

Note

Occurrence of Bulb Rot of *Allium victorialis* var. *platyphyllum* Caused by *Sclerotium rolfsii* in Korea

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In 2007, a bulb rot of *Allium victorialis* var. *platyphyllum* Makino caused by *Sclerotium rolfsii* occurred sporadically in a herb farm at Gyeongsangnam-do, Korea. The symptom initiated with water-soaking lesion and progressed into bulb rot and wilt of a whole plant. Severely infected plants were blighted and killed eventually. White mycelial mats appeared on the lesion at early stage and a number of sclerotia were formed on the bulb. The sclerotia were spherical, 1~3 mm and white to brown. The optimum temperature for the growth and sclerotia formation was 30°C on PDA. The hyphal width was measured 4-9 µm. The typical clamp connections were observed on PDA. Based on the symptom, mycological characteristics and pathogenicity to the host plant, this fungus was identified as *Sclerotium rolfsii* Saccardo. This is the first report on the bulb rot of *A. victorialis* var. *platyphyllum* caused by *S. rolfsii* in Korea.

Keywords : *Allium victorialis* var. *platyphyllum*, bulb rot, *Sclerotium rolfsii*

Allium victorialis belonging to *Liliaceae* is a perennial plant grown in the wood-land. The bulb and leaves of plant are used as a food or vegetable in Korea (Lee, 2003).

A destructive bulb rot of *A. victorialis* caused by *Sclerotium rolfsii* was sporadically observed in the herb farms at jillye-myon, Gimhae city, Gyeongnam province in 2007. The disease mainly occurs on bulbs in the pot. To date, three diseases of *A. victorialis* have been recorded in Korea. However, the bulb rot disease of *A. victorialis* caused by *S. rolfsii* has not been reported in this country yet (Cho et al., 2004).

S. rolfsii is one of the most important soil-borne pathogens in recent years, especially in Gyeongnam province. Newly recorded hosts of the pathogen by the authors are *Disporum sessile* (Kwon et al., 2007) and *Disporum*

smilacinum (Kwon and Jee, 2007).

In this study, the pathogen causing bulb rot of *A. victorialis* is identified based on symptom, mycological characteristics and pathogenicity test.

Symptom and environment. In general, white mycelial mats were appeared on the surface of bulbs tissues. The fungus produced numerous small globoid sclerotia of uniform size which were white at first and turned brown both on PDA and on host in the pot. The heavily infected plants became water-soaked, rotted, wilted, blighted, and died eventually (Fig. 1A).

In Gyeongnam area, the *A. victorialis* is cultivated in the herb farms every year. Cultivation condition of the plant was maintained with high temperature and humidity in greenhouses. Consequently, the cultivation practice favored an outbreak of the disease on bulbs. The infection rate of surveyed areas reached 14% in July of 2007. Abundant sclerotia of the pathogen were often produced on the surfaces of infected bulbs and near on the surface in the pots, which play an important role as a secondary inoculum in the greenhouses.

Mycological characteristics. Freshly infected bulbs were collected from the fields and cut into small pieces for isolation of the causal pathogen. The small pieces of 3×3 mm in size, were disinfected in 1% NaOCl solution for 1 minute and washed in distilled water for 3 times. The causal fungus was easily isolated on water agar (WA) and grew well on potato dextrose agar (PDA). After incubation for 4 days at 25°C, mycelial tips growing out the tissues were cut and transferred on PDA for further study. The mycological characteristics of the fungus was examined after incubation for 16 days at 25-30°C on PDA. For the scanning electron microscopy, the culture on PDA for 4 days was cut into pieces 5×5 mm with a surgical blade and fixed with 2.5% Karnovsky solution for 24 hrs at 4°C. After fixing, the specimens were rinsed carefully with 0.05 M cacodylate buffer (pH 7.2) for 10 min 3 times. Post fixing, the specimens were soaked in 1% osmium tetroxide solution for 2

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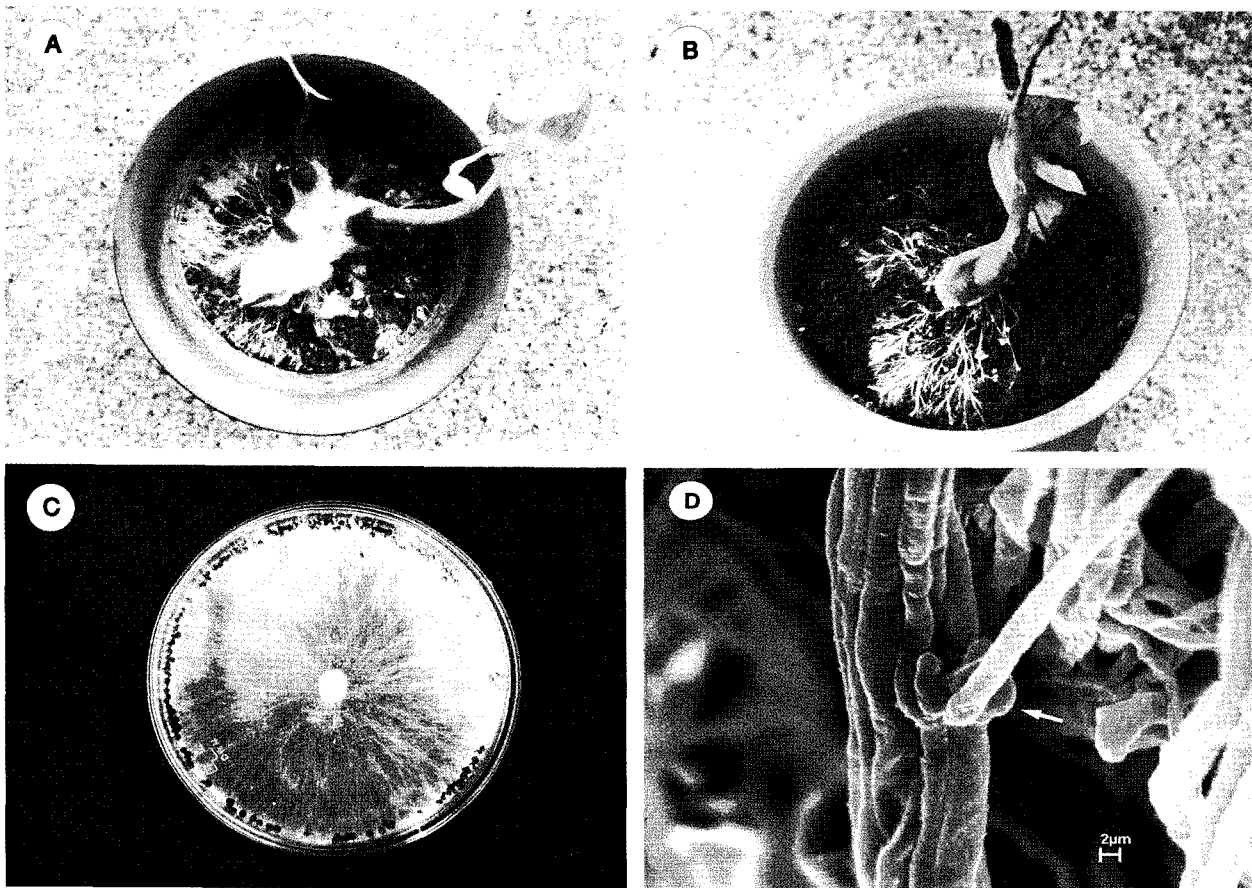


Fig. 1. Symptoms of bulb rot of *A. victorialis* and mycological characteristics of the pathogenic fungus, *S. rolfsii*. (A) typical symptoms occurred on bulb, infected plants wilted, blighted and died eventually, (B) symptoms after artificial inoculation in the pot for 4 days, (C) mycelial mat and sclerotia grown on PDA after 16 days, and (D) clamp connection (arrow).

hrs at 4°C and rinsed carefully 3 times with the same buffer solution. They were dehydrated through a series of ethanol solution gradient (50, 75, 90, 95 and 100%) after soaking for 20 min at room temperature, and followed by isoamyl acetate 100% for 1 hr 2 times. After that, the samples were dried by critical point dryer for 1 hr and were coated by gold/palladium coating by Sputter coater.

The number of sclerotia was investigated after mycelial growth for 16 days on PDA. Small and spherical sclerotia were produced on the surface of lesions. The sclerotia were white and turned to dark brown at maturation with relatively uniform sizes. The maximum numbers of sclerotia produced at 30°C, but no sclerotium was observed below 10°C or over 35°C for 16 days on PDA. The size of sclerotia were measured 1~3 mm and the shapes were mostly spherical (Fig. 1C, Table 1). The optimum temperature for the mycelial growth was 30°C for 4 days on PDA, however, it did not grow below 5°C and over 35°C. The white mycelium usually formed many narrow hyphal strands with 4~9 µm width in the aerial mycelium. This mycelium showed typical clamp connection structure (Fig. 1D).

Table 1. Comparison of mycological characteristics between the present isolate obtained from *A. victorialis* and *S. rolfsii* described previously

Characteristics		Present isolate	<i>S. rolfsii</i> ^a
Colony	color	white	white
Hyphae	diameter	4~9 µm	4.5~9 µm
	clamp connection	present	present
Sclerotium	shape	globoid	spherical
	size	1~3 mm	1~2 mm
	color	brown	brown

^aDescribed by Mordue (1974)

Pathogenicity test. For the pathogenicity of the fungus, *A. victorialis* was tested in a greenhouse at the Gyeongsangnam-do Agricultural Research and Extension Services, Korea. Total 6 of two years old plants were cultivated in plastic pots (14.5 cm width×13.5 cm height) with autoclaved field soil. 30 Petri-plates that were fully grown fungal mycelial mats were amended into 3 kg sterile field soil referred to as inoculum source. The plants were

inoculated with 100 g of the inoculum source on the bulbs. The first symptom was appeared 4 days after inoculation and developed to severe bulb rot. Infected plant was wilted, blighted and died eventually (Fig. 1B). The causal pathogen was re-isolated from the lesions to prove Koch's postulation.

The sclerotial diseases caused by *S. rolfsii* primarily occur in warm climates, especially under a high temperature with humid condition. The pathogen of sclerotial diseases causes damping-off of seedlings, stem canker, crown blight, and rots on root, crown, bulb, tuber and fruit of various plant groups (Gobayashi et al., 1992). Sclerotial diseases frequently affect a wide variety of plants, including most vegetables, flowers, legumes, cereals, forage plants and weeds (Agrios, 2005).

Based on the characteristics examined in this study, present isolates causing blub rot on *A. victoralis* was identified as *S. rolfsii* (Mordue, 1974). The type culture of the fungus is stored at the Korean Agricultural Culture Collection (KACC No. 43065), National Institute of Agricultural Biotechnology, RDA, Suwon.

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