Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Soybean Seedling Disease Caused by *Rhizoctonia solani* AG-7 in Taiwan

Yu-Cheng Lin,¹ Min-Nan Tseng,² and Hao-Xun Chang^{1,†}

¹ Department of Plant Pathology and Microbiology, National Taiwan University, Taipei City 10617, Taiwan

² Kaohsiung District Agricultural Research and Extension Station, Council of Agriculture, Pingtung County 90846, Taiwan

Funding: This project is supported by the Council of Agriculture (Taiwan), research program 109AS-1.1.5-ST-a7 to Dr. Hao-Xun Chang. Plant Dis. 106:314, 2022; published online as <https://doi.org/10.1094/PDIS-01-21-0036-PDN>. Accepted for publication 7 August 2021.

From August to November 2020, reduced emergence and damping-off of soybean seedlings were observed in two fields (Benzhou and Wandan) in Taiwan. Disease incidence was approximately 40% in Benzhou by field scouting. The roots of damping-off seedlings were brown. Affected seedlings could be easily pulled out from the soil and the lesions on the roots/stem were generally dry and sunken. These symptoms suggested the possibility of *Rhizoctonia* infection. Soil surrounding symptomatic seedlings were collected to bait the potential pathogen and symptomatic plants were used for pathogen isolation. The diseased tissues were washed with tap water and surface-disinfected with 1% bleach before placing on Dexon selection medium at 26°C for 2 days (Ko and Hora 1971). Hyphae were transferred to potato dextrose agar (PDA), and a brown colony with brown and irregular-shaped sclerotia grew from 90 out of 99 isolates. The hyphae exhibited typical characteristics of *Rhizoctonia solani*, including a constriction and a septum near the end of branching hyphae (Ajayi-Oyetunde and Bradley 2018). Two isolates from Benzhou and two isolates from Wandan were tested for their pathogenicity, and eight surface-disinfected seeds were distributed evenly on water agar plates covered by 2-day-old mycelia at 25°C in dark for 7 days. All isolates caused cotyledon rot and reduced germination. To verify their pathogenicity in pots, double-sterilized sorghum seeds were inoculated with two strains and incubated at 25°C for 2 weeks to be used as fungal inoculum (Ajayi-Oyetunde and Bradley 2017). A layer of 15 ml of fungal inoculum was placed 5 cm beneath the soil surface in pots. Four soybean seeds were planted approximately 3 cm above the inoculum in each pot. After two weeks, reddish lesions on the hypocotyls or taproots of all seedlings in the inoculated pots were observed, while seedlings in the control pots inoculated with sterile sorghum seeds remained healthy. The pathogen was reisolated

from lesions and had identical morphology to the original isolates. To characterize the fungal identity, the internal transcribed spacer (ITS) was sequenced using the primers ITS1/ITS4 (Sharon et al. 2006). Using BLASTN in the NCBI database, the sequence (GenBank nos. MW410857 and MW410858) showed 100% (639/639 bp) similarity to KF907734 and 99.83% (635/636 bp) similarity to AF354099, both belonging to *R. solani* anastomosis group 7 (AG-7) (Gonzalez et al. 2001; Hua et al. 2014). Phylogenetic analysis comparing sequences with different AGs (Ajayi-Oyetunde and Bradley 2017) grouped our isolates within the AG-7 clade with a 100% bootstrap confidence. In the anastomosis test, an incompatible zonation and unequal mycelial growth rates were observed when AG-7 isolates were paired with an AG-1 IA isolate. On the other hand, the compatible tuft reaction was observed when two AG-7 isolates were paired, and the compatible merge reaction was observed in the self-pairing tests (Macnish et al. 1997). Accordingly, the molecular and morphological characterizations confirmed the causal pathogen as *R. solani* AG-7. *R. solani* AG-7 was first reported on radishes in Japan (Homma et al. 1983), first found on carnation in Taiwan, and has been found in field soils of various crops, but not soybean (Chuang 1997). It was suggested that *Rhizoctonia* diseases of soybean may be present in Taiwan, but molecular confirmation was lacking (Anonymous 1979). As *R. solani* AG-7 causes diseases of soybean in the U.S. and Japan (Baird et al. 1996), the importance of AG-7 as an endemic pathogen of soybean in Taiwan should be recognized and its prevalence determined as a first step to managing this disease.

References:

- Ajayi-Oyetunde, O. O., and Bradley, C. A. 2017. Plant Dis. 101:520.
- Ajayi-Oyetunde, O. O., and Bradley, C. A. 2018. Plant Pathol. 67:3.
- Anonymous. 1979. List of plant diseases in Taiwan. Plant Protection Society, Republic of China.
- Baird, R. E., et al. 1996. Plant Dis. 80:1421.
- Chuang, T. Y. 1997. Plant Pathol. Bull. 6:163.
- Gonzalez, D., et al. 2001. Mycologia 93:1138.
- Homma, Y., et al. 1983. Ann. Phytopathol. Soc. Jpn. 49:184.
- Hua, G. K. H., et al. 2014. PLoS One 9:e111750.
- Ko, W., and Hora, F. K. 1971. Phytopathology 61:707.
- Macnish, G. C., et al. 1997. Mycol. Res. 101:61.
- Sharon, M., et al. 2006. Mycoscience 47:299.

The author(s) declare no conflict of interest.

e-Xtra

Keywords: *Glycine max* (L.) Merr., *Rhizoctonia solani*, seedling disease, soybean anastomosis group 7 (AG-7)

[†]Indicates the corresponding author.
H. Chang; hxchang@ntu.edu.tw