Geminivirus-associated betasatellites: exploiting chinks in the antiviral arsenal of plants

With the support of the National Natural Science Foundation of China, the research team led by Prof. Zhou XuePing (周雪平) at the State Key Laboratory for Biology of Plant Diseases and Insect Pests, Institute of Plant Protection, Chinese Academy of Agricultural Sciences, revealed the counter-defensive strategies deployed by geminivirus-associated betasatellites to overcome the antiviral arsenal of plants, which has been published in *Trends in Plant Science* (2019, http://doi.org/10/1016/j.tplants.2019.03.010)

Betasatellites are a diverse group of small circular single-stranded DNA satellites that are frequently found in association with begomoviruses belonging to the family *Geminiviridae*. Since they were first discovered in 1999, more than 1300 full-length betasatellite sequences, belonging to 61 species of the genus *Betasatellite* have been characterized from 37 countries. Begomovirus-betasatellite complexes transmitted by the whitefly vector cause extensive yield losses in vegetable and fiber crops, posing a serious threat to global agriculture and food security.

With a small viral genome and limited coding capacity, the geminivirus-betasatellite disease complex relies extensively on the host cell machinery for replication, transcription, cell-to-cell movement, systemic spread, and vector transmission. Challenged with a geminivirus-betasatellite infection, plants are able to mount multiple layers of defense, including RNA silencing, post-transcriptional modification of proteins, and autophagy, to protect themselves. Previous research by Zhou's group and others demonstrated that the βC1 protein, encoded by the betasatellite, is the master instigator that employs counter-defensive strategies to achieve a successful infection and to establish a mutualism with whitefly vectors.

In their recent work, they summarized the defense/counter-defense interplay between geminivirus-betasatellite and their host plants manifests at genomic, transcriptional, post-transcriptional, and post-translational levels. They also found that some host factors involved in the interactions between the plant host and the geminivirus-betasatellite complex are also at the core of plant and RNA virus interactions. Their work suggests that geminivirus-betasatellite disease complexes can be used as an excellent model for probing plant antiviral immunity. Understanding of the evolutionary molecular arms race between plants and geminivirus-betasatellite disease complexes will likely allow for the development of novel sustainable antiviral strategies.

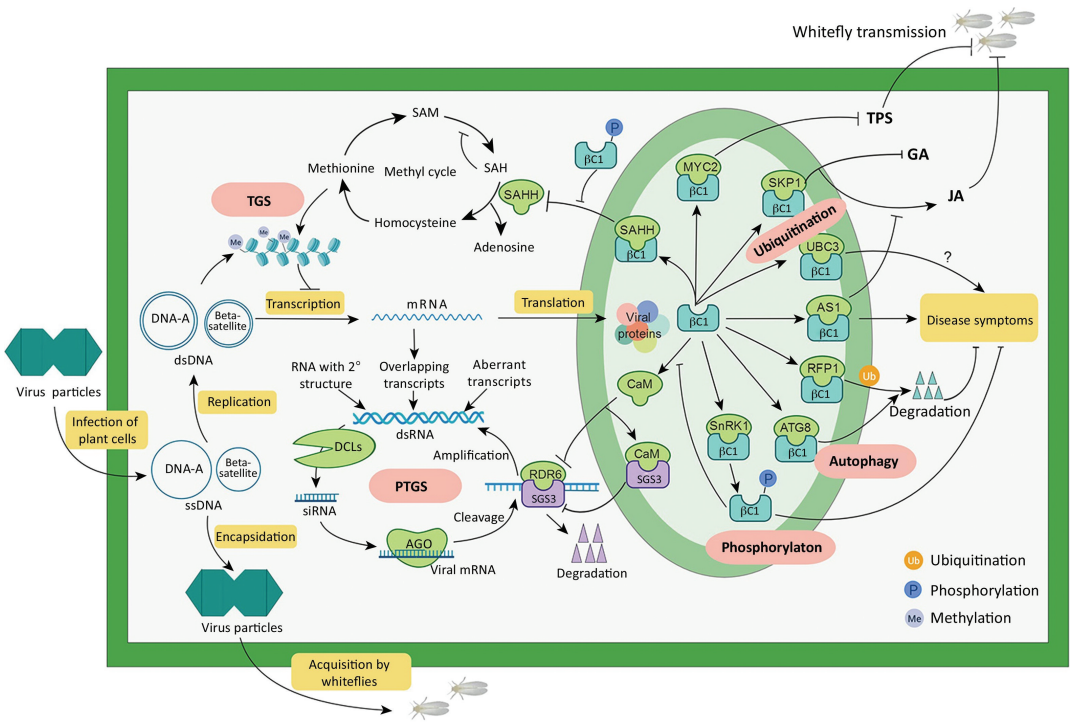

Figure A model depicting the activation and suppression of plant antiviral immune responses by begomovirus-betasatellite complexes.