RNA INTERFERENCE TECHNOLOGY: A NEW PATH FOR THE RESEARCH AND MANAGEMENT OF THE OBLIGATE BIOTROPHIC PHYTOPATHOGENIC FUNGUS *PODOSPHAERA XANTHII*

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The cucurbit powdery mildew disease, caused by *Podosphaera xanthii*, represents some of the most destructive plant diseases worldwide. Currently, chemical control and resistant cultivars are the primary approaches for disease management. However, fungicide-resistant isolates and new races of the pathogen make its control even more challenging, being necessary the development of innovative strategies. Chitin is a crucial component of fungal cell walls and an effective inducer for plant immunity, thus, phytopathogenic fungi have developed virulence factors to suppress this defensive response. In this study, the molecular machinery of chitin-triggered suppression through the effectors involved in the modification of chitin immunogenic oligomers (CDA) and in their degradation (EWCAs), were used as targets for the design of new antifungal strategies. To test this, an RNA interference (RNAi) technology, which consists of the application of double-stranded RNA (dsRNA) designed to suppress the expression of the corresponding target genes, was used. Initially, the uptake and processing of dsRNAs targeting the genes previously mentioned by RNAi machinery of melon plants through small RNA sequencing (sRNA-seq) was studied. Then, the *P. xanthii* uptake was explored through confocal microscopy visualization. Subsequently, these dsRNAs were infiltrated and sprayed on melon cotyledons and leaves, respectively, to evaluate fungal development and induce genes silencing. The results from sRNA-seq demonstrated that melon plants could process these dsRNAs at 24 hours post-spraying, while confocal images revealed the presence of fluorescent dsRNAs inside fungal spores after overnight application. Moreover, the RNAi strategy reduced by approximately 50% powdery mildew disease symptoms. Furthermore, by protecting these dsRNAs with “carbon dots” nanoparticles in greenhouse conditions, a significant prolongation of powdery mildew disease inhibition was observed over time, indicating its potential as an innovative and precise method for managing cucurbit powdery mildew.

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