

Discovery of novel emaraviruses in diseased broad-leaved tree species

SUSANNE VON BARGEN¹, MARIUS REHANEK¹, LAURA ZINNERT¹, JENNY ROßBACH¹, HANS-PETER MÜHLBACH², ARTEMIS RUMBOU¹, THIERRY CANDRESSE³, MARTINA BANDTE¹ and CARMEN BÜTTNER¹

¹ Humboldt-Universität zu Berlin, Division Phytomedicine, Lentzeallee 55/57, 14195 Berlin, Germany, susanne.von.bargen@agrar.hu-berlin.de

² University of Hamburg, Biocenter Klein Flottbek, Ohnhorststraße 18, 22609 Hamburg, Germany, hpmuehlbach@gmx.net

³ UMR 1332 BFP, INRA, Univ Bordeaux, 33882 Villenave d'Ornon, France, thierry.candresse@inra.fr

Keywords: Next generation sequencing, ringspots, mosaic

ABSTRACT

European mountain ash ringspot-associated virus (EMARaV) is the type member of the genus *Emaravirus* comprising plant viruses with a segmented ss(-)RNA genome mainly infecting woody hosts. Emaraviruses consists of a core of four conserved monocistronic genome segments within the enveloped spherical particle, encoding the replicase (RNA1), a glycoprotein precursor (RNA2), the viral nucleocapsid protein (RNA3), and a movement protein (RNA4). Some members of the genus contain up to four additional genomic RNA molecules encoding proteins of unknown function. Emaraviruses have a narrow host range usually restricted to few related species. Symptoms include chlorotic ringspotting and mottling of leaves. Decline of affected broad-leaved species is also often observed.

Rowans (syn. European mountain ash) and other *Sorbus* spp. were assessed for EMARaV infection by visual inspection and RT-PCR. Other deciduous tree species showing virus-like symptoms were investigated for plant virus infection applying high-throughput sequencing (Illumina RNASeq) in combination with RT-PCR. Chlorotic ringspots, mottle and dieback is closely associated with EMARaV infection of the *S. aucuparia* population in several European countries. The virus was also detectable in other tree species of the *Rosaceae* family exhibiting similar symptoms. Further, previously unknown RNA viruses were identified in important tree species of other families showing chlorotic ringspots, line pattern and mottling of leaves. Sequence analyses revealed closest relationships to Emaraviruses.

EMARaV is the main viral agent which affects rowans throughout. Related plant viruses are able to infect other broad-leaved tree species in Europe and some of them are widespread in their respective host tree species. Thus, members of the genus *Emaravirus* have to be considered as relevant pathogens of woody species and need to be included in health management strategies of deciduous trees.