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Barley Yellow Dwarf Virus detection and assessment of virus spread in susceptible and resistant barley plants

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Abstract

Virus titers in different plant parts from controlled transmission studies between susceptible and resistant plants are compared to understand the mechanisms underlying the reduction of virus replication/spread in resistant plants and characterize and potentially differentiate between distinct mechanisms of BYDV resistance or tolerance.

Keywords: Barley yellow dwarf virus, aphids, barley, PCR, titer

The aphid transmitted *Barley yellow dwarf* virus (BYDV) causes stunting, reduced root growth and yellowing or reddening of leaves of barley plants and affects to a number of yield parameters. It is one of the major diseases of barley resulting in substantial yield losses worldwide.

This is aggravated by complex detection methods in aphids and insufficient knowledge about tolerance or resistance to the virus and/or aphids in barley. Up to now only three virus-resistance genes were described. Additionally quantitative trait loci (QTL) have been identified and mapped in two different DH-populations originating from the cultivar ´Post´[1].

For identifying resistance genes and/or QTL, which are responsible for an early and/or systemic response to virus infection, it is necessary to detect the replication and movement of the virus during the early infection phase in plants.

A simplified RNA extraction method and BYDV-specific PCR was established for subsequent BYDV detection in single aphids of the species *Ropalosiphum padi*. Barley plants were grown under controlled growth chamber conditions for 3 varieties, Post, Rubina and Vixen, representing different resistance sources. A total number of 270 plants for every variety were inoculated at one-leaf stage with 3 viruliferous aphids each and 3 whole plants were sampled and dissected into leaves, roots and stems every 12 hours up to day 9 after inoculation or every day up to 21 days after inoculation and stored at -20°C. Virus titers of infected leave tissue of different age gathered from three barley varieties with differential resistance will be analyzed by real time RT-PCR. The results will be compared among the varieties and different ages. Data of infected root tissue derived from the same plants will be included in the final analysis also.

Establishment of a sensitive real-time RT-PCR method for BYDV should allow to monitor replication and virus spread within different tissues, organs and developmental stages. This will enable us to compare virus titers in different plant parts in controlled transmission studies between susceptible and resistant plants to understand the mechanisms underlying the reduction of virus replication/spread in resistant plants and characterize and potentially differentiate between distinct mechanisms of BYDV resistance or tolerance.

References

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