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Exogenous siRNA-mediated protection of plants from virus infection

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A hallmark of antiviral RNA silencing is the production of viral small interfering RNA (vsiRNA). Profiling of vsiRNAs indicates that many regions of viral RNA genome or transcribed viral RNAs are prone to RNA silencing-mediated cleavage. These vsiRNAs could be used to combat virus infection in hosts. Here we show that direct targeting viral genomes by synthetic certain vsiRNAs confers plant resistance to virus infection. Using northern blotting and high-throughput deep sequencing, we obtained vsiRNA profiles for the African cassava mosaic virus (ACMV), a single-stranded DNA virus that causes massive economic losses in the production of cassava (*Manihot esculenta* Crantz), an essential staple carbohydrate food source in Africa and other countries. Sense and anti-sense strands of small RNAs corresponding to hotspot and coldspot vsiRNAs were synthesised. We found that double-stranded hotspot small RNAs were able to protect *Nicotiana benthamiana* from ACMV infection. Consequently, viral DNA replication and accumulation of viral mRNA were undetectable and the treated plants remain healthy. However, the sense or anti-sense strand of hotspot vsiRNAs, and coldspot small RNAs in both double-stranded and single-stranded conformations possessed less or no activity in viral protection. We further demonstrated that the exogenous vsiRNA-mediated virus resistance had a threshold effect and required an active RDR6. These data show that vsiRNAs possess a functional significance on antiviral RNA silencing, suggesting that they may have the potential as an exogenous biological agent for controlling destructive viral diseases in plants and other hosts.

Biography

Yiguo Hong obtained his PhD in plant molecular virology in 1990. As a Principal Investigator he had established an independent Molecular Virology Laboratory at Horticultural Research International (HRI), and then Warwick HRI, University of Warwick since 1999 after his postdoctoral research at Imperial College London, John Innes Centre, Norwich and Scottish Crop Research Institute, Dundee in the UK. He is now a Professor and Director of the Research Centre for Plant RNA Signalling in the College of Life and Environmental Sciences, Hangzhou Normal University while he holds a lasting Visiting Professorship at the University of Warwick. His research interests include RNA and protein signalling in antiviral defence and plant development

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