Efficiency of *Sbm1* and *Sbm2* resistance against soil-borne furoviruses in wheat under specific climatic conditions

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Soil-borne wheat mosaic virus (SBWMV) and *Soil-borne cereal mosaic virus* (SBCMV) are important cereal viruses worldwide. Infections with these viruses result in approximately 40% yield loss. Two SBWMV strains (SBWMV-NY, SBWMV-N) are known and SBCMV is categorized into three main serotypes. Important cereals, including wheat, are host of these viruses. SBWMV and SBCMV are transmitted by the soil-borne plasmiodiophorid *Polymyxa graminis* which infects the roots of cereals.

As soils contaminated by the virus remain infectious over many years, the only efficient control strategy is the growth of resistant cultivars. Until now, only two resistance genes, *Sbm1* and *Sbm2* are thought to confer translocation resistance to wheat, restricting SBWMV/SBCMV to the roots. The stability and the expression pattern of the *Sbm1/Sbm2* resistance genes as well as the effect of additional, yet unknown resistance genes remain unclear.

To better characterize SBCMV/SBWMV resistance with respect to stability and mode of action, 15 genotypes differing in the grade of resistance were sown in Elxleben, Heddesheim (Germany) and Vatan (France) where SBWMV-N (in Germany) and SBCMV, respectively, were previously identified. Four plants of each genotype were sampled, cut into three parts (leaves, steam, roots) and tested for the presence of the viruses with serological tools. The infection rates were very low in Heddesheim, but the analysis in Elxleben and Vatan showed that firstly, most of the upper parts (leaves or shoot) of the plants carrying *Sbm1* remained uninfected, secondly, *Sbm2* did not prevent at all the infection of the upper parts, thirdly, the infection rates of the roots of the cultivars expressing *Sbm1* and/or *Sbm2* were much lower compared to plants without *Sbm* gene, and lastly, the viral titer were lower in the plants carrying *Sbm1* compared to the other plants.

These data were complemented by experiments in soil from Elxleben conducted under controlled conditions, where inoculation took place under specific environmental settings (temperature, water, nutrients). The first serological analysis suggests that temperature is an important parameter for infection.

Altogether, our results suggest that firstly, *Sbm1* is not only a translocation resistance as previously described, secondly *Sbm2* is probably less efficient than *Sbm1* against SBWMV and SBCMV in wheat, and thirdly, the environmental conditions have a high impact on the infection rates of the viruses. Further transcriptomics studies are required to understand expression pattern of Sbm1 and Sbm2 and physiological processes impacted during infection by SBWMV and SBCMV.