Molecular mechanism of suppression of plant antiviral immunity

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Plant viruses reduce the yield and quality of crops. Because utilization of virus resistant varieties is the most effective technique currently available, it is important to understand molecular mechanisms underlying resistances inherent in plants. We studied on mechanisms of RNA silencing and a novel dominant resistance against viruses in the genus *Potexvirus*, which includes economically important species. RNA silencing is a sequence-specific RNA degradation system and plays roles in gene expression regulation and resistance against plant viruses. To counteract RNA silencing, most plant viruses encode suppressors of RNA silencing Although it has been known that TGBp1, one of the three movement protein encoded by potexviruses, suppresses RNA silencing, their detailed mechanism of action has been unelucidated. In this study, we showed that TGBp1 of a potexvirus, plantago asiatica mosaic virus (PlAMV), inhibits double-stranded RNA synthesis in trans-acting small interfering RNA (tasiRNA) pathway, an endogenous RNA silencing pathway in *Arabidopsis thaliana* [1]. In addition, TGBp1 interacted with RDR6 and SGS3 of *A. thaliana*, which are responsible for the double-stranded RNA synthesis in tasiRNA and antiviral RNA silencing pathway. TGBp1 formed aggregates with SGS3/RDR6 bodies, which are RDR6 and SGS3 containing vesicles and normally scattered in cytoplasm. Since double-stranded RNA synthesis has important roles in RNA silencing amplification and systemic signaling, targeting RDR6 and/or SGS3 could be advantageous. Next, we screened ecotypes of *A. thaliana* (family *Brassicaceae*) for a novel resistance gene to PlAMV and identified a single dominant resistant gene *JACALIN-TYPE LECTIN REQUIRED FOR POTEXVIRUS RESISTANCE1* (*JAX1*) [2]. We generated transgenic tomato plants (*Solanaceae*) overexpressing JAX1 protein and found that they did not show any growth defects and completely resistant to pepino mosaic virus a potexvirus causing severe damage to tomato production worldwide [3]. These results indicate successful interfamily transfer of *JAX1* gene. These studies revealed detailed interaction mechanism of two types of resistance, RNA silencing and JAX1-mediated resistance with potexviruses, and provided insights into the development of virus-resistant varieties.

References

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