

PAPAYA RINGSPOT DISEASE: A GLOBAL MENACE AND ITS MANAGEMENT THROUGH RNAi

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ABSTRACT

Papaya (*Carica papaya* L.) is widely cultivated in tropical and sub-tropical regions of the five major continents of the world. Papaya plants are infected by several different viruses, which reduce the development and production of papaya plant as well as the fruits. Currently, Papaya ring spot virus (PRSV, genus: *Potyvirus*, family: *Potyviridae*) transmitted by the aphid vectors is considered the most widespread and destructive disease. PRSV is a positive sense RNA virus encoding for a polyprotein that is processed into ten proteins. Here we will discuss on the diversity of PRSV across the globe, with special reference to the scenario in India. It is difficult to manage PRSV by conventional management strategies, such as vector control or cross-protection. Upon the advent of genetic engineering technology, the concept of pathogen-derived resistance (PDR), became an excellent option to control PRSV infection in papaya. The molecular mechanism underlying PDR involve RNA interference (RNAi). RNAi has been recognized as a sequence specific defense mechanism that is based on the recognition and cleavage of double-stranded RNA (dsRNA) molecules into small interfering RNAs (siRNAs). RNAi was successfully employed to develop transgenic plants with desirable traits, particularly for the control of viral diseases. In the past, transgenic papaya cultivars were developed that overexpressed parts of the PRSV genome and exhibited high levels of virus resistance. In our studies, a non-transgenic approach was employed, in which in vitro produced dsRNA molecules derived from a PRSV isolate was tested for dsRNA-mediated protection against two isolates of PRSV through topical application of the dsRNA on papaya. Significant protection against PRSV infection was accomplished. This study on the topical application of dsRNA opens up a new avenue for the control of papaya ringspot disease worldwide.

Keywords: papaya ringspot virus, potyvirus, diversity, RNAi, dsRNA