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Molecular tools to predict resistance-breaking abilities of rice yellow mottle virus isolates

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Abstract

Rice yellow mottle virus (RYMV, Sobemovirus, Solemoviridae) is a major biotic constraint to rice cultivation in Africa. This icosaedric (+) ssRNA virus has been described in 25 countries. It shows a high and geographically-structured genetic diversity with six major strains distributed in West or East Africa, themselves divided in several sub-lineages. This classification was based on phylogenetic analyses of the coat protein (CP) sequences and confirmed on full-length genomes. Varietal selection is considered as the most efficient and sustainable way to manage RYMV. Sources of high resistance were found mostly in accessions of the African rice species, *Oryza glaberrima*. Two recessive and one dominant resistance genes were identified. Experimental evolution on resistant accessions revealed emergence of resistance-breaking (RB) genotypes in controlled conditions. The RB ability was highly contrasted depending on the RYMV lineages and the resistance sources. We previously demonstrated that the codon 49 of the viral protein genome-linked (VPg) played a major role in the RYMV adaptation to *O. glaberrima* and that the polymorphism at this codon can be used to predict the RB ability of RYMV isolates against several resistance sources. However, sequencing of the VPg gene is required in addition to the CP sequence to determine the RYMV sub-lineage. Moreover, no molecular marker was available to discriminate an hypervirulent lineage able to overcome all the known resistance sources. Here, we identified a molecular signature in the P1 gene of the RYMV hypervirulent lineage. Then, we designed specific RT-PCR primers in the P1 and VPg genes. These primers were tested and validated on 50 isolates representative of the RYMV genetic diversity. They will contribute to mitigate the risks of RB emergence taking into account the RYMV lineages identified in fields and their adaptability to optimise the deployment strategy of resistant lines at the local scale.

Keywords: Molecular tools, resistance-breaking, rice, RYMV

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