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Occurrence of Tulip Fire Caused by *Botrytis tulipae* in Korea

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Severe spotted lesions were observed on tulip plants grown in Asan, Yongin, and Icheon areas in Korea during a disease survey in 2000 and 2001. Diseased plants with severe symptoms were blighted and rotted at the late stage of disease development. A total of 15 isolates was obtained from the infected plant parts of tulip. All the isolates were identified as *Botrytis tulipae* based on their morphological and cultural characteristics. Three isolates of *B. tulipae* were tested for their pathogenicity to tulip by artificial inoculation. Spotted lesions similar to those observed in the fields were induced on tulip leaves. This is the first report of tulip fire disease caused by *B. tulipae* in Korea.

Keywords **:** *Botrytis tulipae*, fire disease, tulip.

Tulip (*Tulipa gesneriana* L.) is cultivated as a bulbous flower. The plant is usually grown in the greenhouse and can be easily infected with *Botrytis* spp. due to low temperature and high humidity in the greenhouse condition. Symptoms were observed on leaves, flowers, and bulbs of tulip in Asan, Yongin, and Icheon areas in Korea during a disease survey in 2000 and 2001. Incidence of the disease ranged from 10 to 100% in 5 of 20 fields surveyed.

The symptoms developed on all parts of tulip plants. Lesions appeared as oval to elongated yellowish spots with dark and water-soaked borders on leaves (Fig. 1A and B). These spots enlarged and turned whitish or grayish brown under humid conditions. Severely infected leaves were blighted and rotted at the late stage of disease development. Lesions on petals showed small, whitish, and somewhat sunken spots (Fig. 1C) and light brownish, wrinkled, and raised blister spots (Fig. 1D). Infected flower buds turned pale yellow to gray, and the lesions gradually progressed toward flower stalks (Fig. 1E). Severely infected flower buds failed to open and rotted with abundant conidia. Lesions on bulbs were dark yellow to brown, slightly sunken on the outer bulb scales, and covered with abundant conidia (Fig. 1F).

A total of 15 monoconidial isolates was obtained from the lesions. All the isolates were identified as *Botrytis tulipae* Lind based on their morphological and cultural characteristics (Fig. 1G-I, Table 1). Conidia were ellipsoidal or obovoid, unicellular, pale brown, smooth, and measured 13.8-22.5 × 8.0-12.5 μm in diameter. Conidiophores were erect and usually 0.7-1.0 mm high. Stipes were long, slender, cylindrical, pale brown at the lower portion and paler at the upper portion, 14.0-20.0 μm wide, some with swollen basal cell, and branches alternating at about two-thirds of the height from the basal portion, and branched again one or two times. Conidiogenous cells were inflated at apices producing conidia on sterigma. Colonies of the isolates on PDA at 21°C consisted of pale gray, sparse aerial mycelium, and produced small, black, round or irregular, numerous sclerotia. The morphological and cultural characteristics of the isolates fitted well with those described in previous works (Beaumont et al., 1936; Ellis, 1971; Kishi, 1988; Ondrej, 1972; Westerdijk & Beyma, 1928). The fungus was distinguishable from other *Botrytis* species occurring in Liliaceae in terms of size of conidia and sclerotia (Arx, 1987; Morgan, 1971). The fungus produced somewhat larger conidia than *B. cinerea*, but smaller than *B. elliptica*. The fungus also produced abundant smaller sclerotia, less than 1 mm on PDA, than the other *Botrytis* species.

To prove pathogenicity of the fungi to tulip, three isolates of the fungus, B0025-1, B0025-2, B0025-3 were used. Mycelial plugs of each isolate were transferred to PDA in plastic petri dishes. The cultures were incubated at 21°C in the dark for 3 days and then illuminated under near ultraviolet light (20 W × 3, 12 h/d) for 5 days. Conidial suspensions were made by flooding the cultures with 10% clarified V-8 juice. Conidial suspensions (3-5 × 10^6/ml) of each isolate were sprayed onto leaves of the plant. Inoculated plants were placed in a dew chamber at 21°C for 48 h for disease development and then moved into a greenhouse. Control plants were sprayed with only 10% clarified V-8 juice. All the inoculated isolates induced spotted lesions on leaves of tulip, but there were no

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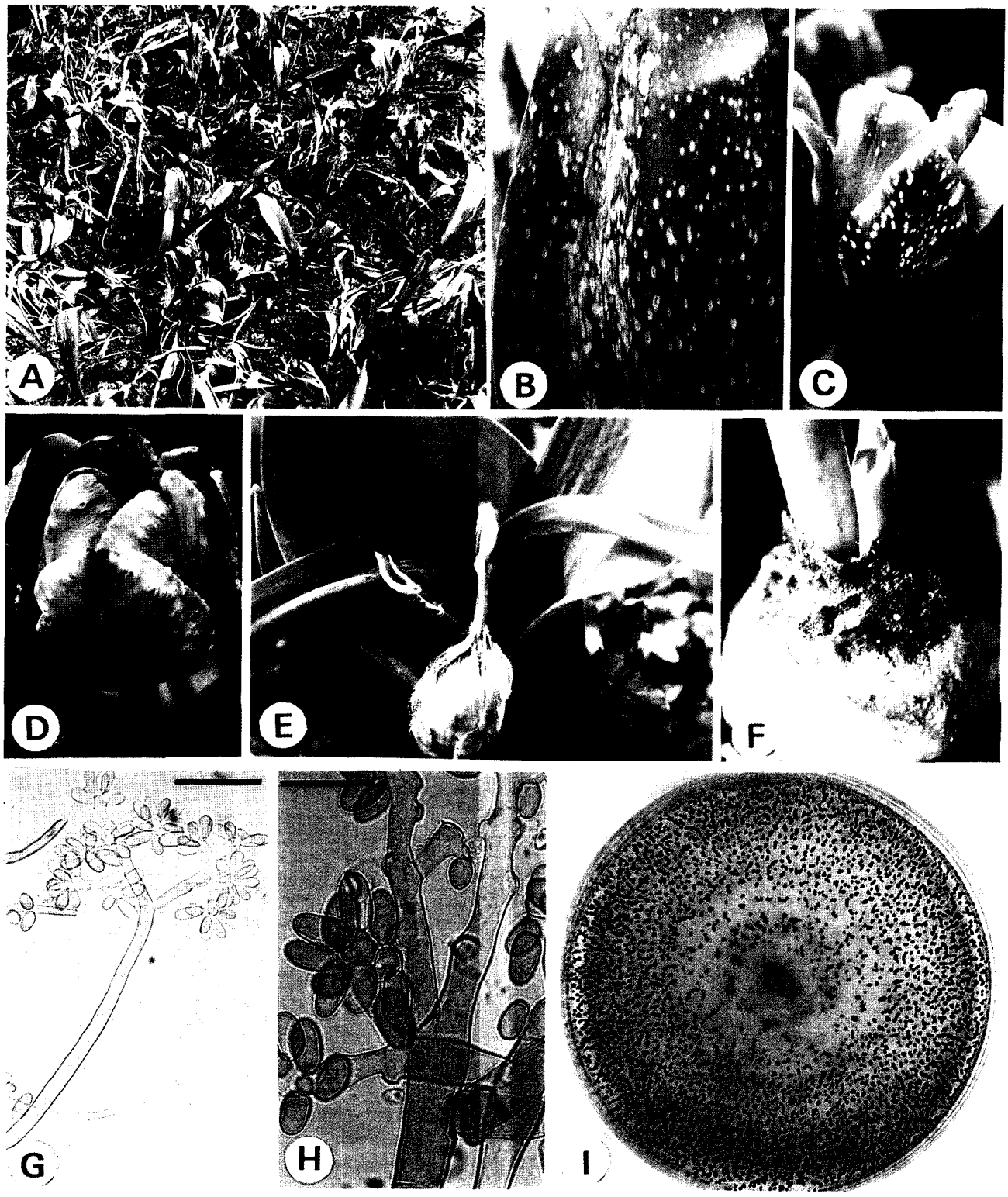

Fig. 1. Symptoms of tulip fire (**A** to **F**) and morphological and cultural features of *Botrytis tulipae* (**G** to **I**). (**A**) infected plants in the field; (**B**) spots on a leaf; (**C**) spots on a flower; (**D**) blister spots on a flower; (**E**) an infected flower bud with sporulation; (**F**) bulb rot; (**G** and **H**), conidiophores bearing conidia (scale bar in G=60 μm, scale bar in H=30 μm); (**I**) a colony on PDA.

Table 1. Morphological characteristics of *Botrytis tulipae* isolated from diseased tulip plants

Structure examined	Present isolates	*Botrytis tulipae*	
		Ellis (1971)	Kishi (1988)
Conidiophore			
Color	Pale brown	–[a]	–
Length (mm)	0.7-1.0	–	–
Width (μm)	14.0-20.0	–	–
Conidium			
Color	Pale brown	–	Hyaline or pale brown
Shape	Ellipsoidal or obovoid	–	Ellipsoidal or obovoid
Surface	Smooth	–	–
Size (μm)	13.8-22.5 × 8.0-12.5	12-22 × 8-15	12-24 × 10-20
Sclerotium			
Color	Black	Black	Black
Shape	Spherical or irregular	–	Sesame-like
Size (mm)	0.3-0.7 × 0.4-1.3	1-2	1-2

[a] – : not described.

symptoms on the control plants. Symptoms first appeared as small spots on leaves of the plant within a few days after inoculation. Spotted lesions gradually enlarged and resulted in blight and rot, which were similar to those observed in the fields. The fungus was re-isolated from the lesions induced on the leaves inoculated.

It has been reported that *B. tulipae* attacks tulip (Ellis, 1971; Kishi, 1988), asparagus (Ellis, 1971), onion (Segal, 1953; Sumner et al., 1994), avalanche-lily (Ginns, 1986), and Madonna-lily (Shaw, 1973). The disease caused by the fungus has been named as tulip fire, tulip mold, and Botrytis blight. However, tulip fire is the most common name for the disease (Beaumont et al., 1936). This is the first report of tulip fire disease caused by *B. tulipae* in Korea.

References

Arx, J. A. von. 1987. *Plant Pathogenic Fungi. J. Cramer*, Berlin, Stuttgart, Germany. pp. 240-241.

Beaumont, A., Dillon Weston, W. A. R. and Wallace, E. R. 1936. Tulip fire. *Appl. Ann. Biol.* 23:57-88.

Ellis, M. B. 1971. *Dematiaceous Hyphomycetes. Commonw. Mycol. Inst.*, Kew, Surrey, England. 608 p.

Ginns, J. H. 1986. *Compendium of Plant Disease and Decay Fungi in Canada 1960-1980. Res. Br. Can. Agric. Publ.* p.416.

Kishi, K. 1988. *Plant Diseases in Japan*. Zenkaku Noson Kyoiku Kyokai Co., Ltd., Tokyo, Japan. 943 p.

Morgan, D. J. 1971. Numerical taxonomic studies of the genus *Botrytis* II. Other *Botrytis* taxa. *Trans. Br. Mycol. Soc.* 56:327-335.

Ondrej, M. 1972. *Botrytis convallariae* (kleb.) comb. nov. A jeji odliseni od ostatnich druhn hub rodu *Botrytis* fuck. *Biologia (Bratislava)* 27:23-29.

Segal, R. H. 1953. Onion blast or leaf spotting caused by species of *Botrytis*. *Phytopathology* 43:483 (Abstr.).

Shaw, C. G. 1973. Host fungus index for the Pacific Northwest - I. Hosts. *Washington State Univ. Agric. Exp. Sta. Bull.* 765:1-121.

Sumner, D. R., Hanlin, R. T. and Gay, J. D. 1994. A bulb rot of vidalia sweet onion caused by *Botrytis tulipae* in Georgia. *Plant Disease* 78:1218 (Abstr.).

Westerdijk, J. and Beyma thoe Kingma, F. H. van. 1928. Die Botrytis-Krankheiten der Blumenwiebelgewächse und der Paeonie. *Meded. Phytopathol. Lab. Willie Commelin Scholten* 12:1-27.