First report of zucchini yellow mosaic virus infecting balloon flower (*Platycodon grandiflorus*) in Korea

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The balloon flower (*Platycodon grandiflorus*) is a perennial herb that grows mainly in Korea, China, and Japan. The root and leaves of the balloon flower are widely used as food and medicine due to their 3 health benefits for hypertension and diabetes (Nyakudya et al., 2014). In September 2020, virus-like symptoms such as foliar yellowing, mild mottle, mosaic, and stunting were observed in balloon flower plants on farms in Samchuck, Korea and their incidence was visually estimated to be approximately ~20%. To identify the causal virus, ten symptomatic and two asymptomatic balloon flower leaf samples were subjected to a DAS-ELISA using specific polyclonal antisera (Agdia, Elkhart, IN, USA) against papaya ringspot virus, pepper mottle virus, watermelon mosaic virus, zucchini yellow mosaic virus (ZYMV), cucumber mosaic virus, pepper mild mottle virus, and tobacco mosaic virus. All ten symptomatic samples were found to be positive only for ZYMV. To further confirm the presence of ZYMV, RT-PCR was conducted using ZYMV coat protein (CP)-specific primers (Cho et al. 2011). PCR products of 822 bp were amplified from five ELISA-positive samples but not from asymptomatic samples. These products were then cloned into pGEM-T vector (Promega, Madison, WI); all clones were sequenced in both directions, and they showed 100% nucleotide identity among each other. The sequence of ZYMV-PG isolate from *P. grandiflorus* was deposited in GenBank (LC602261). Sequence analysis indicated that the CP gene showed 99% identity with a ZYMV isolate from the USA (MK124612). Sap from ZYMV-positive leaf samples was mechanically inoculated into ten *Chenopodium amaranticolor* plants. ZYMV-PG caused mild local lesions at 7 days post-inoculation. RT-PCR with the

aforementioned primers verified the infection of ZYMV in all *C. amaranticolor* plants. To the best of our knowledge, this is the first report of natural infection of ZYMV in *P. grandiflorus*.

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Declarations

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

Conflict of interest The authors declare that they have no conflict of interest.

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