

Chapter - 5

Practical Applications of Virus Induced Gene Silencing (VIGS) in Plants

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Abstract

RNA-interference (RNAi) is the principal mechanism of virus induced gene silencing (VIGS). In case of plants VIGS is known as post transcription gene silencing (PTGS), which is an inborn endogenous plant defence mechanism against intracellular viral movement and proliferation of virus. As the name suggests this mechanism inhibits the translation of mRNA to protein, thereby destroying several harmful genes to express in both plants and animals. Different enzymes i.e. dicer, argonaute, RNA inducing silencing complex (RISC) and different RNAs such as siRNA, shRNA, miRNA, piRNA play a crucial role in completing this process. Besides giving reduction against certain biotic plant pathogens, VIGS plays a significant role in recognition of genes, improving crop quality, resistance against biotic stresses, maintain plant's metabolic activity etc. In this chapter we have given a comprehensive overview on mechanism, applications and several other future prospects of VIGS in plants.

Keywords: RNAi, VIGS, PTGS, Dicer, RISC, miRNA

Introduction

VIGS stands for virus induced gene silencing, in order to elucidate the mechanism of recovery from virus infection, A. Van Kammen first used the term 'virus-induced gene silencing' (VIGS) [Van Kammen A. 1997]. VIGS is based on the RNA-interference (RNAi) principle, which leads to gene expression interference and it mediates in a sequence specific manner by small RNA. Rich Jorgenson and his colleagues found RNAi in plants where they conducted experiments on petunia flowers. In their experiment, they wanted to bloom the colour of petunia flowers more purple by over-expressing the gene responsible for the production of anthocyanin pigments (chalcone synthetase or CHS) by adding a CHS transgene attached to a large promoter