

Disease Note

Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Brown Spot Caused by *Alternaria alternata* on Potato (*Solanum tuberosum*) in Korea

Jaehyuk Choi,¹ Min-Hye Jeong,² Eu Ddeum Choi,² Jiyeon Park,² and Sook-Young Park^{2,†} 

¹ Division of Life Sciences, College of Life Sciences and Bioengineering, Incheon National University, Incheon 22012, Korea

² Department of Plant Medicine, College of Life Science and Natural Resources, Suncheon National University, Suncheon 57922, Korea

J. Choi and M.-H. Jeong contributed equally to this work.

Funding: This work was supported by a grant from the Rural Development Administration (PJ0152782022). Plant Dis. XXX:XX, XXXX; published online as <https://doi.org/10.1094/PDIS-10-22-2490-PDN>. Accepted for publication 6 December 2022.

In June 2020, brown spot symptoms were observed in a commercial potato field in Yecheon, Gyeonggi Province, Korea. The symptoms were similar to those associated with early blight. Brown lesions on leaves were circular and expanded rapidly under high humidity and warm temperatures ranging from 12°C at night to 30°C during daytime. Over 60% of potato (*Solanum tuberosum* L. cv. Superior) leaves showed the symptoms. For fungal isolation, infected leaf tissues (5 × 5 mm) from 14 infected samples were immersed in 70% ethanol for 1 min, rinsed three times in sterilized water, dried, placed on water agar amended with 100 ppm of streptomycin, and incubated in the dark at 25°C. Hyphae emerging from the tissues were subcultured on V8-Juice agar (8% V8-Juice, 1.5% agar, pH 7), and the obtained cultures were subjected to single-spore isolation, resulting in 14 isolates (SYP-934 to 947). Three representative isolates, SYP-934 to SYP-936, were deposited in the Korean Agriculture Culture Collection (accession nos. KACC 410058 to KACC 410060). Conidia ($n = 100$) produced on the colony were brown, ellipsoid to ovoid, with walls ornamented, 1 to 6 transverse and 0 to 3 vertical septa, and length × width of 20 to 45 × 7 to 24 μm ($n = 100$). Their morphological characteristics were consistent with *Alternaria alternata* (Simmons 2007; van der Waals et al. 2011; Woudenberg et al. 2015). Sequences of the following loci in the 14 isolates were determined as described in Woudenberg et al. (2013, 2014): the

internal transcribed spacer (primer pairs VG9/ITS4, GenBank accession nos. OP581413 to OP581425), glyceraldehyde-3-phosphate dehydrogenase (gpd1/gpd2, OP588286 to OP588299), RNA polymerase second largest subunit (RPB2-5F2/rPB2-7cR, OP588314 to OP588327), translation elongation factor 1-alpha (EF1-728F/EF1-986R, OP588300 to OP588313), *Alternaria* major allergen gene (Alt-For/Alt-Rev, OP588328 to OP588341), endopolygalacturonase (PG3/PG2b, OP588342 to OP588355), and an unknown gene region (OPA10-2R/OPA10-2L, OP588356 to OP588368). A neighbor-joining phylogenetic analysis based on the concatenated gene sequences, which was performed using the MEGA X program (Kumar et al. 2018), placed the 14 isolates in the clade containing *A. alternata* isolates. To test pathogenicity, 1-month-old potato (*S. tuberosum* cv. Superior) plants grown in a 25°C growth chamber were sprayed with conidial suspensions (1×10^6 conidia/ml) prepared from 14-day-old cultures of three isolates (KACC 410058 to KACC 410060). Sterile distilled water was used as the control treatment. The inoculated pots were placed in a plastic box to maintain high humidity and incubated in the dark at 25°C for 2 days. The plants were transferred to a growth chamber (16 h light with >70% humidity at 25°C). Symptoms were first observed after 3 days post inoculation (dpi) with all three isolates, and severe brown spot symptoms were observed after 7 dpi. No symptom was observed in the control treatment. The pathogenicity assay was repeated in triplicate. Reisolated cultures from lesions were confirmed to be *A. alternata* based on their sequence at the rpb2 locus, thus fulfilling Koch's postulates. *Alternaria alternata* has been reported to cause brown spot and leaf blight on potato leaves in Israel (Dorby et al. 1984) and South Africa (van der Waals et al. 2011). To our knowledge, this study is the first report of *A. alternata* causing brown spot disease in Korea.

References:

- Dorby, S., et al. 1984. Phytopathology 74:537.
Kumar, S., et al. 2018. Mol. Biol. Evol. 35:1547.
Simmons, E. G. 2007. Page 775 in: *Alternaria: An Identification Manual*. CBS Fungal Biodiversity Center, Utrecht, the Netherlands.
van der Waals, J. E., et al. 2011. Plant Dis. 95:363.
Woudenberg, J. H. C., et al. 2013. Stud. Mycol. 75:171.
Woudenberg, J. H. C., et al. 2014. Stud. Mycol. 79:1.
Woudenberg, J. H. C., et al. 2015. Stud. Mycol. 82:1.

The author(s) declare no conflict of interest.

e-Xtra

Keywords: *Alternaria alternata*, brown spot, potato, *Solanum tuberosum*

[†]Indicates the corresponding author.
S.-Y. Park; spark@snu.ac.kr