Circular Leaf Spot of Bougainvillea Caused by *Cercosporidium bougainvilleae* in Indonesia

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Key words : bougainvillea, *Cercosporidium bougainvilleae*, circular leaf spot, new to Indonesia.

A leaf spot disease of *Bougainvillea spectabilis* Willd., a widely planted ornamental plant, was newly found in Java Island, Indonesia during the survey on the diseases of industrial crops. In this paper results of mycological and etiological studies on the pathogen, which were conducted at Research Institute for Spice and Medicinal Crops (BALITTRO) in Bogor, Indonesia, will be described. Summarized results of the present study was preliminarily reported (Kobayashi *et al.*, 1992).

Symptom and damage (Plate I: A, B). Pale brown circular spots, 1 mm in diameter, appear at first on leaves. They enlarge to 2-5 mm in diam. and become grayish white with brown and narrow surrounding zone. Size of spot does not enlarge more, though the number of spot per one leaf gradually increases. On both surfaces of the spot, dark green to blackish sooty masses, consisting of conidiophores and conidia of the causal fungus, are formed. Infected leaves having many spots become yellowish and gradually defoliate. Damage of the disease seems to be slight to moderate. The disease may distributed widely in Java Island, although in our survey the disease was recorded only two localities of West Java Province, Bogor and Cikampek.

Morphology of the fungus (Plate I: D, E, Fig. 1, Table 1). Mycelia immersed within leaf spot; stroma present, amphigenous, olive brown, 15-50 μm in diam.; conidiophores simple, flexuous, septated, brown, 35-85 $\times$ 4.5-5 μm , with distinct conidial scars; conidia holoblastic, sympodial, obclavate, straight or slightly curved, pale olive brown to olive brown, 2-4(-7)-septated, 35-80 $\times$ 5-7.5 μm , with conspicuous thickening or hilum at the basal end, finely verrucose.

From these morphological characteristics, the fungus was judged to belong to the genus *Cercosporidium* Earle.

Pathogenicity of the fungus (Plate I: C). Five potted seedlings of bougainvillea were used for each inoculation test. As inocula, mycelial suspension made of one-month-old culture on PDA slant was used; mycelial colonies were homogenized and filtrated through double cotton gauze. Three seedlings were sprayed with inoculum suspension and were covered with polyethylen bag for 4 days. The seedlings for control were sprayed with sterilized distilled water. The seedlings, after removed polyethylen bag, were placed in greenhouse for a week, then kept at outdoor. Incubation period was recorded as about 3 weeks. After one week from the disease development, production of fruit bodies were observed on both sides of the spot. Mycelial colonies from conidium on the inoculated leaves developed similar ones to those obtained from the naturally infected leaves.

This is the first instance in confirming the pathogenicity of the fungus through the artificial inoculation, although Sobers and Seymour (1969) examined susceptibility of several cultivars of bougainvillea through their field survey.

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Fig. 1. *Cercosporidium bougainvilleae* (Muntañola) Sobers et Seymour. a: Stroma and conidiophores showing distinct conidial scars, b: Conidia having a distinct hilum at the basal end (— = 10 μ m).

Table 1. Comparison of morphological characteristics of *Cercosporidium* and related genera on *Bougainvillea*

Fungus	Leaf spot (mm)	Stroma (μ m)	Conidiophore (μ m)	Conidia Size (μ m)	Septum
<i>Cercosporidium</i> from Indonesia	Circular 1-5	Amphigenous 18-50	35-85 $\times$ 4.5-5 Brown-olive brown	35-80 $\times$ 5-7.5 Pale-olive brown	2-4 a)
<i>Cercosporidium bougainvilleae</i>	Circular -5	Amphigenous -75	59-148 $\times$ 3.5-7 Pale-medium olive	24-90 $\times$ 4.2-8 Pale-olive brown	3-5 b)
	Round, pale brown	Amphigenous	130 $\times$ 4-6 Pale-olive brown	28-80 $\times$ 4-8 Mid pale brown	3-5 c)
	Brown center 2-3	30-52	54-169 $\times$ 3.6-5.4 Olive brown	36-64 $\times$ 3.2 Hyaline	2-6 d)
<i>Stenella bougainvilleae</i>	Circular 1-7	None, fruiting hypophyllous	30-90 $\times$ 3-4 Pale olive brown	20-65 $\times$ 2.5-4 Pale olive brown	3-6 e)

a) The authors: on *Bougainvillea spectabilis* (Indonesia); b) Sobers and Seymour (1969): on *B. glabra* (El Salvador, USA), on *B. stipitata* (Argentina); c) Ellis (1976): on *Bougainvillea* (Argentina, Cuba, Jamaica, USA, Venezuela); d) Rao (1962): on *B. spectabilis* (India); e) Yen and Lim (1982): on *B. spectabilis* (Singapore).

Taxonomy of the causal fungus. On *Bougainvillea* plants, 3 species belonging to *Cercospora* and related genera have hitherto been described (Pollack, 1987; Yen and Lim, 1982). Among them, *Cercospora bougainvilleae* Muntañola (1957) and *C. bougainvilleae* Rao (1962) were united into one species by Sobers and Seymour (1969) as *Cercosporidium bougainvilleae* (Muntañola) Sobers et Seymour. Distinct presence of stroma, thick and verrucose conidia, conspicuous hilum on the basal end of conidia, clear conidial scar as shoulder on conidiophores and dark colored conidial masses are the separating points of the genus *Cercosporidium* Earle (1901; Deighton, 1967) from the genus *Cercospora* sensu lato. As shown in Table 1. *Stenella bougainvilleae* Yen et Lim (1982) is apparently different from the present fungus by its hypophyllous fruitings without stroma and narrower conidia. The Indonesian fungus was identified as *Cercosporidium bougainvilleae* (Muntañola) Sobers et Seymour, by its quite accordancy of symptom

and morphology. This is the first record of the disease and its causal fungus in Indonesia.

***Cercosporidium bougainvilleae* (Muntañola) Sobers et Seymour.** Proc. Fl. State Hort. Soc. 81: 397, 1969.

Synonym: *Cercospora bougainvilleae* Muntañola, Rev. Argent. Agron. 24: 84, 1957; Sobers and Martinez, Phytopathology 56: 128, 1966.

Cercospora bougainvilleae Rao, Ind. Phytopath. 15(2): 112, 1962.

Specimen examined: on *Bougainvillea spectabilis* Eilld. (Bugenbirea, ikada-kazura)—Cikampek Exp. Garden, BALITTRO, Cikampek, West Java, Nov. 22, 1990, by Takao Kobayashi (TK) and Masaomi Oniki (MO) (TMF: FPH-7263); Cimanggu, BALITTRO-Campus, Bogor, West Java, June 27, 1991, by TK (TMF: FPH-7264).

The circular leaf spot disease and its pathogen *Cercosporidium bougainvilleae* have hitherto been recorded from Argentina, Cuba, El Salvador, India, Jamaica, USA and Venezuela on *Bougainvillea glabra*, *B. spectabilis* and *B. stipitata* (Ancalmo, 1961; Ellis, 1976; Muntañola, 1957, Rao, 1962, Pollack, 1987; Sobers and Martinez, 1966; Sobers and Seymour, 1969).

The authors wish to express their heartiest thanks to the Staff of Laboratory of Plant Pathology, Research Institute for Spice and Medicinal Crops (BALITTRO), for their help during this study.

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和 文 摘 要

小林享夫・鬼木正臣：インドネシアにおけるブーゲンビレア円星病

ジャワ島における工芸作物病害発生実態調査の過程で、観賞樹木ブーゲンビレア葉上にインドネシア未記録の斑点性病害を記録した。病原菌の分生子からの分離および接種試験による病原性の確認ののち、病原菌の形態等菌学的検討を行い、アメリカ、エルサルバドル、インドから報告のある *Cercosporidium bougainvilleae* (Muntañola) Sobers et Seymour と同定した。病名はその病徴から円星病と提案した (小林ら, 1992)。

(Received June 28, 1993)

Plate I

Circular leaf spot of bougainvillea and its pathogen.

A: Symptom of *Bougainvillea spectabilis*, B: Magnified symptom, C: Circular spot produced on the inoculated leaves, D: Stroma and conidiophores of the causal fungus, *Cercosporidium bougainvilleae*, E: Conidia having a distinct hilum.