



First report of *Potato spindle tuber viroid* in vegetatively propagated plants of *Capsicum annuum* in The Netherlands

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Over recent decades *Potato spindle tuber viroid* (PSTVd, genus *Pospiviroid*) has been found in increasingly various crops. It may cause severe diseases in potato and tomato crops but usually occurs as symptomless infections in ornamental species (Verhoeven *et al.*, 2010). Pepper (*Capsicum annuum*) has been reported to show mild symptoms (Lebas *et al.*, 2005). In 2016 a breeding company informed the National Plant Protection Organization (NPPO) of the Netherlands on the suspicion of PSTVd infections in four seedless pepper selections that had been propagated vegetatively. The suspected plants had been produced by a Dutch nursery that had imported the planting material from Israel. In the Netherlands, the plants were grown at four locations: two greenhouses of the same nursery at two locations (598 plants), a greenhouse for fruit production (1,616 plants) and another for demonstration purposes (100 plants) (EPPO, 2016). Within the four locations, plant age varied from young plants that had just been grafted to plants starting fruit production. In none of the pepper plants were any symptoms observed.

At all four locations the NPPO confirmed the presence of PSTVd in all pepper selections by RT-PCR according to Shamloul *et al.* (1997) and subsequent sequencing of the PCR products. The predominant sequence (GenBank Accession No. KX370618), detected in fourteen out of fifteen sequences was identical to FM998548, a sequence of an isolate from *S. jasminoides*, and one sequence showed minor differences. Based on these results, it is assumed that PSTVd-infected plants of *S. jasminoides* were the source of infection in the pepper plants. Aligning the sequence FM998548 with the predominant sequences of isolates from *Brugmansia* spp. and *S. jasminoides*, B1 and S1, respectively (Verhoeven *et al.*, 2010), showed deviations at seven nucleotide positions of which four are identical to B1 and three to S1 (Fig. 1). Since these deviations only occurred at positions where the sequences of S1 and B1 differ, the sequence FM998548 could have resulted from a single recombination event in the terminal right and variable domains (Keese & Symons, 1985) in a plant of *S. jasminoides* infected by both B1 and S1. The same deviations have also been found in an isolate from related pepper selections in Israel, indicating that infected planting material may have served as the pathway for introduction of PSTVd in peppers into The Netherlands.

At the nursery site PSTVd was also found in five out of twelve other

vegetatively propagated pepper selections. Testing of potentially infected deliveries from this nursery revealed only one additional finding at a fruit production location. All infected plants were destroyed under official control of the NPPO. In addition, the national authorities of five other EU member states were informed on the delivery of infected pepper selections to growers in their countries.

The findings of PSTVd in vegetatively propagated selections of *C. annuum* show that new propagation strategies of crops may result in additional risks for spreading pathogens such as viroids. Moreover, this outbreak again demonstrates the role of symptomlessly infected hosts in the epidemiology of pospiviroids. It is important that both plant health officers and policy makers are aware of the presence of these potential risks.

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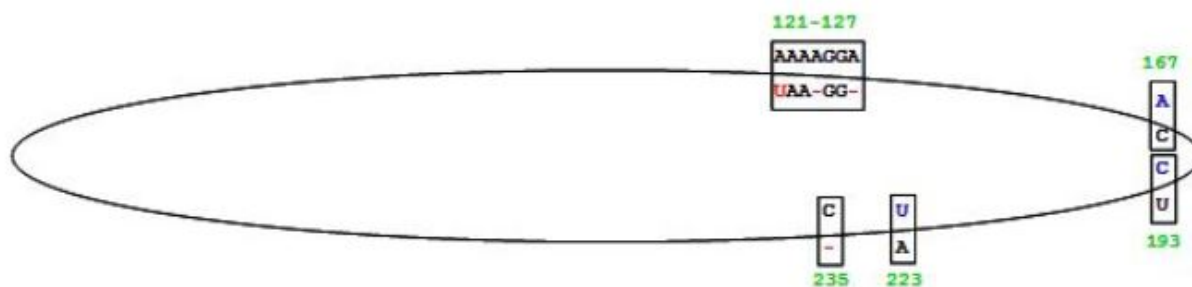


Figure 1

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