

## Anthracnose of Gardenia (*Gardenia jasminoides* for. *grandiflora* Makino) Caused by *Glomerella cingulata*

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**Anthracnose symptoms caused by *Glomerella cingulata* were observed on leaves and stems of gardenia in Suncheon, Jeonnam in Korea in 2000. Symptoms on infected plants typically appeared as irregularly circular, dark-brown ring spots and water-soaked brown lesions. Based on cultural and morphological characteristics, the fungus (G-00-03 isolate) from the diseased plants was identified as *Colletotrichum gloeosporioides*, and its teleomorph stage was *Glomerella cingulata*. Healthy gardenia artificially inoculated with fungal spores showed anthracnose symptom 7 days after inoculation. This is the first report of gardenia anthracnose caused by *Glomerella cingulata* in Korea.**

**Keywords :** anthracnose, *Colletotrichum gloeosporioides*, gardenia, *Glomerella cingulata*.

Gardenia (*Gardenia jasminoides* for. *grandiflora* Makino) is an evergreen shrub with fragrant and lovely blossoms. The plant was first introduced to Korea about 1,500 years ago. To date, only two pathogens, *Botrytis cinerea* and *Phaseosphaerella gardinae* causing gray mold and leaf spot, respectively, have been reported to infect the plant in Korea (The Korean Soc. of Plant Pathol., 1998). Having observed unusual lesions on the plants, diseased leaves and stems were collected from gardenia plants on a roadside in Suncheon, Jeonnam in Korea in 2000. The initial symptoms appeared as irregularly round or circular water-soaked and brown lesions. Sometimes the spots enlarged rapidly, became irregular, and developed on the entire leaf. The size of these spots gradually increased and coalesced to form large circular brown lesions. Infected leaves and stems eventually died (Fig. 1).

The causal agent was isolated from infected leaves and stems on 2% water agar after surface sterilizing with 1% sodium hypochlorite solution for 1 minute. The fungus (G-00-03 isolate) was isolated from the pieces on water agar

and transferred to potato dextrose agar (PDA). For the identification, the fungus (G-00-03 isolate) was cultivated on PDA at 25°C. The fungal colony on PDA showed light or ash-green to dark-green mycelial mat forming a circular shape after 7 days of incubation (Fig. 1A). The acervuli were brown to dark-brown, setose to glabrous, rounded, and measured 125-325×63-166 µm. The setae produced on the acervuli were dark-brown to black and measured 40-145×3-5 µm. On PDA plates, conidia were unicellular, hyaline, straight, cylindrical to fusiform, obtuse at the apex or slightly narrow at one end, and measured 13-18×5-9 µm (Fig. 2B). Appressoria were brown to dark-brown and clavate, but most were irregular and measured 30-75×8-14 µm (Fig. 2C). After 4 weeks of incubation, dark-brown to black and globose perithecia were formed on the mycelial mats, which ranged from 113 to 225 µm in diameter (Fig. 2D). Asci were clavate to cylindrical, eight-spored, and measured 30-73×8-14 µm (Fig. 2E). Ascospores were unicellular, hyaline and fusiform, and measured 13-26×4-8 µm (Fig. 2F). The isolated fungus (G-00-03 isolate) was identified as *Colletotrichum gloeosporioides*, and its teleomorph stage was *Glomerella cingulata* based on cultural and morphological characteristics (Choi et al., 1994; Kim et al., 2000; Kwon et al., 2002; Mordue, 1971).

To determine the optimum temperature for mycelial growth, the fungus was cultivated under the temperature range of 5-40°C in the dark for 7 days. Optimum temperature for mycelial growth of the fungus was 25-30°C. The fungus hardly grew at 5°C or over 35°C (Fig. 3).

For the preparation of inoculum, mycelial plugs of *G. cingulata* were transferred to PDA plates and incubated at 25°C for 4 weeks. The conidial suspension (10<sup>6</sup> conidia/ml) harvested from the culture was sprayed onto the healthy leaves of gardenia with or without wound by sterile pins. All the leaves inoculated were maintained in polyethylene bags in a dark incubator (26°C) for 7 days. Control leaves were treated with sterilized water and maintained under the same condition. The wound-inoculated leaves exhibited circular and water-soaked lesions, which became double ring spots or turned tan. No visible symptoms were

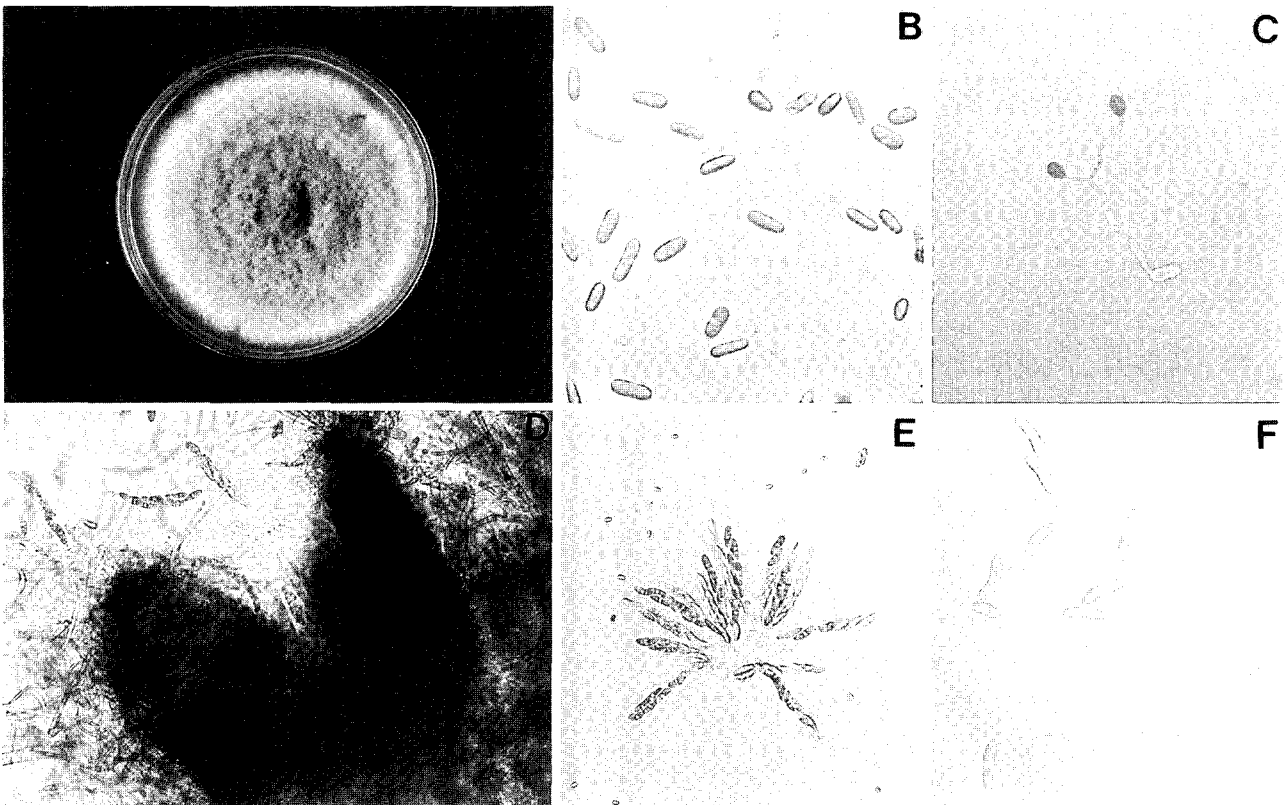
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**Fig. 1.** Symptoms of gardenia anthracnose caused by *Glomerella cingulata*. (A) irregularly circular, dark-brown ring spots and/or water-soaked lesions on leaves; (B) an infected plant becomes defoliated and eventually dies.



**Fig. 2.** Morphological characteristics of *Glomerella cingulata*, the causal organism of gardenia anthracnose. (A) colony of *G. cingulata* on potato dextrose agar; (B) conidia; (C) appressoria developed from conidia; (D) perithecium including asci; (E) asci including ascospores; and (F) ascospores.

observed on the leaves inoculated without wound and on the control leaves. This suggests that *G. cingulata* can

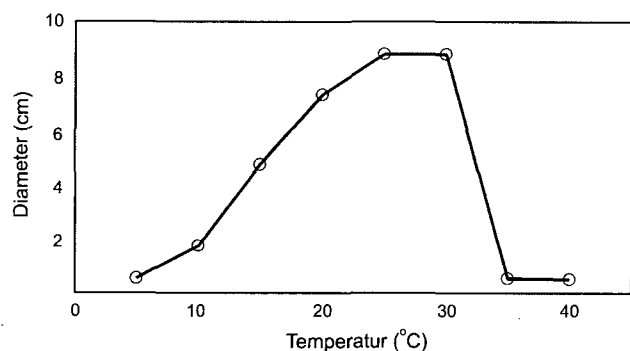
hardly infect healthy leaves, and that wounded leaves are more prone to fungus infection. The lesions on the

**Table 1.** Morphological characteristics of *Glomerella cingulata* isolated from gardenia plants

Characteristics	Mycological characteristics	
	Present isolates	<i>Glomerella cingulata</i> <sup>a</sup>
Colony on PDA	Light or ash-green to dark-green	Grayish white to dark-gray
Acervuli	Shape: Setose to glabrous, rounded or occasionally elongated, eruption Size: 125-325×63-166 µm	Setose to glabrous, rounded, elongated or irregular about 500 µm
Conidia	Shape: Hyaline, cylindrical Size: 13-18×5-9 µm	Hyaline, cylindrical with obtuse ends 9.0-24.0×3.0-6.0 µm
Appressoria	Shape: Clavate or irregular, sometimes becoming complex Size: 8-18×5-10 µm	Ovate to obovate 6.0-20.0×4.0-12.0 µm
Perithecia	Shape: Globose Size: 113-225 µm	Globose to obpyriform 85-300 µm
Asci	Shape: Hyaline, clavate to cylindrical Size: 30-73×8-14 µm	Hyaline, clavate to cylindrical 35-80×8-14 µm
Ascospores	Shape: Hyaline, fusiform Size: 13-27×4-8 µm	Hyaline, narrowly oval to cylindrical to fusiform — <sup>b</sup>

<sup>a</sup>Data from Mordue (1971).

<sup>b</sup>Not described.



**Fig. 3.** Effect of temperature on mycelial growth of *Glomerella cingulata*. Diameter of mycelial mat was measured after 7-day incubation on potato dextrose agar. Data are means of three replicates.

**Table 2.** Pathogenicity of *Glomerella cingulata* isolated from gardenia to apple and pepper

Tested plants	Pathogenicity		Control
	Wounded	Unwounded	
Gardenia	+ <sup>a</sup>	—	—
Apple	++	—	—
Pepper	+	—	—

<sup>a</sup>+ = mild symptom; ++ = severe symptom; — = no symptom.

inoculated leaves were transferred to fresh PDA plates. All yielded the causal fungus *G. cingulata*.

The same methods used in this study were applied to healthy apples and peppers in order to confirm the host range of *G. cingulata*. The typical symptoms were similarly observed on wounded apples and peppers (Table 2).

This is the first report of *G. cingulata* associated with anthracnose of gardenia in Korea.

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