Diseases Caused by Viruses

First Report of Tomato Spotted Wilt Virus in *Petasites japonicus* in Korea

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Butterbur (*Petasites japonicus* [Siebold & Zucc.] Maxim.) is a perennial herb of the Asteraceae family that is cultivated for medicinal and nutritional purposes. Due to long-term vegetative propagation of virus-infected native species, the yield and quality of butterbur plants have deteriorated. Five viruses have been reported to infect this species: alfalfa mosaic virus, arabis mosaic virus, butterbur mosaic virus (ButMV), broad bean wilt virus 2, and cucumber mosaic virus (Ham et al. 2016; Tochiwara and Tamura 1976). From 2018 to 2019, butterbur plants in four greenhouses in Nonsan, South Korea, were found to show virus-like symptoms such as chlorotic and necrotic ring spots, necrosis, and mild mosaic on the leaves. Disease incidence was greater than 80% in one greenhouse (~1,000 m²). To identify the causal virus, we collected 17 symptomatic butterbur leaf samples from these greenhouses and performed reverse-transcription polymerase chain reaction (RT-PCR) analysis using species-specific detection primers for the five reported viruses and tomato spotted wilt virus (TSWV). RT-PCR results showed that 12 samples from three greenhouses showing necrotic ring spots and mosaic symptoms were infected with a mixture of TSWV and ButMV, whereas five samples from one greenhouse showing mild mosaic symptoms were infected only with ButMV. TSWV (genus *Orthotospovirus*, family *Tospoviridae*) is

transmitted by thrips and causes serious damage to a wide range of economically important plants (Pappu et al. 2009). ButMV (genus *Carlavirus*, family *Betaflexiviridae*) is transmitted by aphids as well as by infected vegetative propagation material (Hashimoto et al. 2009) and is the most predominant virus in butterbur in Korea (Ham et al. 2016). To isolate TSWV from butterbur, leaf extracts from symptomatic samples were mechanically inoculated on an assay host, *Chenopodium quinoa*, via three single-lesion passages followed by propagation in *Nicotiana tabacum* cv. Samsun. Thirty different indicator plant species were used for the bioassay of the TSWV isolate (TSWV-NS-BB20) by mechanical inoculation method. RT-PCR analysis confirmed that TSWV-NS-BB20 induced necrotic local lesions and mosaic on *Nicotiana* species and ring spots and mosaic on tomato and pepper. Notably, TSWV-NS-BB20 reproduced necrotic local lesions and mild mosaic symptoms on butterbur plants that were infected with ButMV with no obvious symptoms. To characterize TSWV-NS-BB20 genetically, the complete genome sequences of L (8,914 nt), M (4,751 nt), and S (2,917 nt) RNA segments were obtained by RT-PCR using specific primers for TSWV as described previously (Kwak et al. 2020). The obtained sequences were deposited in GenBank under accession numbers MT643236, MT842841, and MN854654, respectively. BLASTn analysis showed that sequences of each segment had maximum nucleotide identities of 99.0, 98.9, and 98.6% to TSWV-L, M, and S (KP008128, FM163373, and KP008129) of TSWV-LL-N.05 isolate from tomato in Spain. Since 2018, TSWV outbreaks on butterbur are observed every year and thus may act as a potential source of TSWV infection for other crops of importance to Korea, such as pepper. Owing to the butterbur vegetative propagation, the identification of TSWV infection in butterbur will be helpful for future virus management to generate virus-free materials. To our knowledge, this is the first report of TSWV infection of butterbur.

References:

- Ham, I. K., et al. 2016. Kor. J. Hort. Sci. Technol. 34:138.
- Hashimoto, M., et al. 2009. Arch. Virol. 154:1955.
- Kwak, H.-R., et al. 2020. Australas. Plant Dis. Notes 15:5.
- Pappu, H. R., et al. 2009. Virus Res. 141:219.
- Tochiwara, H., and Tamura, M. 1976. Ann. Phytopathol. Soc. Jpn. 42:533.

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