



First report of *Phomopsis asparagi* causing stem blight on asparagus in Vietnam

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Asparagus (*Asparagus officinalis*) has become an economically important crop in many regions of Vietnam. A survey conducted in the asparagus growing areas of North Vietnam in 2018 revealed that more than 70% of asparagus plants were exhibiting disease symptoms. Oval-shaped lesions with dark brown or black pycnidia were found on all aerial parts of the plant, extending and covering large areas of stems (Figs. 1-2). These symptoms were similar to those caused by *Phomopsis asparagi* (syn. *Phoma asparagi*), the most serious pathogen of cultivated asparagus in many parts of the world (Elena, 2006; Zaw *et al.*, 2017).

Diseased samples were collected from Hanoi, Bac Ninh and Bac Giang regions. Pathogens were isolated on water agar (2%) and purified by single spore isolation. A representative isolate PPRI1809.1 was chosen for further study and stored in the culture collection of the Plant Protection Research Institute of the Vietnam Academy of Agricultural Sciences. Fungal mycelium on potato dextrose agar was white to grey and produced aggregated pycnidia after three weeks of incubation at 25°C (Fig. 3). Alpha conidia were formed inside pycnidia, and were hyaline, biguttulate, aseptate, spindle-shaped and tapering towards both ends and measured $8.9 \pm 1.0 \mu\text{m} \times 3.2 \pm 0.2 \mu\text{m}$ (n=30), (Fig. 4). Based on these morphological characters, the fungus was initially identified as *P. asparagi* (Uecker & Johnson, 1991; Thao *et al.*, 2018).

The identity of the causal pathogen was confirmed by the analysis of the ITS region sequence using the primers ITS1 and ITS4 (White *et al.*, 1990). The raw sequence was assembled with MEGA 7.0 and the consensus sequence deposited in GenBank (Accession no. MK400353). A BLAST analysis showed that the ITS sequence from PPRI1809.1 shared 99% identity with that of *P. asparagi* (JQ619528, LC203583 and KY16055).

To fulfil Koch's postulates, isolate PPRI1809.1 was used to inoculate shoots of healthy asparagus plants. A conidial suspension in sterile distilled water (1×10^6 conidia/ml) was sprayed on three asparagus plants (one shoot per plant). One plant was inoculated with sterile distilled water as a control. Inoculated plants were placed in a greenhouse at 25°C for two weeks and

the experiment was repeated three times. Typical stem blight symptoms (Fig. 5) were observed 10 days post inoculation and the pathogen was successfully re-isolated from symptomatic tissue. No symptoms developed and no pathogens were isolated from the control plants.

This is the first report of *P. asparagi* infecting asparagus in Vietnam. The disease was widely spread in the northern regions of Vietnam in August and September 2018, when the temperature is around 25-30°C and the humidity is high. This disease has the potential to become a major threat to the asparagus production of Vietnam.

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Figure 1



Figure 2

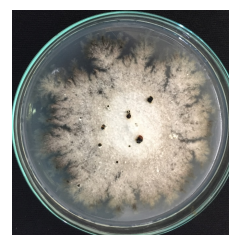


Figure 3

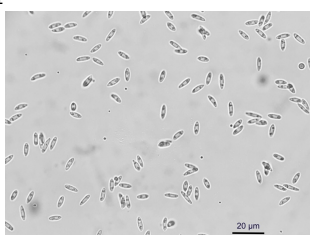


Figure 4

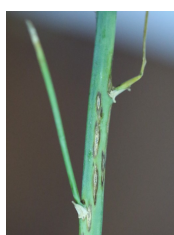


Figure 5

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