New Disease Reports

First report of *European mountain ash ringspot-associated virus* in serviceberry (*Amelanchier* spp.) in Germany

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Chlorotic ringspots and line pattern have been observed in different species of serviceberry (*Amelanchier* spp.), for instance in the Netherlands since 1957 (Cooper, 1979). Being tolerant against various abiotic stresses these shrubs are often used in urban green space and also have decorative flowers, berries and a red leaf colouration in the autumn.

Serviceberry shrubs cultivated in public or private urban areas in the cities of Oldenburg (Lower Saxony) and Berlin, Germany exhibiting chlorotic ringspots, mottle and line patterns on the leaves were sampled (Fig. 1, Table 1). The disease resembled characteristic symptoms caused by *European mountain ash ringspot-associated virus* (EMARaV) in serviceberry (Grimová *et al*., 2015). To confirm the presence of the virus in these samples, total RNA was extracted and tested by RT-PCR using a genus-specific primer set to detect RNA1 (Elbeaino *et al*., 2013) and EMARaV-specific primers targeting RNA2, RNA3 (Mielke & Mühlbach, 2008) and RNA4 (Roßbach *et al*., 2015). All four RNAs of EMARaV were detectable in each of the four serviceberries exhibiting symptoms (Fig. 2) and this was confirmed by sequencing of the PCR products. Complete viral genome segments were amplified by RT-PCR from sample E55282 using primers targeting the conserved terminal regions of emaraviruses (Di Bello *et al*., 2015). PCR products were cloned and sequenced confirming the complete RNA3 (1.6 kb, GenBank Accession No. LT992915) and RNA4 (1.3 kb, LT992916) of EMARaV. Sequence comparison with respective reference sequences from GenBank and generation of a neighbour-joining phylogenetic tree using complete sequences of the nucleocapsid protein encoded by RNA3 of emaraviruses (Fig. 3) confirmed the virus as EMARaV with a maximum of 99.6 % (RNA3) and 99.1 % (RNA4) identity at the protein level.

This is the first record of EMARaV affecting serviceberry and causing chlorotic ringspots, mottling and line patterns in Germany. The virus has previously been confirmed to be widespread in *Sorbus aucuparia* in Germany (Roßbach *et al*., 2015). The disease identified in Germany shares characteristic symptoms reported from EMARaV-infected serviceberry in the Czech Republic (Grimová *et al*., 2015). It has been demonstrated that the causal agent is graft transmissible within species of the *Rosaceae* family including serviceberry and rowan (Cooper, 1979; Grimová *et al*., 2015). How the diseased serviceberries acquired the virus in independent locations in Germany is unknown as modes of transmission other than grafting are not well documented for EMARaV.

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Figure 1

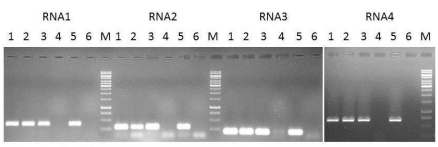

Figure 2

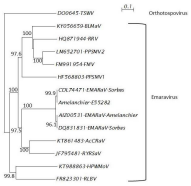

Figure 3

Table 1: Overview of serviceberries (*Amelanchier* spp.) sampled from Germany

Sample ID	Symptoms	Collection date	Location, street	Town	Area
E55282	chlorotic ringspots	September 2016	Klingenbergstraße	Oldenburg	public space
E55283	no symptoms	September 2016	Klingenbergstraße	Oldenburg	public space
E56730	chlorotic ringspots, line pattern	June 2017	Klingenbergstraße	Oldenburg	public space
E56731	chlorotic ringspots, mottle	June 2017	Brandenburger Straße	Oldenburg	public park
E57062	chlorotic ringspots	June 2017	Dohsentieg	Berlin	private garden

Figure 4

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