

## Anthracnose of Cosmos Caused by *Colletotrichum acutatum* in Korea

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**Anthracnose of cosmos caused by *Colletotrichum acutatum* is reported for the first time in Korea. The disease occurred widely in Kyeongnam province in 1998 and the symptoms of sunken brownish spots were severely developed on stems. The fungi showed strong pathogenicity to the plant and are required at least 3 hr for conidial germination and host infection.**

**Keywords :** anthracnose, *Colletotrichum acutatum*, cosmos.

Anthracnose of cosmos (*Cosmos bipinnatus*), which has not been reported in Korea (The Korean Society of Plant Pathology, 1998) previously, occurred at Chinju, Sachon and Sanchong in Kyeongnam province in 1998. Incidence of the disease ranged from 6.3 to 14.0% at the areas.

The yellowish to reddish brown spot was developed on all above ground parts of the plant, viz., stems, leaves and flowers (Figs. 1A, 1B, 1C). Initial small irregular spots enlarged or coalesced into large oval sunken lesions with hallos, and pink conidial masses were colonized on the lesions under favorable conditions. Plant parts above the lesions were often wilted, blighted and died eventually. Diseased flowers and flower buds eventually fell off.

The causal fungus was readily isolated on water agar and grew well on potato dextrose agar (PDA) at 10 to 35°C. No isolate grew and germinated at 5°C and 40°C. Optimum temperature for mycelial growth and conidial germination was 25°C (Table 1).

A total of 12 isolates of *Colletotrichum* spp. were collected from various parts of infected cosmos plants. The fungal colony on PDA was grey to greyish brown at the early stage and changed to salmon color with age. Conidia formed on solitary phialides were aseptate, colorless, fusiform with slightly tapered base, and measured 9.8-15.0×3.3-4.8 µm. Acervuli were setose, rounded and elongated. Setae were 1-2 septate, variable in length, brown, slightly swollen at the base and tapered towards the apex on which

conidia were born occasionally. Appressoria were dark brown, oval to club-shaped and 6.1-8.9×2.3-4.6 µm (Table 2; Figs. 1D, 1E).

The fusiform conidia with attenuated ends are considered as a decisive characteristic for *Colletotrichum acutatum* distinguishing from other species in the genus (Yaguchi et al., 1993). Since most mycological characteristics of the present isolates agreed well with *C. acutatum* described by previous workers (Kwon et al., 1998; Kim et al., 1999; Simmonds, 1968; Sutton, 1980; Yaguchi et al., 1993), we identified the fungus as *C. acutatum*.

Cosmos plants grown for 21 days in Wagner pots were used for the pathogenicity test. Conidial suspension of an isolate was prepared from 30-day-old culture on PDA and adjusted to 3×10<sup>5</sup> conidia/ml. Fifty ml of the inoculum was sprayed on each plant and the plants were placed in a humid growth chamber adjusted to 25°C and 100% humidity. In order to determine the time required for infection under the condition, plants were incubated for 1, 3, 5, 10, 15, 20 and 24 hr and returned to a normal greenhouse condition. None of the plant was infected when the plant was incubated only 1 hr, but 28.4% were infected by 3 hr and the infection rate increased gradually with incubation time reaching 100% by 24 hr of incubation (Table 3).

Anthracnose caused by *Colletotrichum* spp. is known to occur on foliage, stems or fruits of numerous plants that typically develops dark-colored spots or sunken lesions with a slightly raised rim (Agrios, 1997). *C. acutatum* as well as other species in the genus attacks wide host plants. However, the fungus has not been reported in Korea

**Table 1.** Effect of temperature on mycelial diameter and conidial germination of *Colletotrichum acutatum* isolated from cosmos

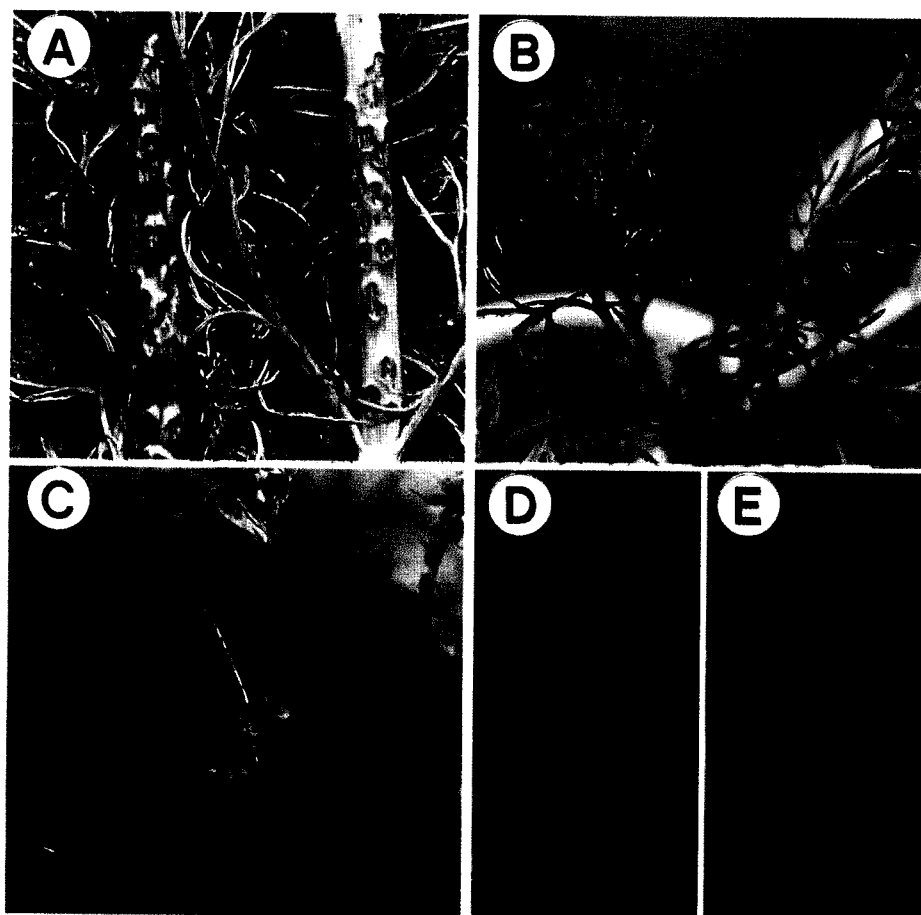
Temperature (°C)	Mycelial diameter <sup>a</sup> (mm±SE)	Conidial germination (%±SE)
5	0.0±0.0	0.0±0.0
10	19.3±1.15	14.3±2.29
15	50.7±1.15	59.4±5.0
20	70.5±0.5	87.0±5.0
25	90.0±0.0	97.5±0.31
30	76.0±1.14	90.4±5.0
35	19.3±1.15	46.7±3.10
40	0.0±0.0	0.0±0.0

<sup>a</sup>Mycelial diameter was measured 11 days after incubation on PDA.

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**Fig. 1.** Symptoms of anthracnose on cosmos caused by *Colletotrichum acutatum*. Symptoms on stems (A), leaves (B), flowers and floral axis (C) of cosmos; conidia (D) and appressoria (E); Bars indicate 10  $\mu$ m.

**Table 2.** Comparisons of morphological characteristics of conidia and appressoria of cosmos isolate and *Colletotrichum acutatum* reported by previous workers

Authors or isolate	Conidia		Appressoria	
	Shape	Size ( $\mu$ m)	Shape	Size ( $\mu$ m)
Cosmos isolate	fusiform	9.8-15 $\times$ 3.3-4.8	clavate	6.1-8.9 $\times$ 2.3-4.6
Yaguch, Y. et al.	fusiform	11-14 $\times$ 2.8-3.5	clavate	6.9 $\times$ 3.5-5.0
Simmonds, J. H.	fusiform	8.3-14.4 $\times$ 2.4-4	—	—
Sutton, B. C.	fusiform	8.5-16.5 $\times$ 2.5-4	clavate or slightly irregular	8.5-10 $\times$ 4.5-6

**Table 3.** Times required for conidial germination and host infection of a cosmos isolate of *Colletotrichum acutatum* at 25°C

Incubation time (hr)	Conidial germination (% $\pm$ SE)	Host infection (%)
1	0.0 $\pm$ 0.0	0
3	3.9 $\pm$ 0.38	28.4
5	21.9 $\pm$ 2.22	43.3
10	75.5 $\pm$ 1.18	64.4
15	82.9 $\pm$ 1.63	76.7
20	90.7 $\pm$ 0.50	88.9
24	97.5 $\pm$ 0.32	100

frequently. Prior to this study, the fungus was reported only by Lee (1994), Kwon et al. (1998) and Kim et al. (1999) as the cause of apple fruit and safflower anthracnose. In our survey, cosmos anthracnose occurred more severely on the plants grown nearby safflower fields heavily infected by the fungus. As presumed, the isolates obtained from cosmos showed strong pathogenicity to safflower and vice versa (data not shown). Consequently, cultivation of the two plants in the same area could accelerate inoculum potentials since they are alternative hosts of the fungus. Ecology and host range of the fungus remain to

be studied further.

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