

## Leaf Blight of Chinese Chive Caused by *Stemphylium vesicarium* in Korea

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**A leaf spot disease occurred on *Allium tuberosum* Roth. (Chinese chive) in Korea. All the isolates of *Stemphylium* sp. from the lesions of the diseased plant parts were identified as *S. vesicarium* (Waller.) Simmons, based on the morphological characteristics of conidia and conidiophores. Pathogenicity of the fungus was proved by artificial inoculation on Chinese chive plants. This is the first record of leaf blight on Chinese chive caused by *S. vesicarium* in Korea.**

**Keywords :** Chinese chive, leaf blight, *Stemphylium vesicarium*.

Chinese chive (*Allium tuberosum* Roth.) is one of the important vegetables in Korea. During the disease survey in the spring 1998, we first found blight lesions on the tips of the leaves. A *Stemphylium* sp. was isolated from the diseased leaves. However, leaf blight caused by *Stemphylium* sp. on Chinese chive was not yet reported in Korea.

Among *Allium* spp., *Stemphylium vesicarium* has been reported on garlic in South Africa (Aveling and Naude, 1992), Spain (Basallote et al., 1993) and Brazil (Boiteux et al., 1994), and on onion in USA (Miller et al., 1978). Diseases causing severe damages to Chinese chive were reported to be leaf spot caused by *Alternaria* sp., leaf blight caused by *Botrytis byssoides*, gray mold, Fusarium basal rot, rust and damping-off (Anonymous, 1998) in Korea. Leaf blight caused by *Stemphylium* sp. severely occurred in *Allium* spp. in Korea. Recently, *Stemphylium vesicarium* was reidentified as the causal agent of leaf blight of garlic, onion and Welsh onion in Korea (Cho and Yu, 1998). The leaf blight caused by *Stemphylium* sp. on Chinese chive may be a potential threat to Chinese chive cultivated under environmental conditions favorable for the disease.

Leaf blight occurred on Chinese chive in Okcheon and Yangju areas of Korea from April to June in 1998. Symptoms usually developed on leaf tip of the 5-14 days-old

plants of Chinese chive cutted. Disease symptoms showed a purplish colour (Fig. 1A), then turned to tan. The older leaves were eventually killed. Some lesions became black when conidia were produced. Infection mostly started at the leaf tips, which withered prematurely, thus resulting in yield reduction.

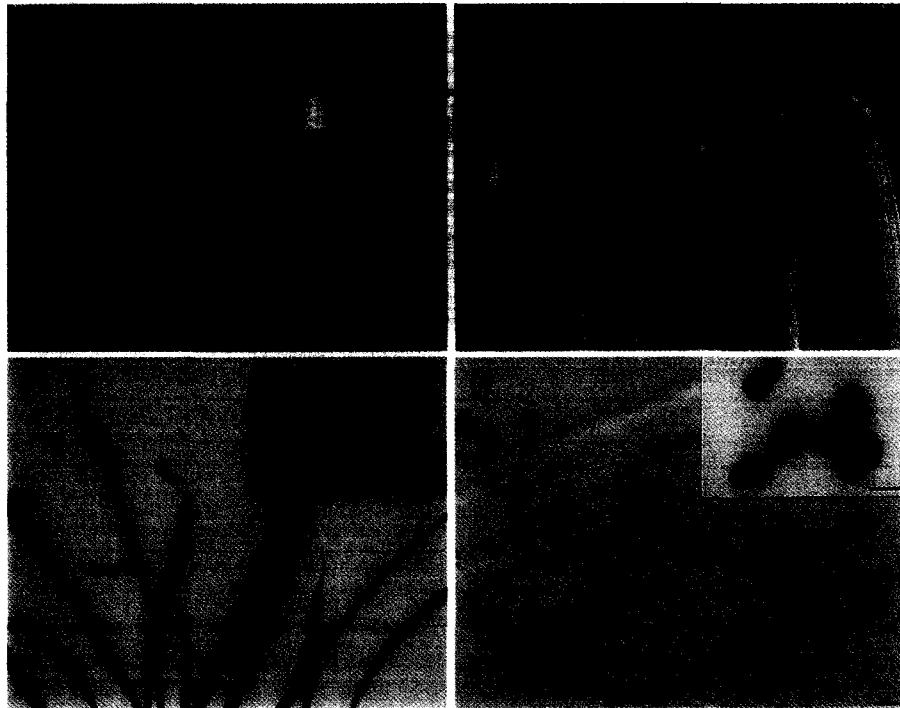
The morphology of the cultures were examined on PDA. The colonies slowly grew on PDA, reaching 21 to 47 mm in diameter after 7 days. Cultures of the fungus from infected leaves produced grey to greyish brown, hairy or velvety mycelia on PDA, when incubated in the dark (Fig. 1C). The conidiophores of the isolates grown on V-8 juice agar were erect, brown with vesicular swellings in the apices of the conidiogenous cells, 3 to 8 septa, and bearing a single conidium at the apex. Conidia were oblong or broadly ellipsoidal, olivaceous brown to mild black, rounded at the apex with no pointed ends, and with the cell wall minutely verrucose. The number of transverse septa ranged from 1 to 6 with several longitudinally irregular septa. Juvenile conidia were constricted at one median transverse septum, but oblong mature conidia commonly constricted at the two to three major transverse septa (Fig. 1D). Average dimensions of 50 conidia obtained directly from the host plant were 25-50 × 15-30 µm with a length : width (l : w) ratio of 2.0 : 1, and 27-45 × 15-25 µm with a l : w ratio of 2.2 : 1 in V-8 juice agar culture (Table 1). The measurements of conidia and conidiophores from leaf lesions on Chinese chive and from cultures were similar to those reported for *S. vesicarium* (Waller.) Simmons (Irwin et al., 1986; Shiskoff and Lorbeer, 1989; Boiteux et al., 1994; Cho and Yu, 1998).

*Stemphylium vesicarium* is distinguished from *Stemphylium botryosum* by the conidial morphology and the number of septum in mature spores (Simmons, 1969; Irwin et al., 1986) although both have muriform, olivaceous, brown conidia rounded at the apex, with pointed ends (Simmons, 1969; Rao and Pavgi, 1975). Conidia of *S. botryosum* usually have 3 transverse and 1-3 longitudinal septa, constricted at one median transverse septum, and with a l : w ratio of 1.0-1.5 : 1 (Simmons, 1969). In *S. vesicarium*, conidia have approximately 6-7 transverse and several longi-

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**Fig. 1.** Leaf spot symptoms on Chinese chive leaves naturally infected by *Stemphylium vesicarium* in a commercial field (A, B); Symptoms on leaves induced by artificial inoculation with *S. vesicarium* (C); Conidia and conidiophores of *S. vesicarium* (D). Bar=20  $\mu$ m.

**Table 1.** Conidial dimensions and length-to-width ratios ( $l:w$ ) of *Stemphylium* isolates in comparison with those of published descriptions of *S. vesicarium*

Isolate	On culture <sup>a</sup>		On host	
	Length $\times$ width ( $\mu$ m)	$l:w$	Length $\times$ width ( $\mu$ m)	$l:w$
Present isolate	27-45 $\times$ 15-25 (Av. 35.0 $\times$ 19.5)	2.2 : 1	25-50 $\times$ 15-30 (Av. 37.9 $\times$ 20.5)	2.0 : 1
<i>S. vesicarium</i> Simmons (1985)	(< 45 $\times$ 18)	2.5-3.0 : 1	25-42 $\times$ 12-22 (Av. 33.4 $\times$ 17.7)	1.5-2.7 : 1 (Av. 1.9 : 1)
Irwin et al. (1986)	26-43 $\times$ 11-19 (Av. 35.5 $\times$ 14.5)	2.3-2.7 : 1	—	—
<i>S. botryosum</i> Simmons (1985)	— (Av. 33 $\times$ 23)	1.5 : 1	33-35 $\times$ 24-26	1.0-1.5 : 1
Irwin et al. (1986)	23-33 $\times$ 15-23 (Av. 28 $\times$ 18)	1.5 : 1	(Av. 34 $\times$ 25)	

<sup>a</sup>After 10 days on V-8 juice agar medium culture at 25 °C

tudinal septa, often constricted at 2-3 major transverse septa, and with a  $l:w$  ratio of approximately 2.0-3.0 : 1 (Simmons, 1985). Conidia of *S. botryosum* are somewhat shorter than those of *S. vesicarium* (Simmons, 1985; Irwin et al., 1986). Our observations of more than 5 isolates from the two Chinese chive-growing areas in Korea confirmed that the causal organism of leaf blight on Chinese chive is identified to *S. vesicarium* previously reported in other *Allium* sp. in Korea (Cho and Yu, 1998).

To prove the pathogenicity of the fungus, the 2-week-old plants of Chinese chive cutted were sprayed using a hand-

sprayer with 10 ml of a conidial suspension adjusted to  $1 \times 10^5$  conidia/ml. A comparable plant was treated with sterilized water. The plants sprayed were placed in a dew chamber at 25 °C for 2 days to ensure favorable conditions for infection. The plants were then transferred to a greenhouse at  $25 \pm 3$  °C. Disease was assessed at 7 days after inoculation. Disease symptoms by artificial inoculation appeared 3 days after inoculation on Chinese chive, onion and Welsh onion. Symptoms on Welsh onion and onion leaves were similar to those on Chinese chive (Fig 1B, Table 2). The lesions were similar to those of naturally

**Table 2.** Pathogenicity of isolated *Stemphylium vesicarium* on *Allium* spp.

Isolate	Host plant isolated	Disease severity <sup>a</sup>			Check
		Chinese chive	Welsh onion	Onion	
SV-9826	Chinese chive	++	++	+	-
SV-9929	Chinese chive	++	++	+	-
SV-9935	garlic	++	++	++	-
SV-9937	garlic	++	+++	++	-

<sup>a</sup> Diameters of the lesions were measured 7 days after inoculation. +++; more than 11 mm in length, ++; 6-10 mm in length, +; 1-5 mm in length, -; no lesion.

infected leaves. Lesions from the plants inoculated with the isolates formed the conidia identical to the *S. vesicarium* isolated. This is the first report of *S. vesicarium* causing leaf blight on Chinese chive in Korea.

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