



NEW DISEASE REPORT

First report of leaf blight disease caused by *Stemphylium solani* on Welsh onion in Korea

W. Dumin¹ | Y.K. Han¹ | J.H. Park¹ | J.W. Han² | C.G. Back¹

¹ Horticultural and Herbal Crop Environment Division, National Institute of Horticultural and Herbal Science, Rural Development Administration, Wanju 55365, Republic of Korea

² Vegetable Research Division, National Institute of Horticultural and Herbal Science, Rural Development Administration, Wanju 55365, Republic of Korea

Correspondence

C.G. Back, Horticultural and Herbal Crop Environment Division, National Institute of Horticultural and Herbal Science, Rural Development Administration, Wanju 55365, Republic of Korea.

Email: plantdoctor7@korea.kr

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Welsh onion (*Allium fistulosum*) is an economically important crop in Korea due to its culinary and medicinal use. Several diseases can infect Welsh onion including *Stemphylium* leaf blight, which can significantly reduce both quality and yield. From June 2019, a severe leaf blight disease was observed in several fields of Welsh onions (approximately 10 ha) in Muan, Korea (Figure 1). Disease incidence was approximately 25% and resulted in approximately a 10% decrease in yield. Symptoms were initially small white-greyish spots that later enlarged to produce



FIGURE 1 Leaf blight disease caused by *Stemphylium solani* infecting Welsh onion in the field



FIGURE 2 Disease symptoms start as yellow spots and water-soaked lesions but progress to dark-violet due to the formation of conidia

sunken brown lesions before turning black-violet in colour due to conidia formation (Figure 2). As the disease progressed, wilted leaves were observed followed by plant death approximately four weeks after the symptoms appeared.

To identify the causal agent, pieces of symptomatic tissue (c. 0.2 × 0.2 cm) were surface disinfested in 1% NaOCl and rinsed twice in



FIGURE 3 Muriform conidia of *Stemphylium solani*

sterile water before plating onto potato dextrose agar. After five days at 25°C, white-greyish putative colonies of *Stemphylium* were observed, with colonies turning red-brown after 15 days incubation. Conidia observed were muriform, brown, oblong or clavate shape ($27.6\text{--}49.6 \times 13.1\text{--}29.3 \mu\text{m}$, $n = 50$) with 1–3 transverse and 2–7 longitudinal septa (Figure 3). Morphological characteristics resembled *Stemphylium solani* as described by Ellis (1971). To confirm species identity, sequencing of the ribosomal DNA internal transcribed spacer region (rDNA-ITS) and calmodulin (cmdA) genes from four isolates (collected from different fields) were undertaken using previously described methods (Carbone & Kohn 1999; White et al., 1990). Phylo-

genetic analysis (Figure 4) of the concatenated nucleotide sequences of rDNA-ITS and cmdA confirmed all four isolates were *Stemphylium solani*.

A pathogenicity test was performed on detached Welsh onion leaves using the representative isolate KCTC56745 (GenBank Accession No. LC592373 and LC601643). A conidial suspension (10^7 conidia/ml) of the isolate was used to inoculate the wounded surface of ten different detached Welsh onion leaves. Detached leaves were wounded with a pin ($25 \times 0.5 \text{ mm}$) situated approximately 15 cm from the leaf tips (leaves were approximately 30 cm long). For a control, three leaves were inoculated with sterile water. The inoculated leaves were kept in a closed container within an incubator to maintain 90% humidity at 25°C. After eight days, a water-soaked symptom was observed on all inoculated leaves (Figure 5). No symptoms were observed in the control plants. Using the method described above, isolation of fungal colonies from symptomatic leaves was attempted. Three colonies were examined and identified as *Stemphylium solani* with morphology and DNA sequences consistent with the original isolate. The pathogenicity test was repeated three times and the results were consistent each time thereby fulfilling Koch's postulates. In this current study, *S. solani* isolated from Welsh onion shows similar symptoms to *S. vesicarium* infection in other *Allium* species. Therefore, accurate identification of *S. solani* as the causal agent is critical for effective disease management to minimise qualitative and quantitative losses. *S. solani* has previously been reported causing grey leaf spot in pepper (*Cap-sicum annuum*) (Kim et al., 2004) and garlic (Zheng et al., 2007). To our knowledge, this is the first report of *S. solani* infecting Welsh onion worldwide.

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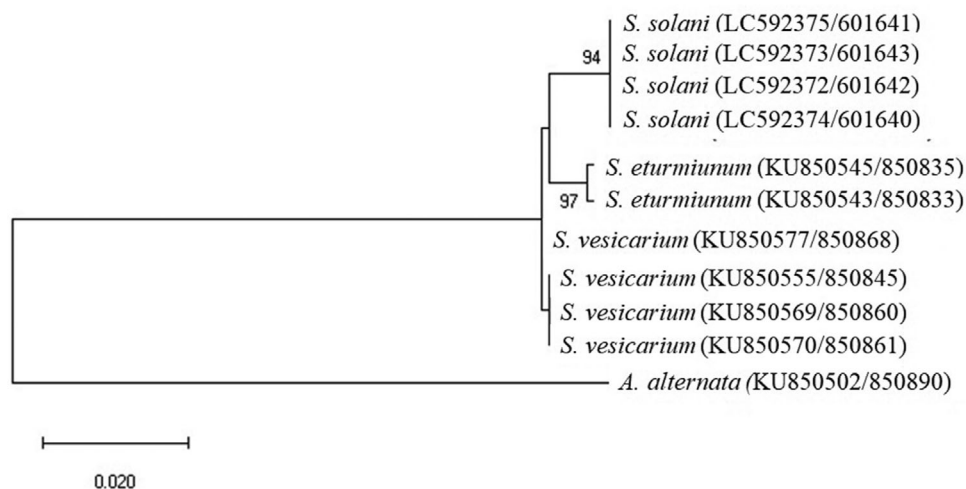


FIGURE 4 Phylogenetic tree constructed from concatenated rDNA-ITS/cmdA sequences. Reference nucleotide sequences of rDNA-ITS/cmdA of *Stemphylium eturmiunum* (*S. eturmiunum*), *S. vesicarium*, and *Alternaria alternata* (*A. alternata*) were obtained from Woudenberg et al. (2017)



FIGURE 5 Disease symptoms on artificially inoculated Welsh onion leaves

ORCID

W. Dumin <https://orcid.org/0000-0001-9952-8208>

C.G. Back <https://orcid.org/0000-0001-5665-4730>

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