Laos, Xiengkhouang Province, Paek District, Phonsavan Village, on leaves of *Capsicum annuum* (Solanaceae), 3 January 2010, P. Phengsintham (NUOL P513).

Passalora erythrinae (Ellis & Everh.) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and its anamorphs: I. Names published in Cercospora and Passalora. CBS Biodiversity Series* **1**: 176 (2003)

≡ *Cercospora erythrinae* Ellis & Everh., *J. Mycol.* **3**: 18. 1887.

Notes: This species is characterized by having conspicuous conidiogenous loci and narrowly obclavate, subhyaline to pale olivaceous conidia (Crous & Braun 2003). The Laos collection has conidiophores of 18-54 × 4-6 µm and conidia of 43-58 × 4-5 µm, 0-3-septate, which are similar to those described in Ellis (1976) [conidiophores 30-50 × 3-5 µm, conidia 22-55 × 3-3.5 µm, 2-5-septate].

Known hosts: *Erythrina crista-galli* and *E. stricta*.

Known distribution: new to Laos (this paper), USA.

Material examined: Laos, Vientiane Capital, Xaythany District, Dongdok Village, on leaf of *Erythrina stricta* (Leguminosae), 27 April 2006, P. Phengsintham (NUOL P27).

Passalora haldinae C. Nakash. & Meeboon [as '*haldinae*'], in Nakashima, Meeboon, Motohashi & To-anun, *Fungal Diversity* **26**(1): 259 (2007).

Notes: In the Laos collection the conidiophores are 12-70 × 2-5 µm (\bar{x} = 31 × 3 µm, n = 16) and the conidia are 65-70 × 2-3 µm (\bar{x} = 67.5 × 2.3 µm, n = 3), i.e. they are similar in size to the collection from Thailand (Nakashima *et al.* 2007) [conidiophores 15-63 × 2.8-3.6 µm, conidia 24-80 × 2.7-5 µm], but the material from Laos differs in having smaller stromata (up to 32 µm diam.).

Known hosts: *Haldina cordifolia*.

Known distribution: new to Laos (this paper), Thailand.

Material examined: Laos, Vientiane Capital, Xaythany District, Dong Makkhai Village, on leaf of *Haldina cordifolia* (Rubiaceae), 20 May 2006, P. Phengsintham (NUOL P53), *ibid.*, 9 December 2008, P. Phengsintham (NUOL P382).

Passalora perfoliati (Ellis & Everh.) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and its anamorphs: I. Names published in Cercospora and Passalora. CBS Biodiversity Series* **1**: 314 (2003).

Notes: The specimen from Laos differs from the material described by Hsieh & Goh (1990) in lacking stromata and conidiophores which are mostly not fasciculate.

Known hosts: *Ageratum conyzoides*, *Chromolaena* sp., *Eupatorium ageratooides*, *E. odoratum* (\equiv *Chromolaena odorata*), *E. perfoliatum*, *E. repandum*, *E. rugosum*, *E. sessilifolium*, *Eupatorium* sp., *Eutrochium purpureum* (\equiv *Eupatorium purpureum*) (Compositae).

Known distribution: new to Laos (this paper), otherwise widespread see Crous & Braun (2003).

Material examined: Laos, Luang Prabang Province, Phoukhoun district, Pha Deng Noi Village, on leaf of *Chromolaena* sp. (Compositae), 17 June 2006, P. Phengsintham (NUOL P101); Thailand, Chiang Mai, 17 July 2007, P. Phengsintham (MFLU10 0285); *Ibid.*, Chiang Rai, 28 May 2008, P. Phengsintham (MFLU10 0286).

Passalora tithoniae (R.E.D. Baker & W.T. Dale) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and its anamorphs: 1. Names published in Cercospora and Passalora. CBS Biodiversity Series 1*: 404 (2003).

Notes: The collection from Laos has longer conidiophores (14-144 \times 3-5 μ m) and conidia (17-73 \times 4-6 μ m) compared with the description in Hsieh & Goh (1990) [conidiophores 30-90 \times 3-4 μ m, conidia 30-50 \times 3.5-5 μ m].

Known hosts: *Tithonia diversifolia*, *T. rotundifolia* (= *T. speciosa*, *T. tagetiflora*), *Viguiera dentata* (Compositae).

Known distribution: new to Laos, furthermore Barbados, Cuba, Hong Kong, India, Ivory Coast, Mauritius, Singapore, Taiwan, Trinidad and Tobago (Crous & Braun 2003).

Material examined: Laos, Luangnamtha Province, Luangnamtha District, Chaleunsouk Village, on leaf of *Tithonia diversifolia* (Compositae), 20 February 2010, P. Phengsintham (NUOL P572).

Pseudocercospora baliospermi (S. Chowdhury) Deighton, *Mycol. Pap.* **140**: 139 (1976).

Notes: The sample from Laos agrees well with the description in Deighton (1976).

Known hosts: *Baliospermum solanifolium* (= *B. montanum*) (Euphorbiaceae).

Known distribution: India, Laos (this paper) and Myanmar.

Material examined: Laos, Xiengkhouang Province, Kham District, Napa Village, on leaf of *Baliospermum montanum* (Euphorbiaceae), 3 January 2010, P. Phengsintham (NUOL P504).

Pseudocercospora buddleiae (W. Yamam.) Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* **2**(2): 114 (1987).

Notes: The collection from Laos differs from the description of this species in Hsieh & Goh (1990) in having larger stromata (20-45 μ m diam.) and larger conidiophore fascicles (16-31 per fascicle) [versus stromata small, and conidiophores 2-12 per fascicle]. The conidiophores are 35-315 \times 4-5 μ m (versus 40-120 \times 3.5-6 μ m) and the conidia are 33-53 \times 3-4 μ m (versus 25-75 \times 3.5-5 μ m).

Known hosts: *Buddleja asiatica*, *B. curviflora*, *B. davidii*, *B. insignis*, *B. madagascariensis*, *Buddleia* sp. (Buddleiaceae).

Known distribution: China, India, Indonesia, Laos (this paper), Japan, Philippines, Taiwan.

Material examined: Laos, Luangnamtha Province, Luangnamtha District, Chaleunsouk Village, on leaves of *Buddleja asiatica* (Buddlejaceae), 19 February 2010, P. Phengsintham (NUOL P560).

Pseudocercospora cassiae-occidentalis (J.M. Yen) J.M. Yen, *Bull. Trimestriel Soc. Mycol. France* **97**(2): 93 (1981)

Notes: The Laos collection differs from that described in Hsieh & Goh (1990) in having smaller conidiophores [$15\text{--}69 \times 3\text{--}5 \mu\text{m}$ ($\bar{x} = 43.6 \times 4.33 \mu\text{m}$, $n = 30$), versus $60\text{--}130 \times 4\text{--}5 \mu\text{m}$] and smaller, sometimes verruculose conidia [$10\text{--}53 \times 2.5\text{--}4 \mu\text{m}$ ($\bar{x} = 30.4 \times 3.2 \mu\text{m}$, $n = 26$), versus $62\text{--}100 \times 3.5\text{--}4.8 \mu\text{m}$].

Known hosts: *Senna occidentalis* (Leguminosae).

Known distribution: China, Laos (this paper), Singapore, Taiwan.

Material examined: Laos, Vientiane Capital, Xaythany District, Dong Dok Village, on leaf of *Senna occidentalis* (Leguminosae), 25 July 2006, P. Phengsintham (NUOL P108); *ibid.*, Dong Dok Village, 9 December 2008, P. Phengsintham (NUOL P382).

Pseudocercospora catappae (Henn.) X.J. Liu & Y.L. Guo, *Mycosystema* **2**: 230 (1989)

Notes: In the Laos specimen the conidiophores are $12\text{--}25 \times 3\text{--}5 \mu\text{m}$ and the conidia are $51\text{--}80 \times 3\text{--}4 \mu\text{m}$, which is similar to those described in Hsieh & Goh (1990) [conidiophores $20\text{--}80 \times 3.5\text{--}5 \mu\text{m}$, conidia $35\text{--}145 \times 3\text{--}5 \mu\text{m}$].

Known hosts: *Terminalia arjuna*, *T. catappa*, *T. chebula*, *T. crenulata*, *T. tomentosa*, *Terminalia* sp. (Combretaceae).

Known distribution: Laos (this paper) and several other countries (see Crous & Braun 2003).

Material examined: Laos, Vientiane Capital, Xaythany District, Dongmakhai Village, on leaf of *Terminalia tomentosa* (Combretaceae), 4 February 2010, P. Phengsintham (NUOL P543).

Pseudocercospora combretigena U. Braun, *Nova Hedwigia* **73**(3-4): 421 (2001)

Notes: In the collection from Laos the conidiophores are $26\text{--}99 \times 4\text{--}5 \mu\text{m}$ and the conidia are $50\text{--}70 \times 2\text{--}4 \mu\text{m}$, which is similar to those described in Braun (2001) [conidiophores $50\text{--}100 \times 3\text{--}5 \mu\text{m}$, conidia $40\text{--}70 \times 3\text{--}4 \mu\text{m}$].

Known hosts: *Getonia floribunda* [\equiv *Calycopteris floribunda*] (new host), *Combretum* sp. (Combretaceae).

Known distribution: Indonesia, Laos (this paper).

Material examined: Laos, Vientiane Capital, Xaythany District, Dongmakhai Village, on leaf of *Getonia floribunda* (Combretaceae), 4 February 2010, P. Phengsintham (NUOL P545).

Pseudocercospora duabangae M.D. Mehrotra & R.K. Verma. *Mycological Research* **95** (10): 1163-1168 (1991). (Re-described as this species poorly known) Figs 1(1-2).

Description: **Leaf spots/lesions** subcircular to irregular, 1-4 mm diam., at first yellowish, later becoming brown, dingy gray to pale tan, brown to dark brown at the margin. **Caespituli/colonies** hypophyllous, conspicuous. **Mycelium** internal; **hyphae** branched, 2-5 μm wide ($\bar{x} = 2.96 \mu\text{m}$, $n = 30$), septate, constricted at the septa, distances between septa 8-25 μm ($\bar{x} = 14 \mu\text{m}$, $n = 30$), brownish, subhyaline, wall approximately 0.3-0.5 μm wide ($\bar{x} = 0.35 \mu\text{m}$, $n = 30$), smooth, forming plate-like plectenchymatous stromatic hyphal aggregations. **Stromata** oval to ellipsoidal, 4-65 μm diam. ($\bar{x} = 37.9 \mu\text{m}$, $n = 30$), brown to dark brown, stroma cells oval,

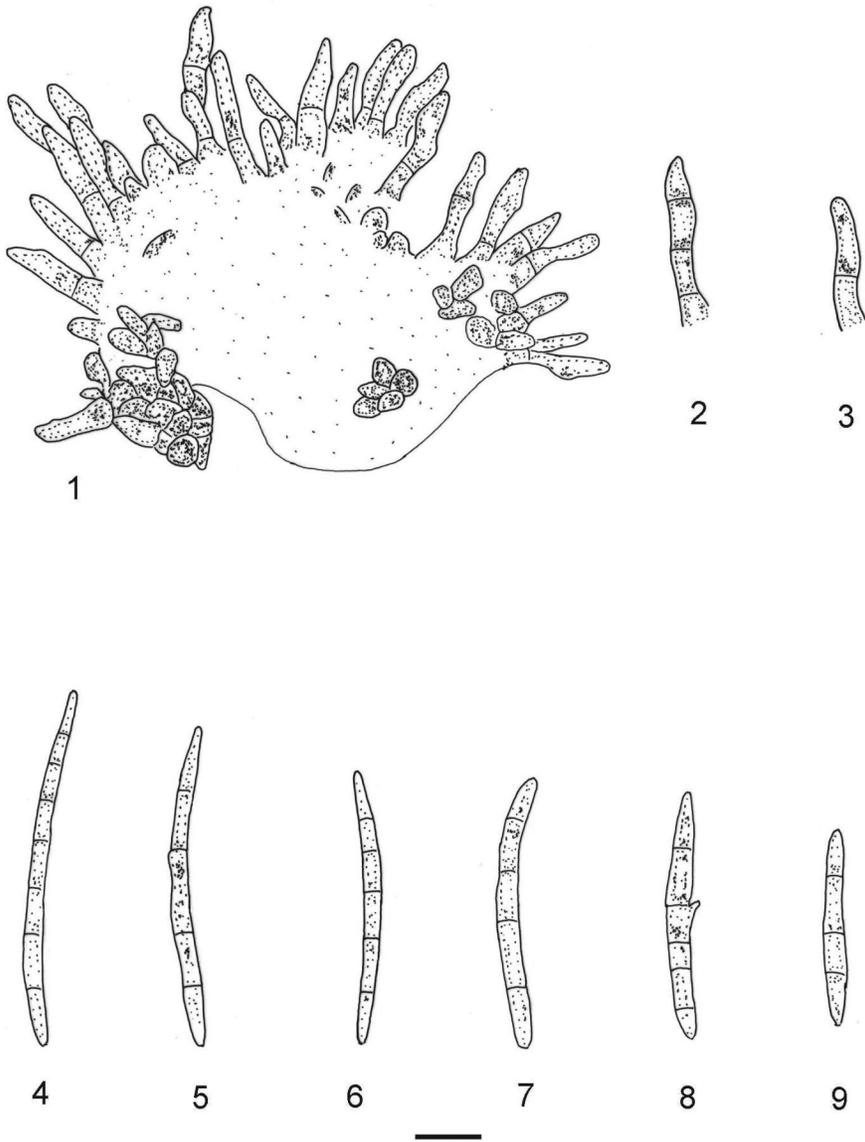


Fig. 1(1), 1-9. *Pseudocercospora duabangae* on *Duabanga grandiflora*: 1. Stroma with attached conidiophores. 2-3. Conidiophores. 4-9. Conidia. Bar: 1-9 = 10 μ m.

ellipsoidal to angular, 3-7 μ m wide (\bar{x} = 4.4 μ m, n = 30), dark brown, wall 0.5-0.8 μ m wide (\bar{x} = 0.63 μ m, n = 30), smooth. **Conidiophores** fasciculate, arising from stromata (2-45 per fascicle), geniculate, unbranched, 8-34 \times 2-5 μ m (\bar{x} = 18.1 \times 3.7 μ m, n = 15), 0-3-septate, slightly constricted at the septa, distances between septa 5-14 μ m long (\bar{x} = 8.37 μ m, n = 30), uniformly pale to medium brown, much paler and narrower towards the tip, wall approximately 0.3-0.5 μ m

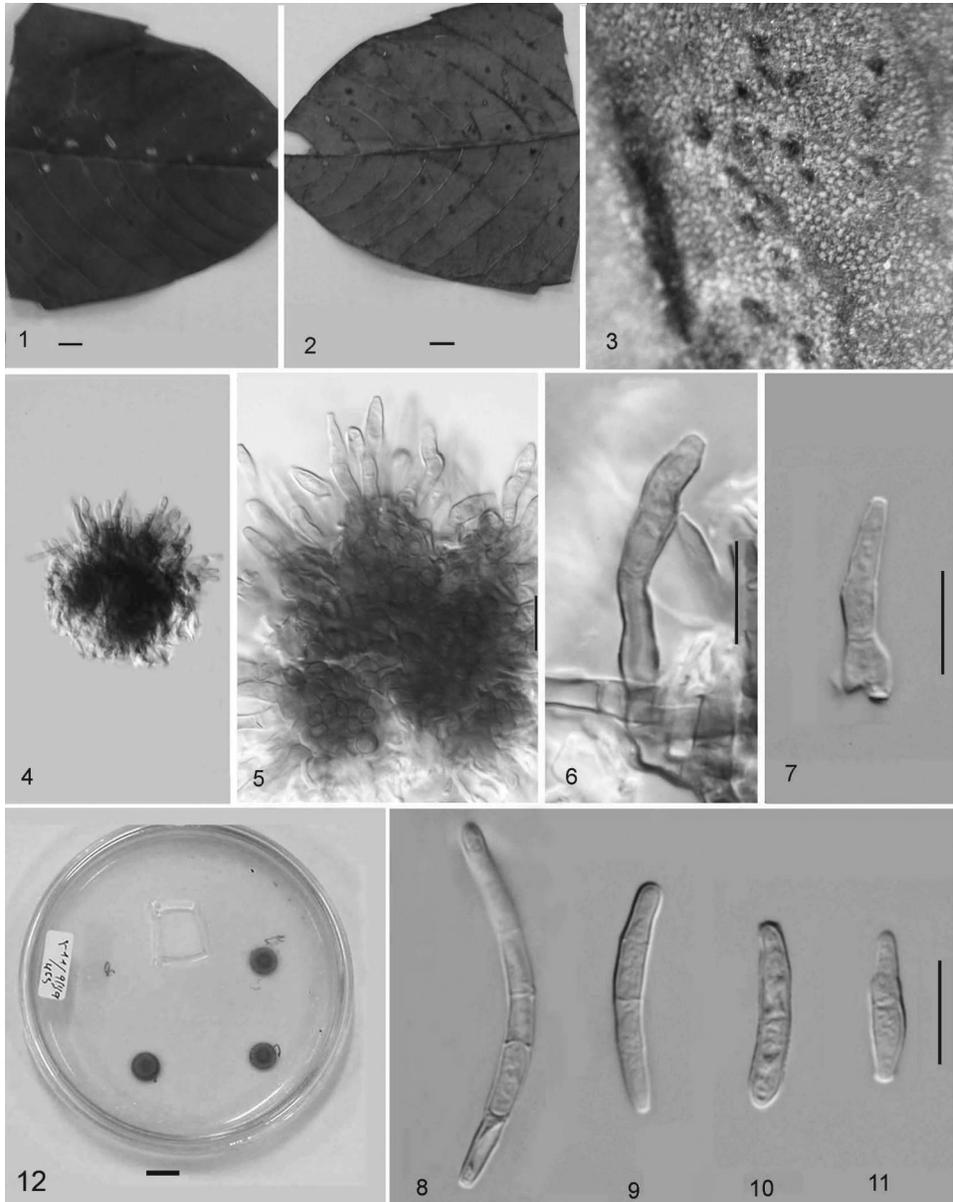


Fig. 1(2), 1-12. *Pseudocercospora duabangae* on *Duabanga grandiflora* from leaf spots: 1-2. Lesions on host leaves (1. Upper surface and 2. Lower surface). 3. Caespituli. 4-5. Stromata with attached conidiophores. 6,7. Conidiophores. 8-11. Conidia. 12. Culture. Bar: 1-2 = 10 mm, 3. Not to scale. 4-11 = 10 μ m. 12 = 10 mm.

(\bar{x} = 0.47 μ m, n = 30), smooth. **Conidiogenous cells** terminal, 8-14 \times 3-4 μ m (\bar{x} = 10.1 \times 3.43 μ m, n = 14), apex obtuse, **conidiogenous loci** inconspicuous, unthickened, not darkened. **Conidia** solitary, obclavate, straight to slightly curved, 18-61 \times 2-3 μ m (\bar{x} = 38.4 \times 2.76 μ m, n = 15), 1-7-septate, pale olivaceous-brown,

wall 0.3-0.5 μm wide (\bar{x} = 0.31 μm , n = 15), smooth, tip subacute, base truncate, hila 1-2 μm wide (\bar{x} = 1.61 μm , n = 9).

Known hosts: *Duabanga grandiflora*.

Known distribution: India, Laos (this paper), Thailand.

Material examined: Laos, Vientiane Province, Home District, Pha En Village, on leaf of *Duabanga grandiflora* (Lythraceae, incl. Duabangaceae and Sonneratiaceae), 18 November 2009, P. Phengsintham (NOUL P465); Xiangkhouang Province, Phoukood District, Namchad Village, 3 January 2010, P. Phengsintham (NUOL P511); Thailand, Chiang Rai Province, Khounkon water fall, 18 December 2009, P. Phengsintham (MFLU10 0287).

Cultural characteristics: **Mycelial colonies** on PDA after three weeks at 25 °C with dark gray mycelium, reaching 6-8 mm diam., hyphae 2-5 μm wide (\bar{x} = 2.96 μm , n = 30), septate, constricted at the septa, distances between septa 7-25 μm (\bar{x} = 14.96 μm , n = 30), brownish or subhyaline, wall approximately 0.3-0.5 μm wide (\bar{x} = 0.35 μm , n = 30), smooth. **Conidiophores** and **conidia** not formed in the culture.

Notes: There is a previous record of *Pseudocercospora duabangae* on *Duabanga* spp. *Duabanga* has previously been placed in the Duabangaceae or Sonneratiaceae. However, according to new phylogenetic results, *Duabanga* is now placed in the Lythraceae (see "Angiosperm Phylogeny Website" of Missouri Botanical Garden). Among *Pseudocercospora* spp. on other hosts of the Lythraceae, *P. duabangae* is morphologically comparable with *P. lagerstroemiae-subcostatae* (Sawada) Goh & W.H. Hsieh (conidiophores up to 60 μm long, conidia cylindrical to obclavate-cylindrical) and *P. lythracearum* (Heald & F.A. Wolf) X.J. Liu & Y.L. Guo (caespituli amphigenous, conidiophores uniformly olivaceous or pale olivaceous-brown, conidia up to 90 \times 4 μm) [Chupp 1954, Hsieh & Goh 1990, Guo & Hsieh 1995]. Other species on host of the Lythraceae are quite distinct, e.g. *P. lagerstroemiigena* Goh & W.H. Hsieh (with superficial hyphae and solitary conidiophores, conidiophores narrower, only 2-3 μm wide), *P. woodfordiae* X.J. Liu & Y.L. Guo (conidiophores up to 260 μm long, often subsynnematosus, conidia 4-6.5 μm wide) or *P. woodfordiigena* U. Braun & Crous (stromata very large, 60-120 μm diam., conidiophores up to 65 μm long, conidia narrowly linear, up to 130 \times 2-3.5 μm) [Chupp 1954, Hsieh & Goh 1990, Guo & Hsieh 1995, Crous & Braun 2003].

Pseudocercospora gmelinae (J.M. Yen & Gilles) J.M. Yen, *Bull. Trimestriell Soc. Mycol. France* **94**(4): 383 (1979).

Notes: In the Laos collection the conidiophores are 27-70 \times 5-7 μm and the conidia are 14-40 \times 4-6 μm , which is similar to those described in Yen (1979).

Known hosts: *Gmelina arborea* and *Gmelina* sp.

Known distribution: Ivory Coast, Laos (this paper), Philippines, Thailand and Venezuela.

Material examined: Laos, Bolikhamxay Province, Khamkeud District, Nongxong Village, on leaf of *Gmelina arborea* (Verbenaceae), 10 August 2008, P. Phengsintham (NUOL P358); Xiengkhouang Province, Phoukood district, Namchat Village, on leaf of *Gmelina arborea*, 3 January 2010, P. Phengsintham (NUOL P505).

Pseudocercospora holarrhenae (Thirum. & Chupp) Deighton, *Mycol. Pap.* **140**: 145 (1976)

Notes: In the sample from Laos the conidiophores are 23-37 \times 4-6 μm and the conidia are 27-86 \times 2-4 μm , which is similar to those described by Chupp (1954) [conidiophores 10-40 \times 2-4 μm , conidia 20-75 \times 2-4 μm].

Known hosts: *Holarrhena antidysenterica*, *H. curtisii* (this paper).

Known distribution: India and Laos (this paper).

Material examined: Laos, Vientiane Province, Phonhong District, Thalad Village, on leaf of *Holarrhena curtisii* (Apocynaceae), 4 February 2010, P. Phengsintham (NUOL P540).

Pseudocercospora macarangae (Syd. & P. Syd.) Deighton, *Mycol. Pap.* **140**: 47 (1976)

Notes: In the Laos specimens the conidiophores are 30-210 × 4-5 µm and the conidia are 22-58 × 3-5 µm, which is similar to those described by Hsieh & Goh (1990) and Guo & Hsieh (1995) [conidiophores 70-150 × 3-5.5 µm, conidia 20-75 × 4.5-6 µm].

Known hosts: *Macaranga cuspidata* (= *M. peltata*), *M. denticulata*, *M. grandifolia*, *M. indica*, *M. tanarius* (Euphorbiaceae).

Known distribution: China, India, Laos (this paper), Philippines, Singapore, Taiwan.

Material examined: Laos, Luangnamtha Province, Luangnamtha District, Chaleunsouk Village, on leaf of *Macaranga denticulata* (Euphorbiaceae), 19 February 2010, P. Phengsintham (NUOL P564).

Pseudocercospora musae (Zimm.) Deighton, *Mycol. Pap.* **140**: 148 (1976)

Notes: The collection from Laos is characterized by conidiophores 10-22 × 5-6 µm and conidia 19-70 × 3-5 µm, which is similar to those described in Ellis (1971), Hsieh & Goh (1990) and Guo & Hsieh (1995) [conidiophores 5-45 × 3-5 µm, conidia 10-70 × 4-6 µm].

Known hosts: *Musa acuminata* (= *M. cavendishii*, *M. nana*), *M. banksii*, *M. basjoo*, *M. liukiensis*, *M. paradisiaca* (= *M. sapientum*), *M. textilis*, *Ensete ventricosa* (Musaceae).

Known distribution: Laos (this paper), otherwise widespread (see Crous & Braun 2003).

Material examined: Laos, Vientiane Capital, Xaythany District, Xay Village, on leaf of *Musa sapientum* (Musaceae), 29 July 2006, P. Phengsintham (NUOL P113).

Pseudocercospora namae (Dearn. & House) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and its anamorphs: 1. Names published in Cercospora and Passalora. CBS Biodiversity Series 1*: 288 (2003).

Notes: Crous & Braun (2003) mentioned that this species is a typical *Pseudocercospora* as it has inconspicuous conidiogenous loci; the conidiophores are fasciculate or solitary, arising from superficial hyphae. These characters were not described in Chupp (1954). In the Laos collection the conidiophores, 41-130 × 4-7 µm, and conidia, 37-111 × 4-6 µm, are longer than those (conidiophores 5-15 × 4-5 µm, conidia 40-100 × 2-3.5 µm) described in Chupp (1954).

Known hosts: *Hydrolea ovata*, *H. zeylanica* (Hydrophyllaceae).

Known distribution: Laos (this paper), USA.

Material examined: Laos, Vientiane Capital, Xaythany District, Dong Makkhai Village, on leaf of *Hydrolea zeylanica* (Hydrophyllaceae), 6 September 2006, P. Phengsintham (NUOL P159)

Pseudocercospora ocimicola (Petr. & Cif.) Deighton, *Mycol. Pap.* **140**: 149 (1976).

Notes: In the Laos specimen the conidiophores are 8-24 × 3-5 µm and the conidia are 28-82 × 3-4 µm, which is similar to those described in Hsieh & Goh (1990) [conidiophores 10-30 × 3-5 µm, conidia 25-70 × 3-4 µm]. Braun & Uruga

(2008) reduced *Cercospora hyptidicola* Chupp & A.S. Mull. (nom. inval.) to synonymy with *P. ocimicola* and referred collections on *Hyptis* to the latter species.

Known hosts: *Hyptis suaveolens*, *Hyptis* sp., *Marsypianthes chamaedrys*, *Ocimum americanum*, *O. basilicum*, *O. campechianum* (= *O. micranthum*), *O. kilimandscharicum*, *O. tenuiflorum* (= *O. sanctum*) [this paper], *Ocimum* sp. (Labiatae).

Known distribution: Brazil, China, Cuba, Dominican Republic, Fiji, India, Laos (this paper), New Zealand, Taiwan, Vanuatu.

Material examined: Laos, Vientiane Capital, Xaythany District, Xay Village, on leaf of *Ocimum tenuiflorum* (Labiatae), 4 February 2010, P. Phengsintham (NUOL P541).

Pseudocercospora piperis (Pat.) Deighton, *Mycol. Pap.* **140**: 150 (1976).

Notes: The collection from Laos is characterized by having shorter conidiophores (10-75 × 3-5 µm) and conidia (40-56 × 3-5 µm) than those reported in Ellis (1976) [conidiophores 50-120 × 4-6 µm; conidia 45-100 × 4-6 µm].

Known hosts: *Piper aduncum*, *P. arboretum* subsp. *tuberculatum* (≡ *P. tuberculatum*), *P. auritum*, *P. dilatatum*, *P. hispidum*, *P. jamaicense*, *P. lolot* (this paper, new host), *P. longum*, *P. marginatum*, *P. nigrum*, *P. sarmentosum* (= *P. lolot*), *Pothomorphe peltata* (≡ *Piper peltatum*), *P. umbellata* [≡ *Piper umbellatum*] (Piperaceae).

Known distribution: Laos (this paper), otherwise widespread, see Crous & Braun (2003).

Material examined: Laos, Xiengkhouang Province, Kham District, Napa Village, on leaf of *Piper sarmentosum* (Piperaceae), 3 January 2010, P. Phengsintham (NUOL P516).

Pseudocercospora sphaerellae-eugeniae (Rangel) Crous, Alfenas & R.W. Barreto, *Mycotaxon* **64**: 425 (1997)

Notes: In the Laos collection the leaf spot colour differs from that described in Hsieh & Goh (1990) and Chupp (1954) in being dark red, compared to uniformly brown or brown with a purple border. Conidiophores, 8-24 × 3-6 µm (\bar{x} = 14.8 × 4 µm, n = 13) and conidia, 5-78 × 2-3 µm (\bar{x} = 30.87 × 2.35 µm, n = 30), are shorter than those reported in Chupp (1954) and Hsieh & Goh (1990) [conidiophores 10-40 × 3-5 µm, conidia 20-40 × 2-4 µm].

Known hosts: *Syzygium cumini* (= *Eugenia jambolana*), *S. jambos*, *S. samarangense* (= *Eugenia javanica*), *Stenocalyx uniflorus* [≡ *Eugenia uniflora*] (Myrtaceae).

Known distribution: Bermuda, Brazil, China, India, Iran, Laos (this paper), Panama, Taiwan, Thailand, USA.

Material examined: Laos, Vientiane Capital, Xaythany District, Nakhae Village, on leaf of *Syzygium cumini* (Myrtaceae), 29 June 2006, P. Phengsintham (NUOL P111), *ibid.*, Nakhae Village, 9 December 2008, P. Phengsintham (NUOL P383).

Pseudocercospora tabernaemontanae (Syd. & P. Syd.) Deighton, *Mycol. Pap.* **140**: 154 (1976)

Notes: In the Laos collection the conidiophores (7-17 × 2-5 µm) and the conidia (15-77 × 2-4 µm) are smaller than those reported in Chupp (1954) and Hsieh & Goh (1990) [conidiophores 10-35 × 2-4 µm, conidia 15-65 × 2-3.5 µm].

Known hosts: *Tabernaemontana divaricata* (= *T. coronaria*), *T. heyneana*, *T. pandaque* (Apocynaceae).

Known distribution: India, Laos (this paper), Malaysia, Myanmar, Pakistan, Philippines, Singapore, Taiwan.

Material examined: Laos, Vientiane Capital, Xaythany District, Xay Village, on leaf of *Tabernaemontana coronaria* (Apocynaceae), 25 July 2006, P. Phengsintham (NUOL P107); 12 June 2008, Don Noune village NUOL P319); *ibid.*, Xay Village, 9 December 2008, P. Phengsintham (NUOL P387).

Pseudocercospora tectonicola J.M. Yen, A.K. Kar & B.K. Das, *Mycotaxon* **16**(1): 68 (1982).

Notes: The sample from Laos differs from the original description based on Indian material in having well-developed stromata, brown to dark brown and up to 40 µm diam. (versus stromata usually absent or sometimes developed, dark brown, subglobose, and up to 20 µm diam.). Conidiophores (5-20 × 3-4 µm and 0-1-septate) and conidia (35-63 × 3-4 µm) are smaller than in the Indian collection [conidiophores up to 120 µm, and up to 12-septate].

Known hosts: *Tectona grandis*.

Known distribution: India, Laos (this paper).

Material examined: Laos, Vientiane Capital, Xaythany District, Nong Viengkham Village, on leaf of *Tectona grandis* (Verbenaceae), 10 August 2006, P. Phengsintham (NUOL P138).

Pseudocercospora tetramelis A.N. Shukla & Sarmah, *Curr. Sci.* **53**(4): 204 (1984).

Notes: The new collections from Laos agrees well with the original description of this species from India. This species is morphologically somewhat intermediate between *Passalora* and *Pseudocercospora*. Such intermediate taxa are above all common in species with synnematosous conidiomata and conidiogenous cells which are barely geniculate, but rather subcylindrical. The new species is morphologically somewhat similar to *Phaeoisariopsis griseola*, the type species of *Phaeoisariopsis* which has similar conidiogenous cells, that is now placed in *Pseudocercospora* (confirmed by molecular methods, Crous *et al.* 2006). *P. tetramelis* has similar conidiogenous loci ranging from unthickened and not darkened to unthickened but slightly darkened-refractive or only the ultimate rim somewhat darkened. The hila of the conidia are all unthickened and not darkened-refractive. Hence, we would prefer to maintain this species rather in *Pseudocercospora* (as in the case of *Phaeoisariopsis griseola*).

Known hosts: *Tetrameles nudiflora* (Datisceae)

Known distribution: India, Laos (this paper).

Material examined: Laos, Vientiane Province, Home District, Pha En Village, on leaf of *Tetrameles nudiflora* (Datisceae), 18 November 2009, P. Phengsintham (NUOL P462).

Pseudocercospora trematicola (J.M. Yen) Deighton [as 'tremicola'], *Mycol. Pap.* **140**: 154 (1976).

Notes: In the Laos collection the conidiophores are 30-110 × 3-4 µm and the conidia are 44-80 × 4-5 µm, which is similar to those reported in Ellis (1971) and Hsieh & Goh (1990) [conidiophores 25-55 × 3.5-5.5 µm, conidia 20-90 × 4-5 µm].

Known hosts: *Trema cannabina* (incl. var. *dielsiana*), *T. guineensis*, *T. orientalis*, *T. politoria* (Ulmaceae).

Known distribution: Gabon, Ghana, India, Ivory Coast, Laos (this paper), Sierra Leone, Singapore, Taiwan, Thailand.

Material examined: Laos, Luangnamtha Province, Luangnamtha District, Chaleunsouk Village, on leaf of *Trema orientale* (Ulmaceae), 19 February 2010, P. Phengsintham (NUOL P563); Thailand, Chiang Rai Province, Tasud Muang District, Sripangxang Village, 25 January 2010, P. Phengsintham (MFLU10 0288).

Scolecostigmina mangiferae (Koord.) U. Braun & Mouch., in Braun, Mouchacca & McKenzie, *New Zealand J. Bot.* **37**(2): 323 (1999).

Notes: The collection from Laos differs from the description given in Ellis (1971) and Hsieh & Goh (1990) in having longer conidiophores with three annelations (versus up to seven annellations).

Known hosts: *Mangifera indica* (Anacardiaceae).

Known distribution: Laos (this paper) and several other countries (see Crous & Braun 2003).

Material examined: Laos, Vientiane Capital, Xaythany District, Dong Makkhai Village, on leaf of *Mangifera indica* (Anacardiaceae), 18 December 2008 P. Phengsintham (NUOL P388).

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

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Figs 2(1-2)

Stenellopsidis nepalensis remote affinis, itaque signis morphologicis valde differentibus, namque hyphis superficialibus cum conidiophoris solitariis et conidiis solitariis vel catenulatis, angustioribus, 2-4 μm latis.

Description: **Leaf spot/Lesion** variable, more or less irregularly orbicular, 2-30 mm diam., typically brown. **Caespituli/colonies** hypophyllous, conspicuous. **Mycelium** external; **hyphae** branched, 2-4 μm wide (\bar{x} = 3 μm , n = 10), septate, constricted at the septa, distances between septa 6-22 μm (\bar{x} = 13.8 μm , n = 10), pale olivaceous-brown, thin-walled, approximately 0.5-1 μm wide (\bar{x} = 0.63 μm , n = 10), verruculose. **Stromata** absent. **Conidiophores** borne on external hyphae, unbranched, cylindrical, 10-205 \times 3-4 μm (\bar{x} = 89.8 \times 3.57 μm , n = 23), 5-20-septate, distances between septa 5-19 μm (\bar{x} = 12 μm , n = 30), mid golden brown, wall approximately 0.5-0.8 μm (\bar{x} = 0.73 μm , n = 30), smooth. **Conidiogenous cells** integrated, terminal or intercalary, 8-19 \times 3-3.5 μm (\bar{x} = 12.3 \times 3.07 μm , n = 7), cylindrical, somewhat swollen and curved at the apex; **conidiogenous loci** forming minute, dark or refractive scars on lateral and terminal denticles, 1-1.5 μm diam. (\bar{x} = 1.2 μm , n = 8), giving rise to branched conidial chains, wall approximately 0.5-0.8 μm wide (\bar{x} = 0.62 μm , n = 8), thickened, darkened. **Conidia** solitary or catenulate, sometimes ellipsoidal-ovoid or subcylindrical, but mostly slightly obclavate, straight or slightly curved or sinuous, 16-145 \times 2-4 μm (\bar{x} = 55.2 \times 3.01 μm , n = 30), 1-9-septate, pale olivaceous, wall approximately 0.3-0.5 μm wide (\bar{x} = 0.42 μm , n = 30), smooth or finely verruculose, apex rounded or subtruncate; base short tapered, hila 1-2 μm wide (\bar{x} = 1.33 μm , n = 30), wall approximately 0.3-0.5 μm wide (\bar{x} = 0.4 μm , n = 30), thickened and darkened.

Known hosts: *Micromelum hirsutum*.

Known distribution: Laos (this paper).

Material examined: Laos, Vientiane Capital, Xaythany District, Dongmakkhai Village, on leaf of *Micromelum hirsutum* (Rutaceae), 4 February 2010, P. Phengsintham (NUOL P551, **holotype**); ex-type living culture deposited in Systematic Mycology and Lichenology Laboratory, Institute of Microbiology, Chinese Academy of Sciences, No.1 Beichen west road, Chaoyang District, Beijing 100101, PR China.

Cultural characteristics: **Colonies** on PDA after three weeks at 25°C with spreading mycelium, surface ridged, dark brown in the centre and grey margin, reaching 8-12 mm diam., **hyphae** often constricted at the septa, distances between septa 6-20 \times 2-4 μm (\bar{x} = 10.2 \times 3.7 μm , n = 30), thin-walled, approximately 0.3-0.8 μm (\bar{x} = 0.52 μm , n = 30), brownish to brown, smooth or verruculose. **Conidiophores** and **conidia** not formed in culture.

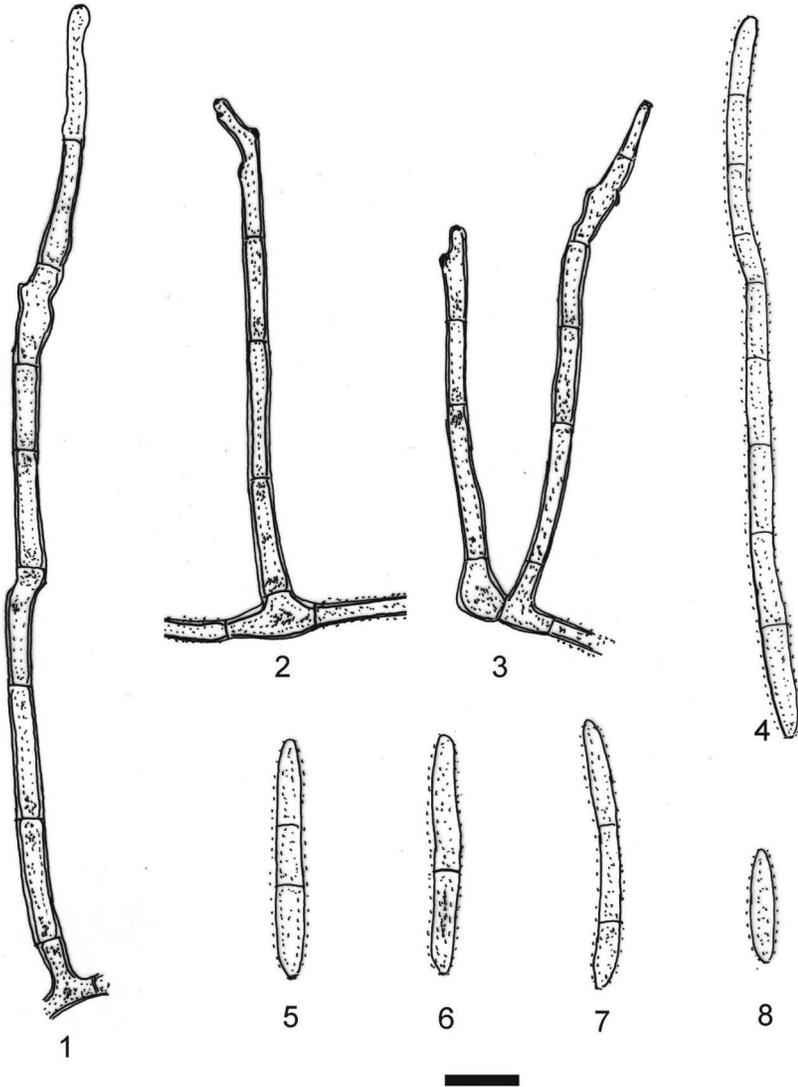


Fig. 2(1), 1-8. *Zasmidium micromeli* **sp. nov.** (from NUOL P551, holotype) on *Micromelum hirsutum*: 1-3. External mycelium with attached conidiophores. 4-8. Conidia. Bar: 1-8 = 10 μ m.

Remarks: *Stenellopsis nepalensis* on *Clausena platyphylla* in Nepal (Chaudhary *et al.* 1996) is the only additional zasmidium-like hyphomycete on a host of the Rutaceae. However, this species is quite distinct in having fasciculate conidiophores, lacking superficial hyphae and consistently singly formed wider conidia (27-125 \times 3-8 μ m).

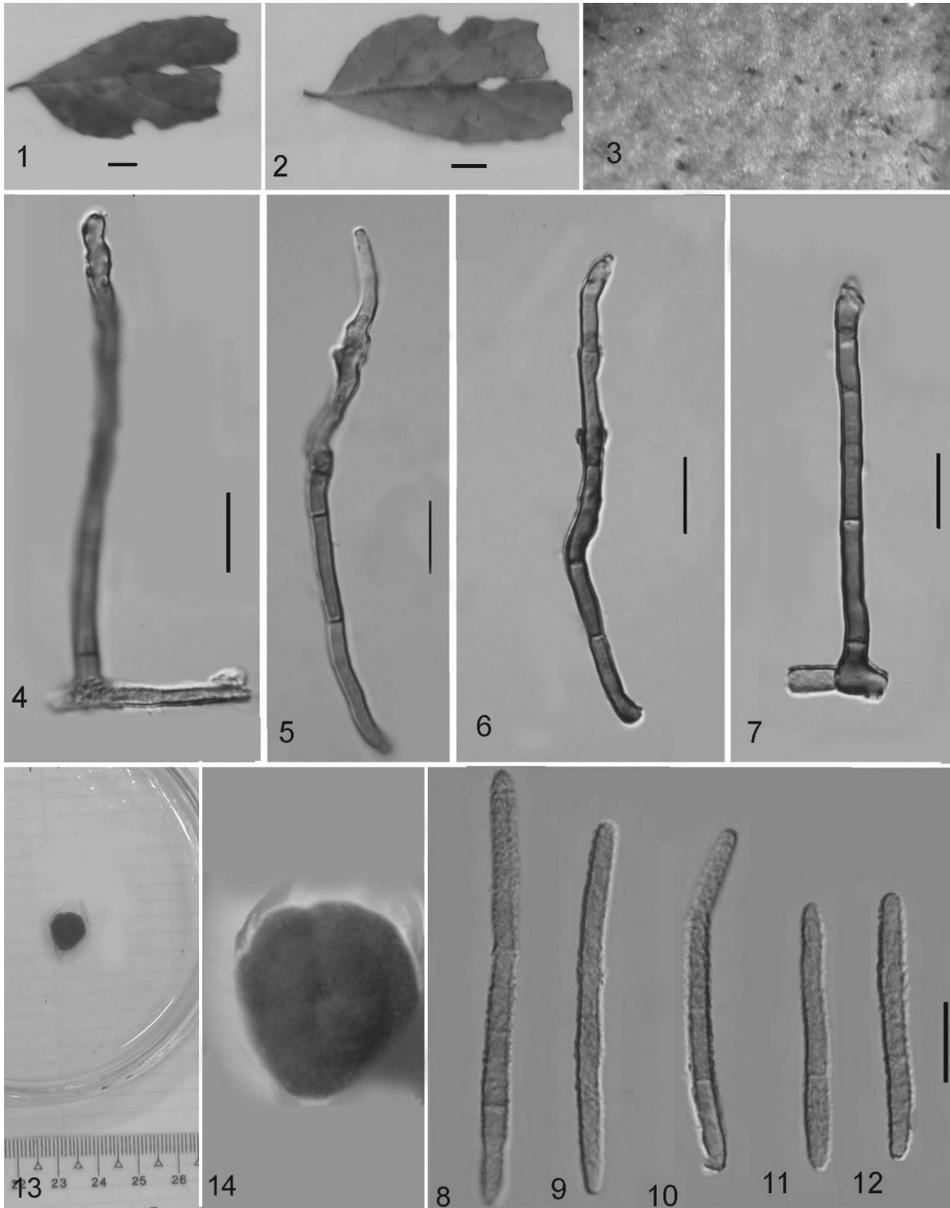


Fig. 2(2), 1-14. *Zasmidium micromeli* sp. nov. (from NUOL P551, holotype) from leaf spot on *Micromelum hirsutum*: 1-2. Lesions on host leaves (1. upper surface and 2. lower surface). 3. Caespituli. 4. External mycelia with attached conidiophore. 5-7. Conidiophores. 8-12. Conidia. 13. Culture. 14. Colony in culture. Bar lines: 1-2 = 10 mm, 3. Not to scale. 8-12 = 10 μ m. 13 = 10 mm. 14 Not to scale.

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