

Plant Pathology Seminar Series

Viroids: ancient parasites threatening modern agriculture

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Abstract

Viroids are the smallest known infectious agents of plants consisting of a covalently closed circular single stranded RNA with sizes ranging from 250 to 400 nucleotides. To date, there are about 30 species of viroids taxonomically divided into two families, *Pospiviroidae* and *Avsunviroidae*. Viroids of both families use host DNA dependent RNA polymerase to replicate via a rolling circle mechanism, but members of the family *Pospiviroidae* replicate in the nucleus while those of the *Avsunviroidae* replicate in the chloroplast.

Most recognized viroid diseases are of recent origin and that their sudden appearance is attributed to widespread changes in agriculture in the 20th century (1). Although the viroid concept was accepted by the scientific community only during the later part of the 20th century, viroids themselves existed in a much earlier time and this archaic existence is illustrated by Potato spindle tuber viroid (PSTVd) (2) and citrus viroids (3). Furthermore, one hypothesis states that viroids are remnants of pre-cellular evolution predicted by the RNA world hypothesis (4). Central to this concept is the ability of viroids in the family of *Avsunviroidae* to mediate self-cleavage and self-ligation during replication (5).

Much progress has been made in our ability to detect viroids in host tissues but the impact of viroids on agriculture continues to increase. Case studies of diseases cause by Hop stunt viroid (HSVd) and Coconut cadang-cadang viroid (CCCVd) are presented to illustrate the impact of viroids in modern agriculture. Most viroids are considered to have a narrow host range but there is recent evidence that weed species in potato and hop fields could support replication of PSTVd and HSVd, respectively (6). This apparent ability of viroids to expand their host ranges can be attributed to the plasticity of their genome and high mutation rates (7, 8).

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References:

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