

First Report of *Corynespora* Leaf Spot in Pepper Caused by *Corynespora cassicola* in Korea

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A *Corynespora* leaf spot of pepper, which has not been reported previously in Korea, occurred severely at the major pepper cultivation area of Chinju, Gyeongnam province in 2001. Infection rate ranged from 48.2 to 84.7% in eight fields surveyed. The causal fungus was identified as *Corynespora cassicola* based on the following cultural and morphological characteristics. The fungi grew well on potato dextrose agar, showing gray to brown color with cultural age. Conidia formed solitary or catenary were obclavate to cylindrical in shape, and pale olivaceous brown or brown in color. They had 420 pseudoseptate and isthmus, and measured $42.7-197.6 \times 9.3-21.5 \mu\text{m}$. Septate conidiophores were pale to light brown in color, and measured $116.5-836.0 \times 4.2-11.0 \mu\text{m}$. Conidia germinated as a bi-polar type. Optimal temperature for mycelial growth and conidial germination was 30°C and 25-30°C, respectively. The fungus showed strong pathogenicity to pepper plant, and the symptoms on pepper by the artificial inoculation were similar to those observed in the field. This is the first report on the *Corynespora* leaf spot on pepper (*Capsicum annuum*) caused by *Corynespora cassicola* in Korea.

Keywords : *Corynespora cassicola*, *Corynespora* leaf spot, pepper (*Capsicum annuum*).

Pepper (*Capsicum annuum*) is one of the most important condimental vegetables in Korea. During a disease survey on pepper cultivated in greenhouses in winter of 2001, a severe leaf spot caused by a *Corynespora* species was observed in Geumsan-myon, Chinju city, Gyeongnam province. The infection rate of diseased plants ranged from 42.8 to 84.7% in eight fields surveyed.

The disease usually initiated on young leaves, however, the pepper branch, stem, crown, and fruit stalk were also infected by the fungus (Fig. 1A, B, C, D, E). Typical symptoms on leaves developed as a small brown spot with sur-

rounding halo. The averaged spot size was about one cm in diameter. The irregularly round necrotic lesions became dark often with wavy border and zoned frequently up to 2-3 cm in diameter. Infected leaves became chlorotic and defoliated eventually (Fig. 1F). Severely infected plants were wilted or blighted under the humid environmental conditions favorable to the disease development. Fungal hyphae grew internal leaf tissues and covered the lesions with abundant conidia and conidiophores. The symptoms were similar to those of the *Cercospora* leaf spot (*Cercospora capsici*), *Alternaria* leaf spot (*Alternaria solani*) or the bacterial spot (*Xanthomonas campestris* pv. *visicatoria*) of pepper described previously (Cho et al., 1997).

A total of 50 isolates of the fungus were collected from the diseased leaves of pepper (cv. Chungyang) cultivated in greenhouses. The fungal colonies were gray to brown and thinly hairy on potato-dextrose agar (PDA) and the conidiophores were viewed iridescently under a binocular dissecting microscope (Table 1). Conidia were solitary or catenary, variable in shape as obclavate to cylindrical, straight or curved, subhyaline to rather pale olivaceous brown or brown in color, and smooth. Conidia which were sized $42.7-197.6 \times 9.3-21.5 \mu\text{m}$ with 4-20 pseudosepta were observed isthmus (Fig. 2A). Germination type was bi-polar (Fig. 2B). Conidiophores emerged through leaf epidermics were slightly or conspicuously swollen at apex, simple, single, straight or slightly flexuous, pale to mid brown in color, smooth, septate, thick, monotretic determinate or in tufts, proliferating terminally through scars of previous conidia. Conidiophores were measured $116.5-836.0 \times 4.2-11.0 \mu\text{m}$ (Fig. 2C).

The maximum, optimum and minimum temperatures for mycelial growth were 35°C, 30°C and 10°C, respectively. Conidia germinated over 95% at 25-30°C (Fig. 3). Most characteristics of the fungus examined in this study were almost identical to *Corynespora cassicola* (Berk and Curt) Wei described previously by others (Farr et al., 1995). Accordingly, we identified the causal fungus of pepper leaf spot as *C. cassicola* Wei.

For pathogenicity test, conidial suspension of the isolate

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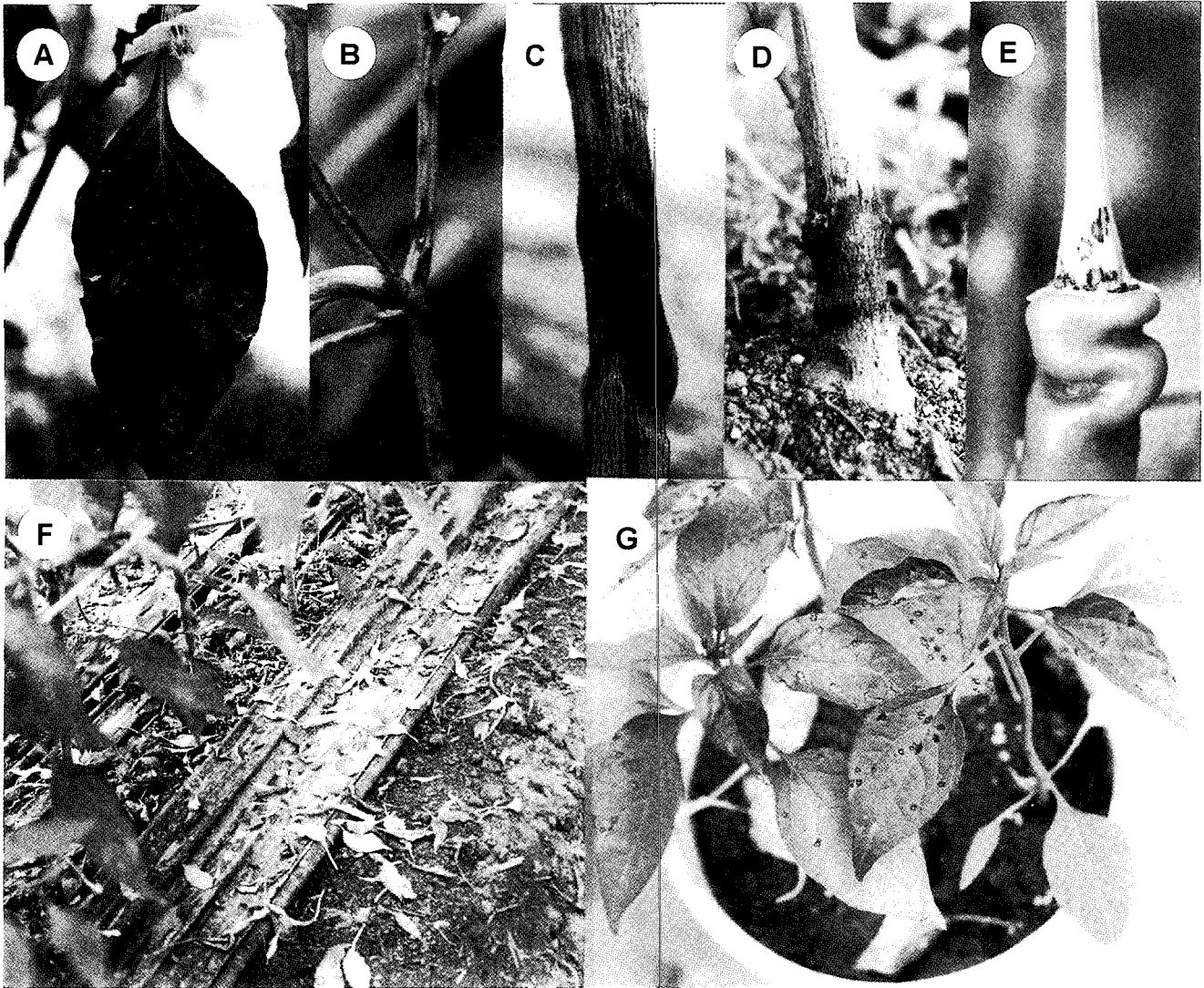


Fig. 1. Symptoms of leaf spot on pepper caused by *Corynespora cassicola*. Typical symptoms of brown leaf spot with surrounding halo (A), branch (B), stem (C), crown (D) and fruit stalk (E). F: Severely Infected plants, leaves of which became chlorotic and defoliated eventually. G: Artificially inoculated leaves.

Table 1. Mycological characteristics of the fungal isolate from leaf spot on pepper and *Corynespora cassicola* described by Ellis and Holliday

		Isolate from leaf spot on pepper	<i>C. cassicola</i> ^a
Colony	color	gray or brown	gray or brown
Conidia	color	pale olivaceous brown or brown	pale olivaceous brown or brown
	shape	obclavate or cylindrical	obclavate or cylindrical
	size	42.7-197.6 × 9.3-21.5 μm	40-220 × 9-22 μm
	isthmus	present	present
No. of pseudosepta	4-20	4-20	
Type of germination	bi-polar	bi-polar	
Conidiophore color		mild brown	mild brown
	size	116.5-836.0 × 4.2-11.0 μm	110-850 × 4-11 μm

^a Described by Ellis and Holliday (1971).

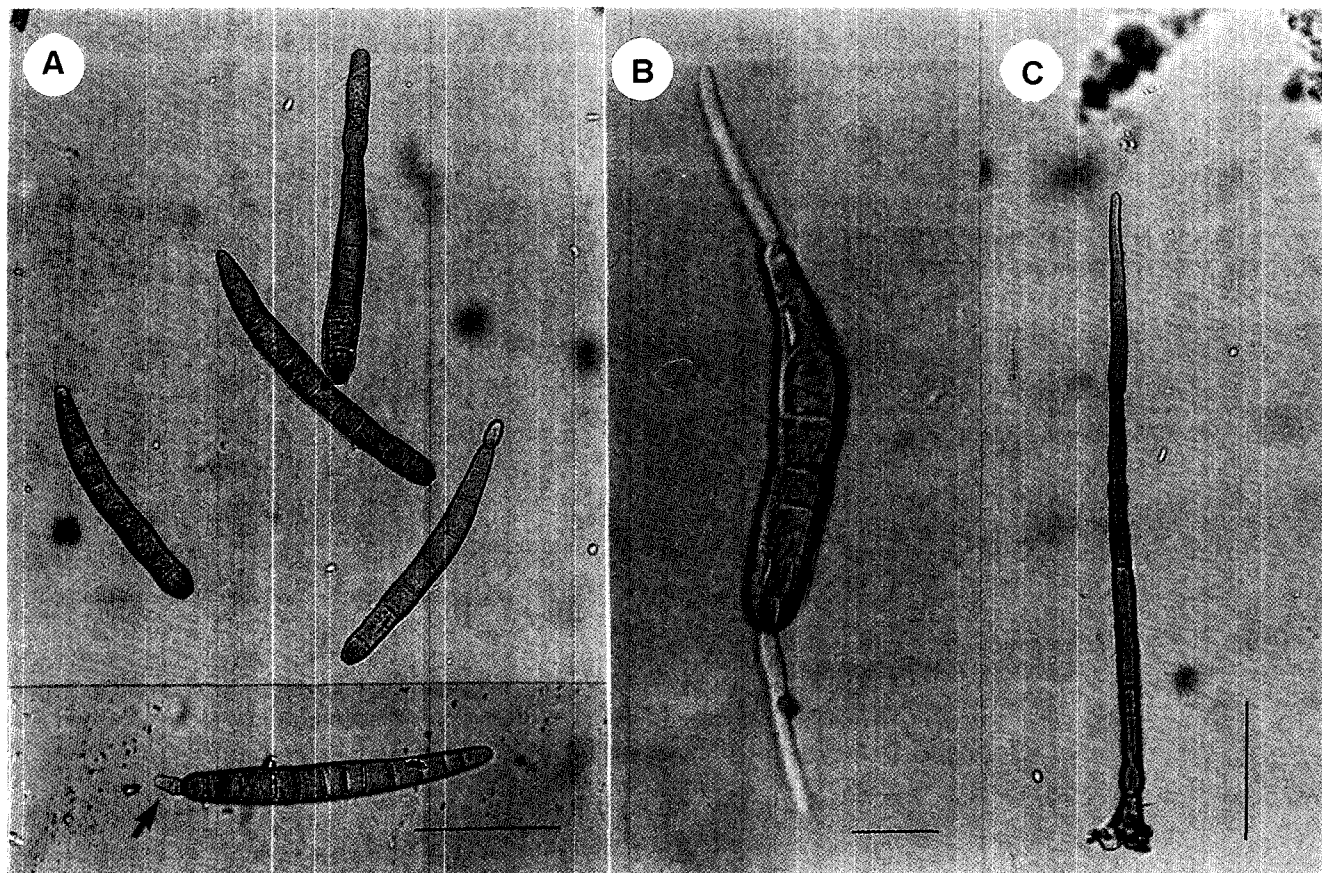


Fig. 2. Morphological characteristics of the causal organism of leaf spot on pepper, *Corynespora cassicola*. **A:** Conidia and isthmus (arrow), **B:** Conidial germination, **C:** Conidiophore. Scale bars represent 50 μ m.

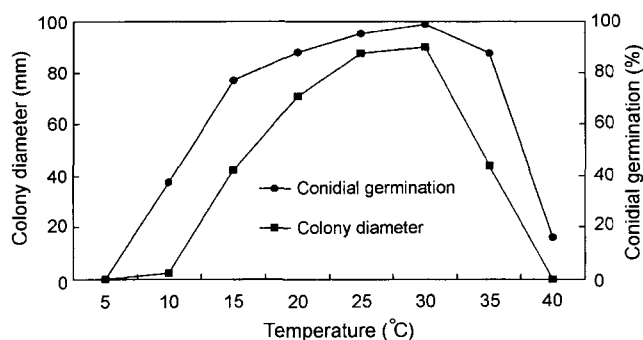


Fig. 3. Effect of temperature on mycelial growth and conidial germination of *Corynespora cassicola*, the causal organism of pepper leaf spot. Colony diameter (■-■) was measured 10 days after incubation on PDA. Data are means of three replications. Germination rate of the conidia (●-●) was measured 24 h after treatment with three replicates.

was prepared from PDA cultures, and the conidial density was adjusted to 2×10^5 /ml using a hemacytometer. Plants tested were five cultivars of pepper, and each cultivar of sesame, soybean and tomato. They were spray-inoculated with 35 ml of the suspension per plant. Inoculated plants were placed in a humid chamber with 100% relative humidity at 25°C for 24 h, and then cultivated in 1/5,000a Wagner pots with sterile soil for 63 days in a greenhouse. Typical symptoms on pepper were appeared at six days after inoculation. Symptoms developed on the inoculated pepper plants were similar to those observed in fields (Fig. 1G). All cultivars of pepper tested were infected by the fungus, especially, cultivars Chungyang and Nokkwang were more susceptible than cultivars Kkwari and Newace, paprica, tomato and sesame (Table 2). The fungus was re-

Table 2. Pathogenicity of *Corynespora cassicola* isolated from capsium to the various crops

	Cultivars of pepper					Sesame	Soybean	Tomato
	Chungyang	Nokkwang	Kkwari	Newace	Paprica			
Symptoms ^a	+++	+++	++	++	+	++	++	++

^aDegree of symptoms, -: no symptom, +: slight, ++: moderate, +++: severe.

isolated from inoculated pepper plants.

Although the corynespora leaf spot on *Capsicum annuum* reported in UDA (Farr et al., 1995), the disease has not been reported in Korea yet (The Korea Society of Plant Pathology, 1998). The corynespora leaf spot was reported on sesame, soybean and tomato in Korea, and on lotus (*Nelumbo nucifera*), hydrangea (*Hydrangea macrophylla*) and soybean (*Glycine max*) in Japan (Gobayashi et al., 1992, Udagawa et al., 1980). Peppers are often cultivated under high temperature and humid conditions. Such environments seemed to increase the occurrence of the corynespora leaf spot.

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