



NEW DISEASE REPORT

First report of High Plains wheat mosaic virus in Iran

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High Plains wheat mosaic virus (HPWMoV, genus *Emaravirus*) has an octopartite, negative-sense RNA genome, each segment encoding a single open reading frame. The virus is transmitted by the wheat curl mite (*Aceria tosichella*) (Tatineni et al., 2014). HPWMoV has been reported from Argentina, Australia, Canada, New Zealand, Ukraine and the USA (Abdullahi et al., 2020; Snihur et al., 2020). Mixed infections of HPWMoV and *Wheat streak mosaic virus* (WSMV, genus *Tritimovirus*) often occur in the field and lead to severe symptoms (Byamukama et al., 2016).

In 2021 and 2022, 85 leaf samples were collected from different gramineous plants with chlorotic leaf streak symptoms (Figure 1) in the Isfahan and Chaharmahal-o-Bakhtiari provinces, central Iran. Total RNA was extracted using the CTAB method and RT-PCR was performed using the specific HPWMoV primers HPV-F1 and HPV-R1 targeting part of the nucleocapsid protein gene (Lebas et al., 2005), and WSMV-specific primers WSMVF and WSMVR amplifying the coat protein gene (Mar et al., 2013). The expected fragments (339 and 948 bp, respectively) were amplified, Sanger-sequenced directly and confirmed as HPWMoV and WSMV, respectively, by nucleotide sequence comparisons. The results revealed HPWMoV in single or mixed infection with WSMV in wheat (*Triticum aestivum*), barley (*Hordeum vulgare*), corn (*Zea mays*), oat (*Avena sativa*), millet (*Panicum miliaceum*) and Johnsongrass (*Sorghum halepense*). Eighty percent of the collected samples

were infected with at least one virus. Mixed and single infections of HPWMoV and WSMV were determined in 41, 37 and 22% of samples, respectively. Sequence analysis of an Iranian HPWMoV isolate from wheat (GenBank Accession No. OQ214884) showed the highest identity (97%) to a corn isolate from Ohio (KT988872.1) and a barley isolate from Kansas (KT988863.1), and the lowest identity (87%) to a wheat isolate from Ohio (KT970501.1). However, an Iranian HPWMoV isolate from barley (OQ214885) had 92% identity to a wheat isolate from Ohio (KT988882.1).

In a transmission test, wheat curl mite nymphs reared on wheat were allowed to feed on HPWMoV-infected wheat for 24 hours of acquisition access feeding. The nymphs were then transferred to thirty seedlings at the two-leaf stage, twenty nymphs per plant, for 24 hours of transmission feeding. All test plants showed mosaic symptoms four to six days post inoculation. Infection of the test plants was confirmed by RT-PCR as described above.

To the best of our knowledge this is the first report of HPWMoV in Iran. WSMV is widely distributed in most wheat-producing regions in Iran (Masumi et al., 2006). However, our results suggest that HPW-MoV is more common than WSMV in the central parts of Iran and probably in other regions too and should be considered as a new agent in the epidemiology of mite-borne viruses infecting cereals in Iran.

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FIGURE 1 Symptoms of a mixed infection of *High Plains wheat mosaic virus* and *Wheat streak mosaic virus* on wheat in Iran.

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