

First Report on Gray Blight of Tea Plant Caused by *Pestalotiopsis theae* in Korea

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A fungus associated with gray blight on tea plant (*Camellia sinensis*) was identified as *Pestalotiopsis theae* based on the mycological characteristics. Mycelial growth on potato dextrose agar and size and shape of conidia of *P. theae* were similar to those of *P. longiseta*, but *P. theae* was different from *P. longiseta* in the color of three median cells and the number of apical appendages. Artificial inoculation of conidial suspension or mycelial mats on the wounded leaves and shoots of healthy plants induced the same disease, respectively. The Korean native variety was relatively more resistant to *P. theae* than a Japanese variety 'Yabukita' which has been recently introduced and planted in large areas of southern parts of Korea. Here, we report the first record of gray blight caused by *P. theae* on tea plant in Korea.

Keywords : *Camellia sinensis*, gray blight, *Pestalotiopsis theae*, tea plant.

Tea plant (*Camellia sinensis*) is one of the commercial crops whose demands are rapidly growing in Korea recently. Five fungal species such as *Colletotrichum camelliae* (brown blight), *C. theae-sinensis* (anthracnose), *Coccochorina japonica*, *Pestalotiopsis longiseta* (gray blight) and *Sphaceloma theae* (white scab) have been recorded so far to cause diseases on the plant in Korea (The Korean Society of Plant Pathology, 1998). Gray blight on tea plant has been known to be caused by two species of *Pestalotiopsis*, *P. longiseta* and *P. theae* in Japan (Ezuka and Ando, 1994). *P. longiseta* was also reported to cause gray blight on tea plant in Korea (Park et al., 1996), while *P. theae* reported as a causal agent of leaf blight on sweet persimmon tree (*Diospyros kaki* var. *domestica*) (Chang et al., 1996), but not on tea plant.

We found a disease whose symptoms were characterized by leaf blight. Small brown spots were noticed at the early stage of disease development and later enlarged to circular or oval lesions 10-15 mm in diameter showing a grayish

center with light to dark brown margins. The dark acervuli were formed on the upper surface of the lesions and the color was changed to light gray at the end of the disease development (Fig. 1A). Dark lesions were also observed on the wounded shoots damaged during harvest or trimming works.

Pestalotiopsis sp. was consistently isolated from the lesions showing typical leaf blight symptoms on tea leaves. Longitudinal sections of its acervuli showed saucer-shaped conidiomata under a light microscope ranging 85 to 180 µm in width and dark colored conidia released through the disrupted epidermic layer (Fig. 1E). Mycelia of *Pestalotiopsis* sp. detached from the lesions were transferred on fresh potato dextrose agar (PDA). After incubation at 25°C over 7 days, white colored aerial mycelial mats were formed with a circular shape (Fig. 1C), and dark colored acervuli were formed all over the mycelial mats over 15 days later (Fig. 1D). Conidia were fusiform, straight, rarely curved, 5-celled, hardly constricted at septa, 20.2-30.4 µm (average 26.1 µm) long × 6.3-8.9 µm (average 7.1 µm) wide. The three median cells of conidia were 16.5-22.7 µm (average 18.2 µm) long, equally dark olivaceous, but apical and basal cells were hyaline. Apical appendages were 3, rarely 2 or 4, hyaline, cylindrical to spatulate apices, 20.2-35.4 µm (average 26.6 µm) long. Basal appendages were hyaline, straight, 5.1-8.9 µm (average 6.6 µm) long (Fig. 1F). The morphological and cultural characteristics of *Pestalotiopsis* sp. associated with gray blight on tea plant were in accordance with those of *P. theae* (Kibushi et al., 1974; Mordue and Holliday, 1971) (Table 1). The fungus also exhibited very similar morphological characteristics to a *P. theae* isolate obtained from Japanese National Research Institute of Vegetables, Ornamental Plants and Tea.

Mycelial growth of *P. theae* on PDA was similar to that of *P. longiseta* which has been already reported in Korea to cause gray blight on tea leaves (Park et al., 1996). The size and shape of conidia of *P. theae* were also similar to those of *P. longiseta*. However, 3 median cells were equally dark olivaceous among 5 cells of the *P. theae* conidium, whereas the basal cell of the conidium was lighter in olivaceous tint than that of *P. longiseta*. While the number of apical

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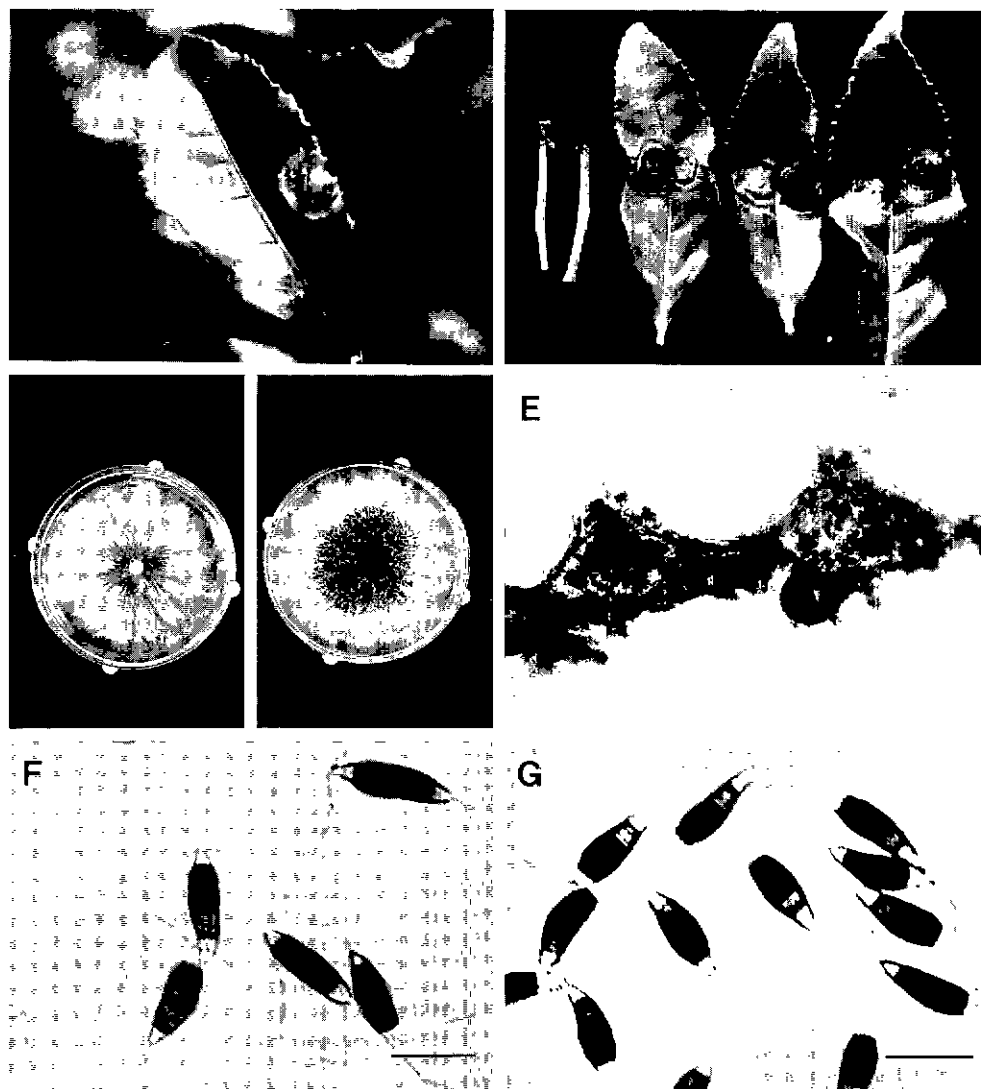


Fig. 1. Symptoms of gray blight caused by *Pestalotiopsis theae* on tea plant and morphological characteristics of *Pestalotiopsis theae*. A typical symptom on a naturally infected leaf (A), symptoms on shoots and leaves induced by artificial inoculation (B), colony on potato dextrose agar after 7 days (C) and 15 days of incubation (D), acervuli (E), and conidia of *P. theae* (F) and *P. longiseti* (G) formed on potato dextrose agar. Scale bars represent 20 µm.

Table 1. Comparison of mycological characteristics of the fungus isolated in this study with *Pestalotiopsis* species previously reported on tea plant

Characteristics	Present isolates	<i>Pestalotiopsis theae</i> ^a	<i>Pestalotiopsis longiseti</i> ^b
Conidia			
Size (µm)	20.2-30.4×6.3-8.9 (average 26.1×7.1)	23-35×5.5-8 (average 27×7.2)	21.7-26.2×6.4-8.6 (average 24.5×7.6)
Shape	fusiform, straight rarely curved	fusiform, straight rarely curved	fusiform, straight rarely curved
Three median cells			
Size (µm)	16.5-22.8 (average 18.2)	15-22 (average 18)	14.3-18.8 (average 16.4)
Color	equally dark olivaceous	equally dark olivaceous	upper two cells dark brown and bottom cell olivaceous
Apical appendages			
Number	2-4 (usually 3)	2-4 (usually 3)	3
Size (µm)	20.2-35.4 (average 29.1)	15-50 (average 30.0)	16.7-30.9 (average 25.9)
Basal appendages	5.1-8.9 (average 6.6)	4-10	5.7-9.5 (average 7.1)

^a From Mordue, J. E. M. and Holliday, P. (1971).

^b From Hamaya, E. and Horikawa, T. (1982).

Table 2. Pathogenicity of *Pestalotiopsis theae* on leaves and shoots of tea plant

Variety tested	Part inoculated	Disease severity ^a	
		Wounded	Unwounded
Yabukita	Leaf	++	—
	Stem	++	—
Korean native variety	Leaf	+	—
	Stem	+	—

^aDiameters of the lesions were measured 15 days after inoculation. ++: more than 5 mm in length, +: 2-5 mm in length, —: no lesion developed for 15 days

appendages of *P. theae* varied 2 to 4, conidia of *P. longiseta* had invariably 3 apical appendages (Fig. 1G).

For pathogenicity test, inoculum of *P. theae* was prepared by inoculating mycelial plugs on PDA and culturing at 25°C for 4 weeks. The conidial suspension (3.3×10^5 conidia/ml) harvested from the culture was sprayed onto the wounded leaves of 4-year old healthy plants until run-off. Inoculation of mycelium plugs (5 mm in diameter) was also performed on the shoot of tea plants according to Kono's method (1996). Two varieties of tea plants, a Korean native or 'Yabukita', were used for the test in three replicates. The materials inoculated were wrapped with polyethylene film to give 100% relative humidity and kept at $25 \pm 1^\circ\text{C}$ for 2 days. No visible symptoms were observed on the leaves or on the shoot of control plants. However, the first foliar symptom was noticed on Yabukita 5 days after inoculation and on the Korean native variety 10 days after inoculation, respectively. Diameters of the lesions were measured 15 days after inoculation (Fig. 1B). Lesions on

the leaves and the shoots developed on Yabukita were longer than those on the Korean native variety (Table 2). The result demonstrated that the Korean native variety is relatively more resistant to *P. theae*, compared with the Japanese variety which has been recently planted in a large area of southern parts of Korea. This is the first record of *P. theae* associated with gray blight on tea plant in Korea.

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