

RESEARCH NOTE

Seedling Rot of Kamchatka Goatsbeard Caused by *Rhizoctonia solani* AG-1(IB)

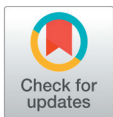
Wan-Gyu Kim*, Gyo-Bin Lee, Hong-Sik Shim, and Weon-Dae Cho
Global Agro-Consulting Corporation, Suwon 16614, Korea

*Corresponding author: wgkim5121@naver.com

ABSTRACT

In July 2021, we surveyed diseases affecting wild vegetables grown in Hongcheon, Gangwon Province, Korea. During this survey, we observed severe seedling rot symptoms in Kamchatka goatsbeard (*Aruncus dioicus*) grown in a vinyl greenhouse. The incidence of the disease in the plant seedlings was 1–10%. Diseased seedlings from this population were collected, and fungi were isolated from leaf and petiole lesions. *Rhizoctonia* sp. was consistently isolated from the lesions. We examined the morphological and cultural characteristics and anastomosis groups of nine *Rhizoctonia* sp. isolates obtained from the lesions. The results revealed that all isolates corresponded to *Rhizoctonia solani* AG-1(IB). Three isolates of *R. solani* AG-1(IB) were evaluated to determine their pathogenicity towards Kamchatka goatsbeard seedlings through artificial inoculation. The tested isolates caused rot symptoms on the inoculated plant seedlings. The symptoms were similar to those observed in plant seedlings from the vinyl greenhouse. We found that *R. solani* AG-1(IB) caused seedling rot of Kamchatka goatsbeard.

Keywords: Anastomosis, *Aruncus dioicus*, Kamchatka goatsbeard, *Rhizoctonia solani* AG-1(IB), Seedling rot



OPEN ACCESS

pISSN : 0253-651X
eISSN : 2383-5249

Kor. J. Mycol. 2022 December, 50(4): 357-360
<https://doi.org/10.4489/KJM.20220038>

Received: August 31, 2022

Revised: December 10, 2022

Accepted: December 13, 2022

© 2022 THE KOREAN SOCIETY OF MYCOLOGY.



This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Kamchatka goatsbeard [*Aruncus dioicus* (Walter) Fernald] is a perennial plant that belongs to the family Rosaceae. The native range of the plant is Europe to Caucasus, East Siberia to Russian Far East, and North Central and East USA [1]. In Korea, Kamchatka goatsbeard is cultivated as a wild vegetable for human consumption. In July 2021, we surveyed diseases affecting wild vegetables grown in Hongcheon, Gangwon Province, Korea. During this survey, we observed severe seedling rot symptoms in Kamchatka goatsbeard grown in a vinyl greenhouse. The disease symptoms appeared on the leaves and petioles of the seedlings. The infected seedling parts turned brown to dark brown and rotted as the disease progressed (Figs. 1A and 1B). Five sites were observed in the vinyl greenhouse, and 100 plants at each site were investigated for the disease occurrence. The incidence of the disease in the plant seedlings was 1–10%.

Diseased seedlings of Kamchatka goatsbeard were collected from the investigated vinyl greenhouse, and fungi were isolated from the leaves and petioles of these seedlings. The leaf and petiole lesions were cut into 3–5 mm-long pieces, surface-sterilized with 1% sodium hypochlorite solution for 1 min, and placed on 2% water agar (WA) plates. The WA plates were incubated at 25°C for 1–2 days, and fungal mycelia that grew from the lesion pieces were transferred onto potato dextrose agar (PDA) slants. Nine fungal isolates were

obtained from the leaf and petiole lesions and used for identification. The morphological characteristics of the isolates were examined as previously described [2]. Young vegetative hyphae branched near the distal septa of the hyphal cells. Hyphae were constricted at the points of hyphal branches, and septa were formed at a short distance from the points of the hyphal branches. The isolates did not produce conidia and clamp connections on the hyphae. The morphological characteristics were identical to those of *Rhizoctonia solani* Kühn described previously [3, 4].

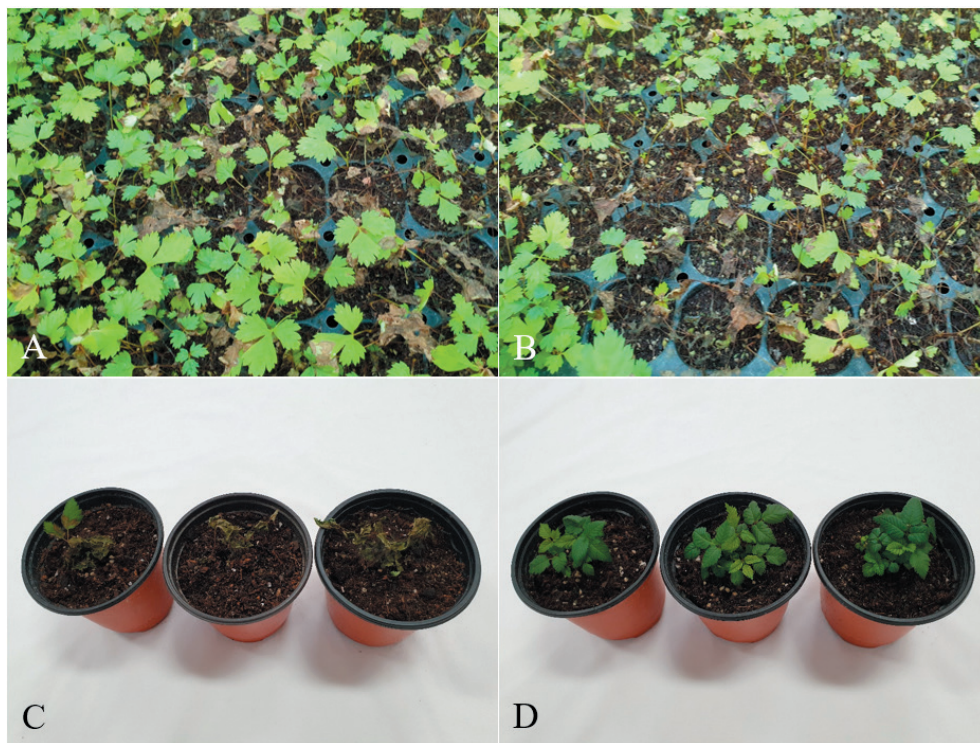


Fig. 1. Seedling rot of Kamchatka goatsbeard. (A, B) Symptoms observed in a vinyl greenhouse. (C) Symptoms induced by artificial inoculation tests with *Rhizoctonia solani* AG-1(IB) isolates. (D) Non-inoculated seedlings (control).

Anastomosis groups of the *R. solani* isolates were examined using tester isolates of *R. solani* (AG-1-5), as previously described [2, 5]. All tested isolates anastomosed with the tester isolate of *R. solani* AG-1. The anastomosed cells of the tested isolate and the tester isolate showed killing reactions (Fig. 2A). The mycelia of the isolates cultured on PDA were light brown to grayish brown (Fig. 2B). Sclerotia were produced separately or as aggregates on the medium, and their surface was typically mycelioid or wooly. The culture type of the isolates was identified as IB of *R. solani* AG-1, based on comparison with previously described culture characteristics [6].

Three isolates (RS-2121, RS-2123, and RS-2125) of *R. solani* AG-1(IB) were tested for their pathogenicity towards Kamchatka goatsbeard seedlings through artificial inoculation, as previously described [7]. Mycelial disks of 6 mm in diameter from each isolate grown on PDA were placed on the

petioles at the soil surface level of 10-month-old Kamchatka goatsbeard seedlings growing in circular plastic pots (height: 9 cm; upper diameter: 10 cm; lower diameter: 7 cm) in a vinyl greenhouse. Plastic boxes (60 cm × 43 cm × 33 cm) were used to maintain a relative humidity of 100% at room temperature (24–26°C). The inoculated plant pots were placed in the plastic boxes for 3 days, after which they were removed from the plastic boxes and placed indoors. The inoculation test was performed in triplicate, and the results were evaluated at 5 days after inoculation. Inoculation tests showed that the tested isolates caused seedling rot symptoms in the inoculated plants (Fig. 1C), whereas no symptoms were detected in the non-inoculated plants (Fig. 1D). The induced symptoms were similar to those observed in plant seedlings from the vinyl greenhouse investigated. Re-isolation of the inoculated isolates from the lesions was confirmed.

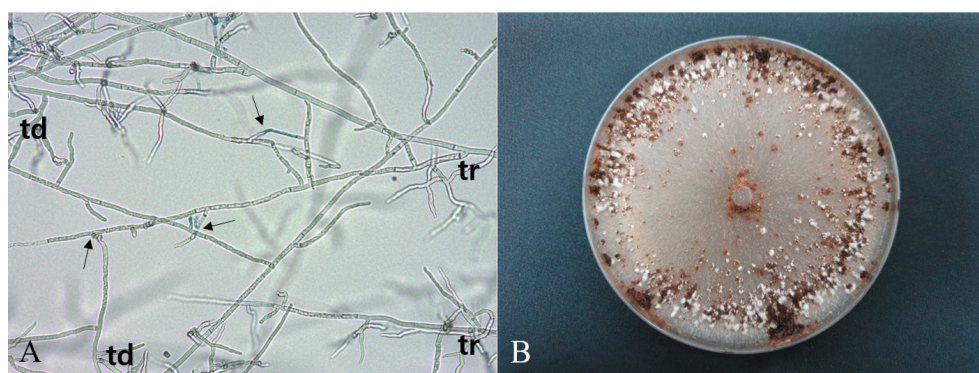


Fig. 2. Anastomosis test of *Rhizoctonia solani* isolate from Kamchatka goatsbeard and cultural appearance of the isolate. (A) Anastomosis reactions between the tested isolate (td) and the tester isolate (tr) of *R. solani* AG-1. The arrows indicate points of hyphal anastomosis. (B) Colony of *R. solani* AG-1 (IB) isolate grown on potato dextrose agar at 25°C for 10 days.

R. solani has very wide range of host plants, and its anastomosis groups have different genetic and pathological characteristics [4]. *R. solani* AG-1 (IB) causes various diseases such as damping-off, leaf blight, leaf rot, stem rot, and root rot in many crops [7]. However, seedling rot of Kamchatka goatsbeard caused by the fungal anastomosis group has not been reported. We detected seedling rot of Kamchatka goatsbeard caused by *R. solani* AG-1 (IB).

CONFLICT OF INTERESTS

No conflict of interest was reported by the author(s).

ACKNOWLEDGEMENTS

This study was supported by a research grant (PJ014507012021) from the Rural Development Administration, Korea.

REFERENCES

1. Plants of the World Online. *Aruncus dioicus* (Walter) Fernald. [Internet]. Kew: Royal Botanic Garden; 2022 [cited 2022 August 29]. Available from <https://powo.science.kew.org/>.
2. Kim WG, Lee GB, Shim HS, Cho WD. 2022. Stem rot of bonnet bellflower caused by *Rhizoctonia solani* AG-4. *Kor J Mycol* 2022;50:61-4.
3. Parmeter JR Jr., Whitney HS. Taxonomy and nomenclature of the imperfect state. In: Parmeter JR Jr., editor. *Rhizoctonia solani*: Biology and Pathology. Berkeley: University of California Press; 1970. p. 7-19.
4. Sneh B, Burpee L, Ogoshi A. Identification of *Rhizoctonia* Species. St. Paul, Minnesota, USA: APS Press; 1991.
5. Kim WG, Cho WD, Lee YH. Anastomosis groups and cultural characteristics of *Rhizoctonia solani* isolates from crops in Korea. *Kor J Mycol* 1994;22:309-24.
6. Watanabe B, Matsuda A. Studies on the grouping of *Rhizoctonia solani* Kühn pathogenic to upland crops (in Japanese). Appointed Experiment (Plant diseases and insect pests). Bulletin No. 7, Agric For Fish Res Counc and Ibaraki Agric Exp Stn Japan 1966;7:1-131.
7. Kim WG. Pathogenicity of anastomosis groups and cultural types of *Rhizoctonia solani* isolates on crops. *Korean J Plant Pathol* 1996;12:21-32.