

Stem Rot of Tomato Caused by *Sclerotium rolfsii* in Korea

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(Received September 27, 2002)

A destructive stem rot of tomato (*Lycopersicon esculentum*) occurred sporadically some farmers' fields in Jinju City, Gyeongsangnam province in Korea. The infected plants also showed stem, crown rot or whole plant blight. White mycelium spread over stems of infected plants and formed sclerotia on the old lesions nearby soil surface. The fungus showed maximum mycelial growth around 30°C. The fungus formed white colony on PDA, usually with many narrow mycelial strands in the aerial mycelium and the width were 4.0–9.8 µm. The typical clamp connections were formed on the mycelium. Numerous sclerotia was formed on PDA at 30°C. The shape of sclerotia was globoid and 1.0–3.0 mm in size. The fungus was isolated repeatedly from the infected tissues and the pathogenicity was confirmed to tomato and identified as *Sclerotium rolfsii*. This is the first report on the stem rot of tomato caused by *S. rolfsii* in Korea.

KEYWORDS: *Sclerotium rolfsii*, Stem rot, Tomato

Sclerotial diseases caused by sclerotium occur primarily in warm climates, especially at high moistures and high temperatures. The pathogens of sclerotial diseases cause damping-off of seedlings, stem canker, crown blight, root, crown, bulb, tuber and fruit rots. Sclerotial diseases frequently affect a wide variety of plants, including most vegetables, floweres, legumes, cereals, forage plants and weeds (Agrios, 1997). This kind of disease is often called sclerotinia rot in general. Several papers has been reported that sclerotia rot on tomato was caused by *Sclerotium rolfsii* (Farr *et al.*, 1995, The Phytopathological Society of Japan, 2000). Mordue (1974) suggested that *S. rolfsii* is synonym of sclerotial state from *Corticium rolfsii*. However, no report related to the sclerotial stem rot of tomato has been reported in Korea (The Korean Society of Plant Pathology, 1998).

Disease occurrence. In Gyeongnam area, tomato was grew the four seasons in greenhouses. and the tomato seedlings are massively reared in commercial nurseries and transplanted to open area in May. In August, when the canopy of the plants become densely covered, high temperature and frequent rain predispose tomato (cv, Seokwang) to sclerotium stem rot disease. One of the severely infected fields in Jinju area reached to 8.2% of infection rate. In infected plants, fungal hyphae grew upward on surface of stems, covered the lesion with a cottony, white mass of mycelium. The white mycelium inside and outside of infected stems spread on the nearby soil surface. The fungus produces numerous small roundish sclerotinia of uniform size that are white when imma-

ture, becoming dark brown to black on maturity. The fungus grew into the cortex girdles the stems and eventually caused plant death (Fig. 1A, B).

Growth of pathogenic fungus. The causal fungus was easily isolated on water agar (WA) and readily grew on potato dextrose agar (PDA). Diameter of mycelial growth was measured 58 hours of incubation of the fungus on PDA. The data are means of three replications. The mycelium of fungus did not grow temperatures blow 15°C or over than 40°C. The temperature ranges for mycelial growth on PDA was 15–40°C, and the optimum temperature was 30°C (Fig. 2).

The fungus grew very rapidly on PDA. The white mycelium usually formed many narrow mycelial strands in the aerial mycelium and they were measured 4.0–9.8 µm in width. This mycelium showed characteristic clamp connection structure (Fig. 1E).

The number of sclerotina were investigated after mycelial growth 21 days. Small and globoid sclerotinia were produced on the surface of lesions. They were white at first but became dark brown after matured and their size were almost uniform (Fig. 1D).

The maximum numbers of sclerotia produced on PDA were 191.8 at 30°C, 144.2 and at 25°C, 55.6. The number of sclerotinia were reduced sharply below 20°C or over than 35°C (Fig. 2). The sclerotia were not formed below 10°C or over 40°C. The size of sclerotia were measured 1.0–3.0 mm and the shapes were mostly globoid (Table 1). The data are means of three replications.

Pathogenicity of the fungus. The pathogenicity of the fungus to tomato plants was tested in the greenhouse.

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Fig. 1. Symptoms of stem rot of tomato and mycological characteristics of the pathogenic fungus *Sclerotium rolfsii*. A: Severely infected open field with destructive stem rot and blight, B: Typical symptom on stem caused by *S. rolfsii* in the field, C: Lesion after artificial inoculation in a pot, D: The white mycelia and sclerotia of *S. rolfsii* grown on PDA, E: Typical clamp connection of the hyphae. Scale bar: 20 μm .

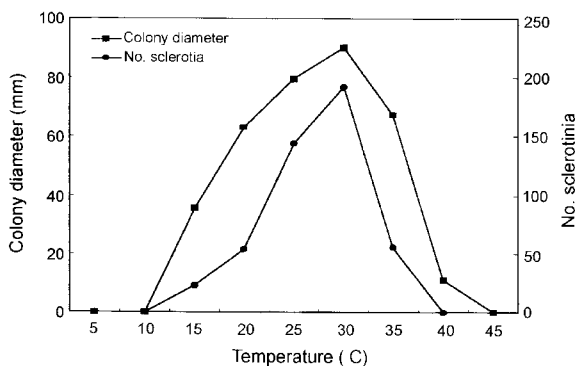


Fig. 2. Effects of temperature on mycelial growth and sclerotia formation of *Sclerotium rolfsii*, the causal organism of stem rot of tomato. Diameter of mycelial growth of *S. rolfsii* was measured 58 hours of incubation on PDA. The data are means of three replications (■—■). The number of sclerotia were counted after 21 days of incubation and the experiments were replicated 3 times (●—●).

Table 1. Mycological characteristics of the fungus isolated from stem rot of tomato and *Sclerotium rolfsii*

Characteristics		Present isolate	<i>S. rolfsii</i> ^a
Colony	color	white	white
Hyphae	diameter	4.0~9.8 μm	4.5~9.0 μm
	clamp connection	present	present
	Sclerotium	shape	spherical
	size	1.0~3.0 mm	1~2 mm
	color	brown	brown

^aDescribed by Mordue (1974).

Tomato plants were grown in greenhouse for 56 days. Tomato (cv. Seokwang) were planted in the Wagner pots (1/5000a) filled with autoclaved soil, which were inoculated with fungal mycelial mats on the stems. Inoculum was prepared with mycelial mats from 4 days cultures on PDA. The first symptom was appeared 12 days after inoculation and the symptom developed to severe rot and

wilted and eventually died (Fig. 1C). The same fungal isolate obtained from infected plant revealed severe symptom strong pathogenicity on tomato.

The pattern of mycelial out growth on infected plants, aerial mycelium and clamp connection structure are considered as the decisive characteristics of *S. rolfsii* for differentiating from other species in genus *Sclerotium*. *Sclerotium rolfsii* is often called the *Aethalium rolfsii* but unconfirmed perfect stage. The characteristics of the present isolates was almost identical with *S. rolfsii* described by previous worker (Farr *et al.*, 1995; Mordue, 1974; The Phytopathological Society of Japan, 2000), *Sclerotinia* sp. were caused by stem, branch, root, bulb and tuber rot in herb and woody plants (Gobayashi *et al.*, 1992). Consequently, the causal fungus of stem rot disease of tomato was identified as *Sclerotium rolfsii*.

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