Chiang Mai J. Sci. 2017; 44(1) : 29-38
http://epg.science.cmu.ac.th/ejournal/
Contributed Paper

# New Species *Pseudocercospora* and New Records from Thailand

**Jeerapa Nguanhom, Khelang Wongsopa, Ratchadawan Cheewangkoon and Chaiwat To-anun**

Department of Entomology and Plant Pathology, Faculty of Agriculture, Chiang Mai University, Chiang Mai 50200,Thailand.

*Author for correspondence; e-mail: chaiwat.toanun@gmail.com

Received: 24 December 2013
Accepted: 4 May 2014

## ABSTRACT

*Pseudocercospora* is a large cosmopolitan genus of plant pathogenic fungi that are commonly associated with leaf and fruit spots as well as blights on a wide range of plant hosts. Three new *Pseudocercospora* species examined in the present research were collected and isolated in Thailand during a study of Mycosphaerella and related genera. These species include *Pseudocercospora kopsii*, *P. mitracarpi* and *P. pericampylii*, and 17 other species and represent new records for Thailand.

**Keywords:** *Pseudocercospora*, *Mycosphaerella*.

## 1. INTRODUCTION

*Pseudocercospora* is a large cosmopolitan genus of plant pathogenic fungi that are commonly associated with leaves, fruit spots or blights as well as necrotic leaves on a wide range of plant hosts. They occur in arid as well as wet environments and in a wide range of climates including cool temperate, sub-tropical and tropical regions [1-5].

*Pseudocercospora* is now recognised as a holomorphic genus in its own right, several species of which have links with *Mycosphaerella*-like teleomorphs [4, 6, 7].

However, *Pseudocercospora* and other Cercosporoid fungi can be found in many areas in tropical regions such as, Northern Thailand and Laos. These groups including species of *Pseudocercospora* are well recognised as plant pathogens, endophytes or saprobes. These fungi damage many host plants and occur on a large number of plants, many of which are important ornamentals and economic plants or food crops including fruits, cereals and commercially propagated forest trees [4]. There have been numerous reports of members of this group infecting host plants in Thailand including new species [8, 9, 10, 11, 12].

Ecologically most *Pseudocercospora* are host plant-specific and are called 'single species on each plant' fungi but some species are able to infect many host plants in a host family. [4] reported that more than 146 species occurring on 115 host genera were host specific.

In Thailand, there have been several recent comprehensive accounts of the fungi

of the country, and the cercosporoid fungi have been well studied there since 1980. [13] recorded 21 species of *Cercospora* in Thailand. [14] listed 47 identified and 13 unidentified species of *Cercospora* in *The Host Index of Plant Diseases in Thailand*, and [15] recorded 49 cercosporoid species. In addition, [16] reported eight new species of *Pseudocercospora*. There is still need, however, for additional taxonomic work in the Cercosporoid group in terms of morphology and phylogenetics especially with the fungal genus *Pseudocercospora*.

The expansion of the database of these pathogenic fungi is an ever-important task, particularly for plant pathologists and plant quaranrine researchers [17]. The current study of *Mycosphaerella* and allied genera in Thailand has been conducted with the aim of providing a comprehensive database of this group of fungi in this region.

## 2. MATERIALS AND METHODS

Specimen collection involved an observation of the presence/absence of the fruiting bodies/caespituli on the leaf. The observation was usually conducted using a 10× or 20× magnifying lens. Specimens that were positive, showed the presence of *Cercospora* fruiting bodies/caespituli, were placed in plastic bags.

The collecting bags were sealed and labeled including: name of host plants, collection site, collector/s, and collection date. Detailed observations of morphological characteristics were generally carried out by means of a dissecting microscope, followed by a compound light microscope using oil immersion (1000×). Specimens for microscopic observation were prepared by hand sectioning or using fine forceps. Water was found to be a very good temporary mounting medium. Shear's solution or lactophenol was usually used as media for permanent slides. Thirty conidia, hila, conidiophores, conidiogenous loci and 10 stromata were commonly measured for each specimen. Line drawings were prepared at a magnification of 400×, or 1000×, if necessary. Dried herbarium specimens were deposited at herbarium at CMU Herbarium (CMU), Biology Department, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand, and BIOTEC Herbarium (BBH), Bangkok, Thailand. Living cultures have been deposited at Molecular of Plant Pathology Laboratory, Department of Plant Pathology, Chiang Mai University.

## 3. RESULTS AND DISCUSSION

### *Pseudocercospora kopsii* Nguenhom, Cheewangkoon and To-anun, sp. nov. (Figure 1-2)

*Etymology*: *kopsii*, derived from the genus name of the host plant.

*Leaf spots* 7-18 mm diameter, amphigenous, solitary, circular to subcircular, scattered, brown, with indistinct border. *Caespituli* amphigenous. *Stromata* (18) 22.5 ± 4.8 (30) µm diameter, intraepidermal, well-developed, composed of brown to darkbrown cells. *Conidiophores* (11) 21 ± 5.9 (30.5) × (2) 3 ± 0.3 (3) µm, numerous in dense fascicles, 0-3-septate, arising from stromata, smooth, light brown to brown, simple, straight, not branched, geniculate. *Conidiogenous cells* integrated, terminal, holoblastic, monoblastic or polyblastic, sympodially proliferating. *Conidiogenous loci* inconspicuous, unthickened, and not darkened. *Conidia* (15) 29.5 ± 9.8 (57) × (1.5) 2 ± 0.2 (2.5) µm, solitary, subcylindric to obclavate, 4-9-septate, straight or slightly curved, smooth, hyaline to pale olivaceous, truncate at the base, with obtuse apex, hila unthickened and not darkened.

*Habitat*: on leaves of *Kopsia fruticosa* (Roxb.) A. DC. (*Apocynaceae*).

*Material examined*: THAILAND, Chiang Mai Province, Chiang Mai University, 12 August 2008, Jamjan Meeboon (BBH 23584: **holotype**).

**Notes**: Four *Pseudocercospora* species, *viz, P. byliana* (Syd.) J. M. Yen, *P.liebenbergii* (Syd.) Deighton*, P. tabernaemontanae* (Syd. and P. Syd.) Deighton*,* and *P. wrightiae* (Thirum. and Chupp) Deighton, have been recorded as species with amphigenous caespituli. This specimen is distinct from the four similar *Pseudocercospora* species in having geniculate conidiophores, and obclavate-filiform conidia with truncate bases and conspicuous septation. Due to the distinct morphological characteristics of this specimen in comparison to similar species this specimen was proposed as a new species.

***Pseudocercospora mitracarpi* Nguenhom, Cheewangkoon and To-anun, sp. nov. (Figure 3-4)**

*Etymology*: *mitracarpi*, derived from the genus name of the host plant.

*Leaf spots* 5-20 mm diameter, distinct, amphigenous, angular to irregular, scattered, dull brown, with dark margins, often limited by vein. *Caespituli* epipyllous, effuse. *Stromata* (31) 28 ± 9.6 (35.5) µm diameter, intraepidermal, small to well developed, composed of globular to angular, brown to dark brown cells, mycelium internal and external. *Conidiophores* (20.5) 36.5 ± 10.7 (54) × (3) 4 ± 0.7 (5) µm, 8 to numerous in a loosely to densely fasciculate, 2-4-septate, arising from the upper part of stromata as well as external mycelium, pale yellowish-brown, straight, smooth, branched, slightly geniculate at the apex. *Conidiogenous cells* integrated, terminal, holoblastic, mostly monoblastic. *Conidiogenous loci* inconspicuous, unthickened, and not darkened. *Conidia* (55) 112.5 ± 28 (163) × (2) 3 ± 0.5 (4) µm, solitary, filiform to long obclavate, 4-11-septate, straight or slightly curved, smooth, pale olivaceous, truncate at the base with obtuse apex, hila unthickened and not darkened.

*Habitat*: on leaves of *Mitracarpus villosus* Cham. And Schltdl. (*Rubiaceae*).

*Material examined*: THAILAND, Chiang Mai Province, Amphur San Sai, Tumbol Mae Fag, 3 August 2008, Jamjan Meeboon (BBH 23748: **holotype**).

**Notes**: Two *Pseudocercospora* species, viz, *P. borreriae* (Ellis and Everh.) Deighton and *Ps. mitracarpicola* (J. M. Yen and Gilles) U. Braun and Crous, have been recorded associated with the plant genus *Mitracarpus*. Crous and Braun (2003) noted that *P. mitracarpicola* has slightly conspicuous conidiogenous loci, and slightly thickened and darkened hila. This specimen is much closer to *P. borreriae* due to branched conidiophores, but differs in having epiphyllous caespituli, shorter conidiophores (20.5-54 × 3-5 mm vs 35-220 × 3-5.5 mm of *P. borreriae*), and longer conidia (55-163 □ 2-4 mm vs 30-90 × 2.5-5 mm of *P. borreriae*) with truncate base. Therefore, this study proposes this specimen as a new species of *Pseudocercospora* from *Mitracarpus villosus*.

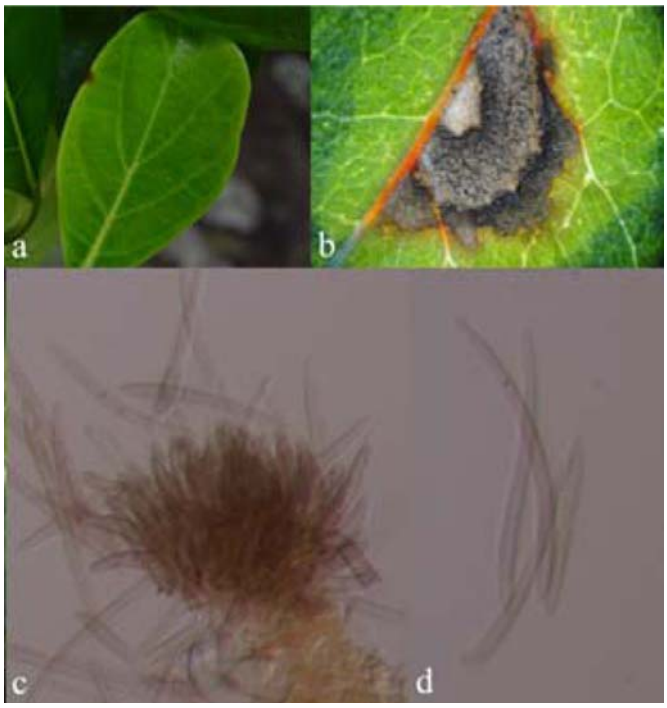


**Figure 1.** *Pseudocercospora kopsii* on *Kopsia fruticosa*. a. Leaf., b. Leaf spot., c. Conidiophores., d. Conidia.

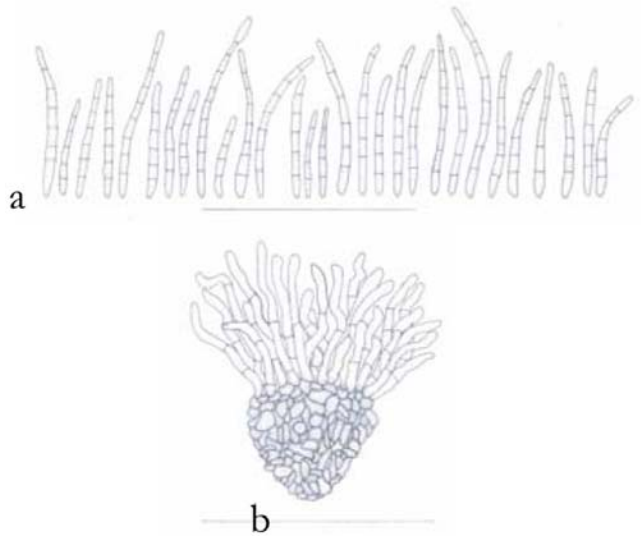


**Figure 2.** Line drawings of *Pseudocercospora kopsii* on *Kopsia fruticosa* (from holotype). a. Conidia., b. Stroma and conidiophores. Bars: a, b= 50 µm.


**Figure 3.** *Pseudocercospora mitracarpi* on *Mitracarpus villosus*. a. Leaves., b. Leaf spot., c. Conidiophores., d. Conidia.

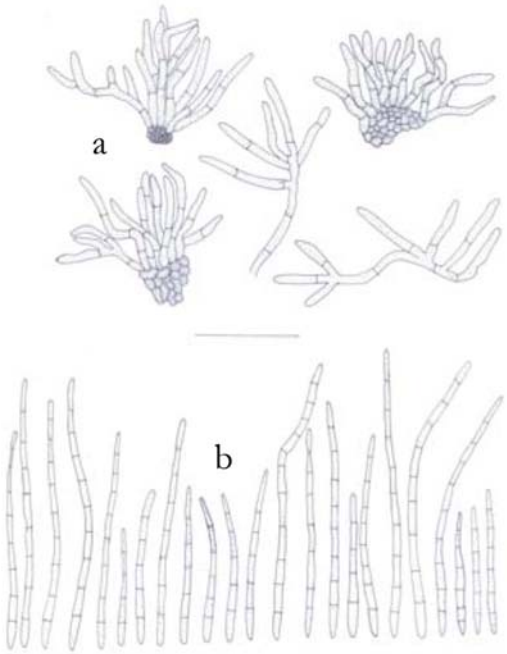


**Figure 4.** Line drawings of *Pseudocercospora mitracarpi* on *Mitracarpus villosus* (from holotype). a. Stroma and conidiophores., b. Conidia. Bars = 50 µm.

***Pseudocercospora pericampylii*** **Wongsopa, Nguenhom and To-anun, sp. Nov. (Figure 5-6)**

*Etymology*: *pericampylii,* derived from the genus name of the host plant.

*Leaf spots* 10-20 mm diameter, amphigenous, solitary, scattered through the host surface, circular to subcircular, brown, with dark brown margins. *Caespituli* amphigenous. *Stromata* 22-53 µm diameter, intraepidermal, well-developed, and composed of globose to subglobose, brown to dark brown cells. *Conidiophores* 84-207 × 3-4 µm, 13-25 in very dense fascicles, not divergent, 2-6-septate, arising from stromata, smooth, brown, and paler towards the apex, straight to decumbent, sometimes branched, slightly geniculate. *Conidiogenous cells* integrated, terminal, holoblastic, monoblastic or polyblastic, sympodially proliferating. *Conidiogenous loci* inconspicuous, unthickened, and not darkened. *Conidia* 27-116 × 3-4 µm, solitary, obclavate to filiform, straight to mildly curved, hyaline to subhyaline, 6-8-septate, smooth, truncate at the base, with obtuse to subobtuse apex, hila inconspicuous, unthickened, and not darkened.

*Habitat*: on leaves of *Pericampylus glaucus* Merr. (*Menispermaceae*).

*Material examined*: THAILAND, Chiang Mai Province, Amphur Mae Taeng, T. Pa Pae, Bahn Phadeng, Pathumikaram Temple, 9 September 2007, Nilam Wulandari (CMU 106: **holotype**).

**Notes**: About four species of *Pseudocercospora,* viz, *P. cocculi* (Syd.) Deighton, *Ps. cocculicola* (W. W. Ray) U. Braun and Crous, *Ps. pareirae* (Speg.) Crousand U. Braun, and *P. triloba* (Chupp) U. Braun and Crous, have been recorded from plant family *Menispermaceae*. This specimen is distinct from these similar species by having very long conidiophores (84-207 × 3-4 mm) very densely fasciculate but not divergent, and long conidia with truncate bases.


**Figure 5.** *Pseudocercospora pericampylii* on *Pericampylus glaucus*. a. Leaves., b. Leaf spot., c. Conidiophores., d. Conidia.

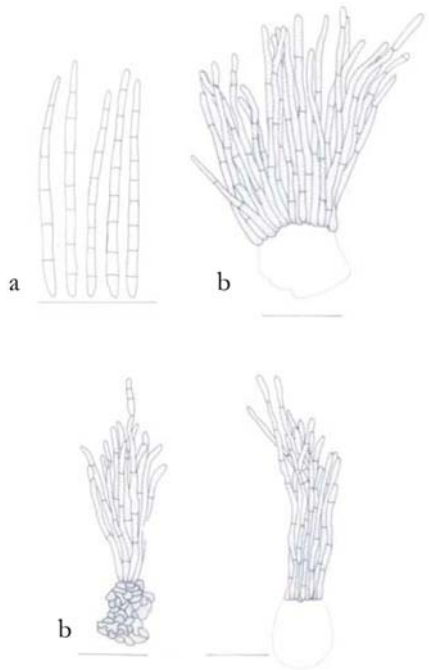


**Figure 6.** Line drawings of *Pseudocercospora pericampylii* on *Pericampylus glaucus* (from holotype). a. Conidia., b. Stroma and conidiophores. Bar = 50 µm.

**New records of *Pseudocercospora* and allied genera in Thailand**

***Pseudocercospora angolensis* (T.Carvalho and O. Mendes) Crous and U. Braun, *Sydowia* 55: 301 (2003).**

*Habitat*: on leaves of *Citrus reticulata* Blanco (*Rutaceae*).

*Material examined*: Chiang Mai Province, Amphur Sarapee, Tumbol Khua Mung, Farming area, 1 March 2008, Jamjan Meeboon (BBH 23605). *Stromata* (15) 44.5 ± 18.6 (60) µm diameter, composed of dark brown. *Conidiophores* (40) 60.3 ± 10.52 (80) × (2.5) 3 ± 0.3 (3.5) µm, 1-4 septate, brown. *Conidia* (17) 58 ± 18.5 (75) × (2) 2 ± 0.4 (3) µm, 3-7 septate, pale olivaceous.

***Pseudocercospora biophyti* (Syd. and P. Syd.) Deighton, *Mycol. Pap.* 140: 140 (1976).**

*Habitat*: on leaves of *Oxalis debilis* Kunth *var. corymbosa* (DC.) Lourteig (*Oxalidaceae*).

*Material examined*: Chiang Mai province, Amphur Mae Jam, Mae Hae Royal Project Area, 12 February 2008, Jamjan Meeboon and Iman Hidayat (BBH 23595). *Stromata* 5-15 µm diameter, brown to dark brown cells. *Conidiophores* 15-40 × 2.5-4.5 µm, 1-2 septate, brown. *Conidia* 30-110 × 2-2.5 µm , 3-4 septate, hyaline to subhyaline.

***Pseudocercospora centrosematicola* (J. M. Yen and G. Lim) J. M. Yen, *Gard. Bull., Singapore* 33: 171 (1980).**

*Habitat*: on leaves of *Centrosema pubescens* Benth (*Fabaceae*).

*Material examined*: Chiang Mai Province, Amphur Sarapee, 12 September 2007, Jamjan Meeboon and Iman Hidayat (BBH 23692); *ibid*, 9 August 2008, Jamjan Meeboon and Iman Hidayat (BBH 32487). *Stromata* 10-38 .00m diameter, brown to dark brown cells. *Conidiophores* 26-45 × 2-5 µm, 1-3 septate, brown. *Conidia* 48-95 × 2.5-4 µm, 4-7 septate, hyaline to subhyaline.

***Pseudocercospora cosmicola* (A. K. Kar and M. Mandal) Deighton, *Trans. Brit. Mycol. Soc.* 88: 388 (1987)**

*Habitat*: on leaves of *Cosmos sulphureus* Cav. (*Asteraceae*).

*Material examined*: Chiang Mai Province, Royal Flora, 27 July 2008, Jamjan Meeboon (BBH 23766). *Stromata* (30) 34 ± 3.7 (40) µm diameter, brown to dark brown cells. *Conidiophores* (13) 15.5 ± 1.6 (18) × (2) 2.5 ± 0.3 (2.5) µm, 1-2 septate , brown. *Conidia* (26) 65.5 ± 16.5(93) × (1.5) 2 ± 0.3(2.5) µm, subhyaline.

***Pseudocercospora cruenta* (Sacc.) Deighton, *Mycol. Pap.* 140: 142 (1976).**

*Habitat*: on leaves of *Pueraria phaseoloides* Benth. (*Fabaceae*).

*Material examined*: Krabi Province, Sa Morokot Wild life Sanctuary, 8 August 2006, Jamjan Meeboon and Iman Hidayat (BBH 23628). *Stromata* 24-41 µm diameter, brown to dark brown cells. *Conidiophores* 29-53 × 3-4 µm, 1-3 septate, brown. *Conidia* 38-58 × 2-3 µm, 1-3 septate, hyaline to subhyaline.

***Pseudocercospora daturina* (J. M. Yen) Deighton, *Mycol. Pap.* 140: 143 (1976).**

*Habitat*: on leaves of *Datura alba* Nees (*Solanaceae*).

*Material examined*: Chiang Mai Province, Suthep-Pui National Park, 26 July 2007, Jamjan Meeboon and Iman Hidayat (BBH 23645). *Stromata* 18-30 µm diameter, brown to dark brown cells. *Conidiophores* 21-78 × 2-4 µm, 1-4 septate, brown. *Conidia* 33-135 × 2.5-4 µm , 6-14 septate, hyaline to subhyaline.

***Pseudocercospora dovyalidis* (Chupp and Doidge) Deighton, *Mycol. Pap.*140: 143(1976).**

*Habitat*: on leaves of *Flacourtia jangomas* (Lour.) Ransch (*Flacourtiaceae*).

*Material examined*: Lamphun Province, Amphur Ban Hong, Farming area, 24 August 2008, Jamjan Meeboon (BBH 23698). *Stromata* (45.5) 68.5 ± 19.1 (95) µm diameter , brown to dark brown cells. *Conidiophores* (20) 36 ± 14.1 (70) × (3) 4 ± 0.8 (5.5) µm, 1-3 septate, pale olivaceous-brown. *Conidia* (8) 21.5 ± 10.2 (49.5) × (2.5)4 ± 0.7 (6) µm, 0-5 septate, pale olivaceous.

***Pseudocercospora egenula* (Syd.) U. Braun and Crous, *CBS Diversity Series* 1: 171(2003).**

*Habitat*: on leaves of *Solanum xanthocarpum* Schrad. (*Solanaceae*).

*Material examined*: Chiang Rai Province, Amphur Wiang Pa Pao, Tumbol Wiang Ga Long, 22 July 2007, Jamjan Meeboon (JM 109). *Stromata* 22-147 µm diameter, brown to dark brown cells. *Conidiophores* 13-56 × 2-4 µm, 0-2 septate, pale brown. *Conidia* 52-68 × 2.5-3.5 µm, hyaline to subhyaline, 4-10 septate.

***Pseudocercospora euphorbie-pubescentis* (Unamuno) U. Braun and Crous, *CBS Biodiversity Series* 1: 180 (2003).**

*Habitat*: on leaves of *Euphorbia milii* Des Moul. (*Euphorbiaceae*).

*Material examined*: Chiang Mai Province, Amphur Hang Dong, Tumbol Num Phrae, Farming area, 7 August 2008, Jamjan Meeboon (BBH 23588). *Stromata* (20) 28.5 ± 6.9 (40) µm diameter, brown to dark brown cells. *Conidiophores* (11) 18.5 ± 4.8(25) × (2.5) 2.5 ± 0.2 (3) µm, 0-1 septate, pale olivaceous-brown. *Conidia* (33.5) 67 ± 21.3(107) × (2.5) 2.5 ± 0.2(3) µm, 3-6 septate, pale olivaceous.

***Pseudocercospora gardeniae* (Boedijn) Deighton, *Mycol. Pap.* 140: 144 (1976).**

*Habitat*: on leaves of *Gardenia jasminoides* Ellis (*Rubiaceae*).

*Material examined*: Chiang Mai Province,

Amphur Muang, Tumbol Mae Hea, Royal Flora, 13 February 2008, Jamjan Meeboon and Iman Hidayat (BBH 23747). *Stromata* 15-27.5 µm diameter. *Conidiophores* (7.5-) 12-21 (-25) × 2-3 (-3.5) µm, 1-3 septate, pale brown. *Conidia* (10-)23.5-62(-75) × (1.5-) 2-2.5 (-3) µm , 3-8 septate, subhyaline.

***Pseudocercospora jatrophae* (G. F. Atk.) A. K. Das and Chattopadh., *J. Mycopathol. Res.* 28: (1990).**

*Habitat*: on leaves of *Jatropha curcas* L. (*Euphorbiaceae*).

*Material examined*: Chiang Mai Province, T. Suthep, Amphur Sarapee, Tumbol Deu Ngok, Farming Area, 7 March 2008, Jamjan Meeboon (BBH 23736). *Stroma* 9-27 µm diameter, brown to dark brown-walled cells. *Conidiophores* 11.5-23 × 2-3 µm , 1-3 septate, pale brown. *Conidia* 20.5-34 × 2-2.5 µm, 3-6 septate, hyaline to subhyaline.

***Pseudocercospora justiciae* (F. L. Tai) Y. L. Guo and X. J. Liu, *Mycosystema* 4: 103 (1991).**

*Habitat*: on leaves of *Justicia betonica* L. (*Acanthaceae*).

*Material examined*: Chiang Mai Province, Mae Fag, Sansai, Farming area, 9 August 2008, Jamjan Meeboon (BBH 23710). *Stromata* (17) 31 ± 11.6 (41) µm diameter, brown to dark brown cells. *Conidiophores* (23) 37.5 ± 9.4 (58) × (2) 3 ± 0.5 (4) µm, 1-3 septate, brown. *Conidia* (19) 62 ± 27.8 (107) × (2) 2.5 ± 0.5 (3.5) µm, 3-10 septate, pale olivaceous.

***Pseudocercospora liquadambaricola* (J. M. Yen) U. Braun, *Schlechtendalia* 5: 44 (2000).**

*Habitat*: on leaves of *Liquidambar formosana* Hance (*Hamamelidaceae*).

*Material examined*: Chiang Mai Province, Amphur Samoeng, Pang Da Royal Project, 7 February 2008, Jamjan Meeboon and Iman Hidayat (JM 105). *Stromata* 29-63 µm diameter, brown to dark brown cells. *Conidiophores* (15-) 20-21 × (2-) 3-4.5 µm, 0-2 septate, pale brown. *Conidia* (26-) 33-50.5 (-54) × 2-2.5 (-3.5) µm , 3-6 septate, subhyaline.

***Pseudocercospora marsdeniae* (Hansf.) Deighton, *Mycol. Pap.* 140: 147 (1976).**

*Habitat*: on leaves of *Dregea volubilis* Benth. ex Hook. f. (*Asclepiadaceae*).

*Material examined*: Chiang Mai Province, Chiang Mai University, Multiple Cropping Centre, 1 August 2008, Jamjan Meeboon (BBH 23720). *Stromata* (27.5) 40 ± 15.4 (62) µm diameter, brown to dark brown cells. *Conidiophores* (9.5) 18 ± 3.9 (29) × (2) 3 ± 0.3 (3) µm, 1-2 septate, pale olivaceous-brown. *Conidia* (26) 47 ± 12 (78) × (2.5) 3 ± 0.4 (4.5) µm, 2-5 septate, pale olivaceous.

***Pseudocercospora ocellata* (Deighton) Deighton, *Trans. Brit. mycol. Soc.* 88: 390 (1987).**

*Habitat*: on leaves of *Camellia sinensis* Kuntze (*Theaceae*).

*Material examined*: Chiang Mai Province, Amphur Samoeng, Pang Da Royal Project, 7 February 2008, Jamjan Meeboon and Iman Hidayat (BBH 23620); *ibid* on *Camellia sinensis* var. *assamica* (BBH 23676). *Stroma* 50-85 µm diameter, brown to blackish brown cells. *Conidiophores* 14-53 × 2-3 µm, pale brown. *Conidia* 34-87 × 2-3 µm, 4-7 septate, subhyaline.

***Pseudocercospora prunicola* (Ellis and Everh.) U. Braun and Melnik, *Trudy Bot. Inst. im V. L. Komarova* 20: 82 (1997).**

*Habitat*: on leaves of *Prunus persica* (L.) Batsch (*Rosaceae*).

*Material examined*: Chiang Mai Province, Pang Da Royal Project, 5 August 2008, Jamjan Meeboon (BBH 23727). *Stromata* (39.5)40.5 ± 1.1(42) µm diameter. *Conidiophores*

(13.5)25.5 ± 8.5(39) × (2)2.5 ± 0.3(2.5) µm, 0-2 septate, brown. *Conidia* (13.5) 27 ± 6.3 (40.5) × (1.5) 2 ± 0.3 (2.5) µm , 1-5 septate, Pale olivaceous.

***Pseudocercospora repens* (Ellis and Everh.) U. Braun and Melnik, *Trudy Bot. Inst. im. V. L. Komarova* 20: 88 (1997).**

*Habitat:* on leaves of *Nerium oleander* L. (Apocynaceae).

*Material examined:* Chiang Mai Province, Tumbol Mae Hea, Amphur Muang, 13 February 2008, Jamjan Meeboon and Iman Hidayat (BBH 23739).

## 4. CONCLUSIONS

Three new species of the fungus *Pseudocercospora* were identified in the present study namely *Pseudocercospora kopsii*, *P. mitracarpi* and *P. pericampylii*. An additional 17 *Pseudocercospora* species were identified which represent new records for Thailand.

## ACKNOWLEDGEMENTS

This work was financially supported by the Royal Golden Jubilee Ph.D. Program (PHD/0061/2551) and the Thailand Research Fund (DBG5380011 and MRG5580163).

## REFFERENCES

[1] Crous P.W. and Braun U., *Mycosphaerella and Its Anamorphs: 1. Names published in Cercospora and Passalora. CBS Biodiversity Series 1*, Utrecht, Netherland, 2003; 1-571.

[2] Crous P.W., Braun U. and Groenewald J.Z., *Stud. Mycol.,* 2007; **58**: 1-32.

[3] Crous P.W., Tanaka K., Summerell B.A, and Groenewald J.Z., *IMA Fungus*, 2011; **2(1)**: 49-64.

[4] Crous P.W., Braun U., Hunter G.C., Wingfield M.J., Verkley G.J., Shin H.D., Nakashima C. and Groenewald J.Z., *Stud. Mycol.*, 2013; **75(1)**: 37-114.

[5] Pollack F.G., *Mycol. Mem.*, 1987; **12**: 1-212.

[6] Crous P.W., *Mycol. Mem.,* 1998; **21**: 1-170

[7] Crous P.W., *Fungal Div.*, 2009; **38**: 1-24.

[8] Cheewangkoon R., Crous P.W., Hyde K.D., Groenewald J.Z. and Toanan C., *Persoonia*, 2008; **21**: 77-91.

[9] Hunter G.C., Crous P.W., Wingfield B.D., Pongpanich K. and Wingfield M.J., *Fungal Div.*, 2006; **22**: 71-90.

[10] Meeboon J., Hidayat I. and To-anun C., *Int. J. Agric. Technol.*, 2007; **3**: 51-63.

[11] Phengsintham P1,2, Chukeatirote E 1, McKenzie EHC3, Hyde KD1 and Braun U., *Curr. Res. Environ. Appl. Mycol.*, 2013; **3(1)**: online version.

[12] To-anun C., Hidayat I. and Meeboon J., *Plant Pathology and Quarantine*, 2011; **1(1)**: 11-87.

[13] Sontirat P., Phitakpraiwan P., Choonbamroong W. and Kueprakone U., *Plant Pathogenic Cercospora in Thailand*, Department of Agriculture, Ministry of Agriculture and Cooperative, Bangkok, Thailand. 1980.

[14] Giatgong P., *Host index of plant diseases of Thailand. Mycology Section, Plant Pathology and Microbiology Division*, Department of Agriculture, Bangkok, Thailand, 1980.

[15] Petcharat V. and Kanjanamaneesathian M., *Thai Phytopathol.*, 1989; **9**: 23-27.

[16] Meeboon J., *Diversity and Phylogeny of True Cercosporoid Fungi from Northern Thailand*, PhD Thesis, Chiang Mai University, Thailand, 2009.

[17] Ko Ko T.W., McKenzie E.H.C., Bahkali A.H., To-anun C., Chukeatirote E., Promputtha I., Abd-Elsalam K.A., Soytong K., Wulandari N.F., Sanoamuang N., Jonglaekha N., Kodsueb R., Cheewangkoon R., Wikee S., Chamyuang S. and Hyde K.D., *Chiang Mai J. Sci.*, 2011; **38(4)**: 625-637.