Viruses in urban trees- studies on distribution of nutrients in leaves of flowering ash (*Fraxinus ornus*)

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Abstract

In contrast to the native common ash (*Fraxinus excelsior*), the flowering ash (*F. ornus*) is considered resistant or tolerant to ash dieback caused by the fungal pathogen *Hymenoscyphus fraxineus*. The flowering ash, originated in Southern Europe, belongs to the so-called "climate tree species". These are non-native robust trees which are considered to be more tolerant to hot and dry conditions expected due to climate changes in Germany.

The suitability of climate change trees, which have already been planted in many German cities, must be evaluated in regard to their susceptibility to diseases in the urban environment. For this purpose, we are conducting studies within the framework of various research projects with a particular focus on virus diseases.

A three-year survey (2018-2020) on the occurrence of virus-suspected symptoms on urban trees in the Hamburg metropolitan region revealed that 12-20% of flowering ash trees (F. ornus) showed ash shoestring-associated virus (ASaV)-related symptoms. ASaV-infected ash trees show chloroses as chlorotic line pattern, in some cases additional leaf deformations up to shoestrings were found.

The virus symptoms suggest disturbances in the physiological processes of the trees. Therefore, ASaV-infected flowering ash trees were chosen as a model host-pathogen system in this study to investigate the overall nutrient composition (ionomics) and their respective distribution of leaves by different X-ray fluorescence spectroscopy-based methods. The knowledge of the disturbances of the plant's nutrient balance caused directly or indirectly by a pathogen could be used for indirect pathogen detection by mobile measuring devices; further, it could also provide the basis for developing an appropriate plant nutrition strategy to increase tree vitality to counteract the negative influences of virus infection in urban green.

The discrepancy of the nutrient distribution in the leaves of ASaV-infected flowering ash trees compared to the control are presented and discussed.

Keywords: Ash shoestring associated virus (ASaV), climate tree species, *Fraxinus ornus*, Ionomics