Diseases Caused by Fungi and Fungus-Like Organisms

First Report of *Fusarium* Stem and Root Rot of *Gerbera jamesonii* Caused by *Fusarium incarnatum* in China

Shuning Chen, Huizhu Yuan, and Xiaojing Yan[†]

Key Laboratory of Integrated Pest Management in Crops, Ministry of Agriculture, Institute of Plant Protection, Chinese Academy of Agricultural Sciences, Beijing 100193, China

Funding: This material is based upon work supported by National Key Research Development Program of China (No. 2019YFD1002000). Plant Dis. 105:4161, 2021; published online as <https://doi.org/10.1094/PDIS-02-21-0440-PDN>. Accepted for publication 25 June 2021.

Gerbera (*Gerbera jamesonii* Bolus) is an important cut flower grown globally. In 2020, gerbera plants (Redaicaoyuan, Baimawangzi, and Hongditan cultivars) with root, crown, and stem rot were found in a greenhouse in Nanping, Fujian, China. Approximately 30% of the 60,000 plants showed symptoms. Diseased plants were stunted with chlorotic leaves. The leaves and flower heads were wilted and withered. Brown discoloration with red to black streaks occurred in the vascular system of the crown and stem. The stem pieces (3 × 3 mm) showing the symptom were surface disinfected with 1% NaClO for 1 min and washed three times with sterilized water. The stem pieces were then dried and placed on potato dextrose agar (PDA) at 25°C inside a dark chamber. Ten single-spored isolates were identified as *Fusarium incarnatum* based on morphological features. White to light brown mycelia were observed among the isolates on PDA medium. Falcate, multicellular, straight to slightly curved macroconidia produced in monophialide sporodochia without a distinctive foot-shaped basal cell; and chlamydospores produced in some isolates (Leslie and Summerell 2006). The size of macroconidia was $36.4 \pm 5.20 \times 4.6 \pm 1.3 \mu\text{m}$ ($n = 100$) with three to five septates. Microconidia were mostly zero to one septate measured $14.6 \pm 1.9 \times 2.6 \pm 0.5 \mu\text{m}$ ($n = 100$). Based on the morphological observation, isolates were further identified by a molecular method. The ITS1/4 region combined with partial gene fragments of translation elongation factor (*EF-1α*, primer EF1/EF2, Geiser et al. 2004) and calmodulin (*CAM*, primer CL1/CL2A, O'Donnell et al. 1998) from the isolates

were amplified and sequenced. All of the three tested isolates showed identical gene sequences. Sequences amplified from one representative isolate (FIN-1) were submitted to GenBank. BLAST searches revealed that ITS1/4 (MW527088), *EF-1α* (MW556488), and *CAM* (MW556487) had 99.22, 99.53, and 99.42% identity compared with *F. incarnatum* (MN480497, MN233577, and LN901596, respectively) in GenBank. *FUSARIUM*-ID (Geiser et al. 2004) analysis also showed 99 to 100% similarity with sequences of the *F. incarnatum-equiseti* species complex (FD_01636 for *CAM*, FD_01643 for *EF-1α*). The phylogenetic analysis was conducted using the neighbor-joining algorithm based on the ITS, *EF-1α*, and *CAM* gene sequences. The isolate clustered with the *F. incarnatum* clade. Then, the pathogenicity of the fungus was confirmed by performing Koch's postulates. Pure single-spored cultures were grown on carboxymethyl-cellulose (CMC) medium for sporulation. *G. jamesonii* plants used for pathogenicity tests were grown on sterilized potting soil in a plastic container to the 10-leaf stage prior to inoculation. Spores harvested from the CMC medium were adjusted to a concentration of 1×10^5 conidia/ml. Twelve healthy rooted gerbera seedlings were inoculated by drenching 10 ml of the conidial suspension onto roots. Twelve gerbera seedlings treated with 10 ml of sterile water served as control treatments. Plants were grown in the glasshouse at temperatures of 23°C, relative humidity >70%, and 16 h of light per day. After 10 days, blackening stems and withered leaf edges began to appear on inoculated seedlings, whereas control seedlings remained healthy. *F. incarnatum* was consistently reisolated from the symptomatic stems, whereas no isolates were obtained from the control seedlings. The assay was conducted twice. To the best of our knowledge, this is the first report of *F. incarnatum* causing stem and root rot on *G. jamesonii*.

References:

- Geiser, D. M., et al. 2004. Eur. J. Plant Pathol. 110:473.
- Leslie, J. F., and Summerell, B. A. 2006. The *Fusarium* Laboratory Manual. Blackwell, Ames, IA.
- O'Donnell, K., et al. 1998. Proc. Natl. Acad. Sci. U.S.A. 95:2044.

The author(s) declare no conflict of interest.

e-Xtra

Keywords: disease management, ornamentals, herbaceous/flowering plants, fungi, *Fusarium*

[†]Indicates the corresponding author.
X. Yan; xjyan@ippcaas.cn