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Recent progress on gene silencing/suppression by virus-derived small interfering RNAs in rice viruses especially *Rice grassy stunt virus*

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1 *Review*

2 **Recent progress on gene silencing/suppression by Virus-derived small interfering**
3 **RNAs in rice viruses especially *Rice grassy stunt virus*.**

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17 **Abstract:** Noncoding RNAs play essential functions during epigenetic regulation of
18 gene expression and development in numerous organisms. Three type of small noncoding
19 RNAs found in eukaryotes, which are small interfering RNAs (siRNAs), microRNAs
20 (miRNAs) and piwi-interacting RNAs (piRNAs). Small RNAs (sRNAs) originated from
21 infecting viruses are known as virus-derived small interfering RNAs (vsiRNAs), are
22 responsible for RNA silencing in plants. However, Virus-induced gene silencing (VIGS) is
23 mainly dependent on RNA silencing (RNAi). Interestingly, RNA silencing happens in plants
24 and insects during viral infections. VsiRNAs originate from dsRNA molecules which further
25 require hosts Dicer-like (DCL) proteins, RNA dependent RNA polymerase (RdRP) proteins,
26 and Argonaute (AGO) proteins. RdRP uses ssRNA for complete RNA amplification process
27 as well as DCL dependent secondary vsiRNA formation. Viral Suppressors of RNA
28 silencing (VSRs) interfere with the movement of signals during silencing mechanism.
29 Moreover, intercellular movement of viruses is facilitated by virus-encoded movement
30 proteins. Proteomic and Transcriptomic mechanisms regulated by specific factors like
31 microRNAs, which has become an essential factor of gene regulation. RNAi is also involved
32 in gene suppression by regulating the transcriptional and post-transcriptional gene expression
33 in many eukaryotes. *Rice grassy stunt virus* (RGSV) is a member of genus *Tenuivirus*.
34 Although, there is no much work done on RGSV, but this virus has become very potent and
35 destructive, and effects rice crop in many Asian countries, particularly in China. In this
36 review, we have highlighted the rice viruses' biology and silencing suppressors. This work
37 will be helpful for plant virologists in understanding the role of vsiRNAs mechanism in rice
38 viruses especially RGSV.

39 **Keywords:** Noncoding RNAs; movement proteins; Gene silencing; virus-induced small
40 interfering RNA; RNA silencing pathway

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42 **1. Introduction**

43 Rice (*Oryza sativa* L.), is essential cereal crop of worldwide. Asia consumes 650 million
44 tons of rice which become 90% of total world production [1, 2]. In Asia, rice production is
45 under serious threat from 10 out of 15 most damaging viruses. For example only in South
46 Vietnam in the 2006-07, *Rice ragged stunt virus* (RRSV) and *Rice grassy stunt virus* (RGSV)

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