



Viroids: Small but mighty

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ABSTRACT

Viroids are naked, circular, long non-coding RNAs pathogens that range in size from 246 to 401nt, causing plant diseases of economic importance. They can infect a wide range of hosts inducing important trees and crops such as citrus trees, hops, tomatoes, potatoes and vineyards. Until now there are thirty-two different viroid species identified and separated into two families (*Pospiviroidae* and *Avsuniviroidae*). Since they do not encode for any protein, they need to use cellular mechanisms in order to infect. In our lab, we are concentrating on different aspects of viroid biology.

- 1) Viroid epidemics in Greece and particularly on the island of Crete. Viroid can be of major agronomic importance depending on the host. We focus mainly on grapevines, citrus trees, avocado and already we were able to identify viroid strains, never detected in Greece before (Collaboration with Hellenic Agricultural Organization DIMITRA).
- 2) Viroid detection. We are developing advanced isothermal protocols (LAMP) for the detection of certain viroids (Collaboration with Dr. Gizeli lab at IMBB).
- 3) Host-viroid interactions. We are mainly focusing on a plant defense mechanism against viruses and viroids, RNA silencing. In *Nicotiana benthamiana* (*N. benthamiana*) this mechanism encompass three major groups of proteins: Dicer (DCL) proteins (4 in *N. benthamiana*), responsible for dicing double stranded RNA, Argonautes (AGO) (7 in *N. benthamiana*) which are the effectors of suppression and finally RNA-dependent RNA polymerase (RDR) proteins (at least 3 in *N. benthamiana*) which are involved in the amplification of the silencing response. In order to study the RNA silencing mechanism we have developed both Knock-down (hairpin technology) and Knock-out (CRISPR/Cas9) plants for all four DCL proteins. Our previous work, showed that DCL4 is targeting PSTVd but not as efficiently as the combination of DCL2/DCL3 suggesting a particular role for each DCL. Even though this study, combined with other studies in recent years, have increased our understanding of the interplay of viroids with RNA silencing there are significant open questions, such as the localization of the main RNAi components and the role of newly identified RNaseIII proteins.