ICTV Virus Taxonomy Profile: Ophioviridae

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Abstract

The Ophioviridae is a family of filamentous plant viruses, with single-stranded negative, and possibly ambisense, RNA genomes of 11.3–12.5 kb divided into 3–4 segments, each encapsidated separately. Virions are naked filamentous nucleocapsids, forming kinked circles of at least two different contour lengths. The sole genus, Ophiovirus, includes seven species. Four ophioviruses are soil-transmitted and their natural hosts include trees, shrubs, vegetables and bulbous or corm-forming ornamentals, both monocots and dicots. This is a summary of the International Committee on Taxonomy of Viruses (ICTV) Report on the taxonomy of the Ophioviridae, which is available at http://www.ictv.global/report/ophioviridae.

Table 1. Characteristics of the family Ophioviridae

<table>
<thead>
<tr>
<th>Typical member</th>
<th>citrus psorosis virus P-121 (RNA1 AY654892; RNA2: AY654893; RNA3: AY654894), species Citrus psorosis virus, genus Ophiovirus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virion</td>
<td>Non-enveloped, nucleocapsids 3 nm in diameter, and 700 nm or 2000 nm long. Pseudo-linear duplex structures are 9–10 nm in diameter</td>
</tr>
<tr>
<td>Genome</td>
<td>11.3–12.5 kb of negative-sense, segmented RNA (3 or 4 segments)</td>
</tr>
<tr>
<td>Replication</td>
<td>Not characterized</td>
</tr>
<tr>
<td>Translation</td>
<td>From mRNAs, which are complementary to the vRNAs</td>
</tr>
<tr>
<td>Host range</td>
<td>Citrus, blueberry, pittosporum, lettuce, sowthistle, tulip, ranunculus, anemone, lachenalia and freesia</td>
</tr>
<tr>
<td>Taxonomy</td>
<td>One genus, Ophiovirus, including seven species</td>
</tr>
</tbody>
</table>

**VIRION**

Particles are non-enveloped, naked filamentous nucleocapsids forming either circles (open form) or pseudo-linear duplex (collapsed form) (Table 1, Fig. 1).

**GENOME**

The genome of ophioviruses consists of three or four individually encapsidated RNA segments (Fig. 2). Members of the species Citrus psorosis virus [1], Ranunculus white mottle virus, Freesia sneak virus and Blueberry mosaic associated virus.

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Abbreviations: CP, coat protein; RdRp, RNA-dependent RNA polymerase.
virus have three RNAs (named RNA1, RNA2 and RNA3) whereas members of the species Mirafiori lettuce big-vein virus and Lettuce ring necrosis virus have a fourth RNA (RNA4) [2]. The genome organization is unknown for members of the species Tulip mild mottle mosaic virus.

Virions encapsidate both the minus- and positive-sense RNAs, but a larger amount of RNA of negative polarity is detected. As virions appear circularized, the presence of panhandle structures has been suggested. RNA1 contains two ORFs in the viral complementary strand (vcRNA) encoding the 22–25K protein and the RdRp. The 24K protein of citrus psorosis virus is involved in the misprocessing of miRNA and RNA silencing suppressor activity. vcRNA2 encodes the cell-to-cell movement protein (MP), which also has RNA silencing suppressor activity. Mirafiori lettuce big-vein virus has a second putative ORF in vRNA2 that encodes a protein of unknown function. The coat protein (CP) is encoded by vcRNA3. A fourth genomic RNA has been reported for Mirafiori lettuce big-vein virus and lettuce ring necrosis virus, encoding putative proteins of unknown function.

**TAXONOMY**

Ophiovirus is the only genus in the family, including seven species. CP amino acid sequence alignments show 31–52 % identity between isolates of different species, and 92–100 % identity within a species. The CPs of Mirafiori lettuce big-vein virus and tulip mild mottle mosaic virus (partial CDS) share about 80 % amino acid sequence identity, thus warranting an ophiovirus species demarcation criterion of <85 % CP amino acid sequence identity. The RdRp contains the SDD sequence in motif C, a signature for segmented negative-stranded RNA viruses. Phylogenetic reconstructions using sequences of the conserved core module from RdRps of ophioviruses and representative negative-stranded RNA viruses reinforce their separation as a monophyletic group. Citrus psorosis virus is present worldwide, transmitted by vegetative propagation of the host, and natural dispersion has also been observed. No vector is known for ranunculus white mottle virus and blueberry mosaic associated virus. Olpidium virulentus and Olpidium brassicae fungi transmit Mirafiori lettuce big-vein virus, tulip mild mottle mosaic virus and lettuce ring necrosis virus; freesia sneak virus is presumably transmitted by a member of the genus Olpidium. Ranunculus white mottle virus has been reported in Italy, France and Germany [3], and tulip mild mottle mosaic virus in Japan [4]. Mirafiori lettuce big-vein virus, the causal agent of big-vein disease in lettuce, probably occurs worldwide. Lettuce ring necrosis virus is closely associated with lettuce ring necrosis disease in The Netherlands, Belgium and France [5]. Freesia sneak virus [6] has been reported in Europe, South Africa, North America, South Korea and New Zealand. Blueberry mosaic associated virus is associated with blueberry mosaic disease found in North and South America, Europe, New Zealand and Japan [7].

**RESOURCE**


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**Conflicts of interest**

The authors declare that there are no conflicts of interest.

**References**