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Molecular characterization of Odontoglossum Ringspot Virus Genomic RNA

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Odontoglossum ringspot virus (ORSV) is a rigid rod-shaped plant virus of the tobamovirus genus, contains a single positive-sense RNA in size of about 6.6 kb. It is one of the most economically important orchid pathogen in Korea as well as in worldwide. ORSV, regarded by some plant virologists as an orchid strain of tobacco mosaic virus (TMV-O), which was first isolated from *Rossioglossum grande* formerly called *Odontoglossum grande*. In Korea, an isolate of ORSV, designated as ORSV-Cy, was isolated from naturally infected oriental cool-growing orchid, *Cymbidium goeringii* Reichenbach which is one of popular native orchids in Korea. Its biological and serological properties are similar to other isolates previously described. The size of the ORSV-Cy genomic RNA was estimated to be about 6.6 kb, which is longer than those of previously described ORSV isolates and may be the longest among the tobamoviruses. Complementary DNA of the genomic RNA of ORSV-Cy was synthesized from polyadenylated viral RNA and cloned. The 3'-terminal half region of the virus was cloned and sequenced. The sequence contained two oen reading frames, which encodes the cell-to-cell movement protein (MP) and coat protein genes (CP), and are 912 nts and 477 nts long, respectively. The MP gene contained a conserved sequence motif of tobamoviruses and putative assembly origin of the viral RNA locating between 1117 nts and 1292 nts from the 3'-end. It has two loops (loop I & II) and contains an XXG repeat motif. A total of nine pseudoknot structure are present at the 3' UTR of ORSV-Cy RNA. Also, there are the aminoacyl acceptor loop (UUCGAAU) comprising nts 27-33 and the hairpin loop of the tRNA-like structure containing GUG at positions 70-74 from the 3'-end coding for an anticodon for histidine.

The complete nucleotide sequence of an ORF is 1377 base pairs in length, and encodes a protein of 458 amino acids about 53,334 daltons. The 52K protein of ORSV is 16 amino acids shorter than that of tobacco mosaic virus (TMV). The 52K protein of ORSV shares four sequence motifs characteristic of viral rna-dependent RNA polymerase. Comparison of the ORSV 52K protein sequence with that of other five viruses in tobamovirus group showed 76.0 to 60.7 % homologies at the amino acid level and the conservation of the four motifs between the viruses. By the phylogenetic relationship of the 52K gene among viruses of the tobamovirus genus in the amino acid level, ORSV is more closely related to PMMV and TMGMV than other tobamoviruses, which is the similar result with the CP comparison with the same viruses. The 52K protein of ORSV shares four sequence motifs (I: 241-249, II: 279-313, III: 329-340, IV: 372-377 amino acids) which are characteristic of viral RNA-dependent RNA polymerase. The Gly-Asp-Asp motif of GDD box (334-336 amino acids) is also found in the third motif.