



This form should be used for all taxonomic proposals. Please complete all those modules that are applicable (and then delete the unwanted sections). For guidance, see the notes written in blue and the separate document "Help with completing a taxonomic proposal"

Please try to keep related proposals within a single document; you can copy the modules to create more than one genus within a new family, for example.

MODULE 1: **TITLE, AUTHORS, etc**

Code assigned:	2014.002aP	(to be completed by ICTV officers)			
Short title: Remove (abolish) the taxon <i>Mexican papita viroid</i> from the genus <i>Pospiviroid</i> and reclassify isolates of Mexican papita viroid as isolates of the species <i>Tomato planta macho viroid</i> (e.g. 6 new species in the genus <i>Zetavirus</i>)					
Modules attached (modules 1 and 9 are required)	1 <input checked="" type="checkbox"/> 6 <input type="checkbox"/>	2 <input type="checkbox"/> 7 <input checked="" type="checkbox"/>	3 <input type="checkbox"/> 8 <input type="checkbox"/>	4 <input type="checkbox"/> 9 <input checked="" type="checkbox"/>	5 <input type="checkbox"/>

Author(s) with e-mail address(es) of the proposer:

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(owensj301@hotmail.com)

List the ICTV study group(s) that have seen this proposal:

A list of study groups and contacts is provided at <http://www.ictvonline.org/subcommittees.asp> . If in doubt, contact the appropriate subcommittee chair (fungal, invertebrate, plant, prokaryote or vertebrate viruses)

Viroid Study Group

ICTV-EC or Study Group comments and response of the proposer:

Date first submitted to ICTV:

June 2014

Date of this revision (if different to above):

MODULE 7: **REMOVE and MOVE**

Use this module whenever an existing taxon needs to be removed:

- Either to abolish a taxon entirely (when only part (a) needs to be completed)
- Or to move a taxon and re-assign it e.g. when a species is moved from one genus to another (when BOTH parts (a) and (b) should be completed)

Part (a) taxon/taxa to be removed or moved

Code	2014.002aP	(assigned by ICTV officers)
To remove the following taxon (or taxa) from their present position:		
<i>Mexican papita viroid</i>		
The present taxonomic position of these taxon/taxa:		
Genus:	<i>Pospiviroid</i>	Fill in all that apply.
Subfamily:		
Family:	<i>Pospiviroidae</i>	
Order:		
If the taxon/taxa are to be abolished (i.e. not reassigned to another taxon) write "yes" in the box on the right		YES

Reasons to justify the removal:

Explain why the taxon (or taxa) should be removed

The taxon *Mexican papita viroid* (MPVd) should be deleted and isolates of this viroid should be reclassified as isolates of the existing species *Tomato planta macho viroid* (TPMVd) because:

- 1) Nucleotide sequence identities reported for isolates of MPVd and TPMVd exceed 90% (which is the species demarcation border indicated by ICTV as one of the criteria, besides biological properties, to discriminate viroid species) [values vary between 91.7 and 99.2%], which indicates that these isolates should be classified in a single taxon (Annex, Table 1).
- 2) Because the sequence identities of certain isolates are close to 90% (the species demarcation border), the ability of these two viroids to infect *Gomphrena globosa* and *Nicotiana glutinosa* following mechanical inoculation were tested by Martinez-Soriano et al. (1996). These authors reported that the appearance of flower-break symptoms in *Nicotiana glutinosa* (evoked by MPVd but not by TPMVd) and replication in *Gomphrena globosa* (TPMVd but not MPVd) could be used to discriminate between these two species, but no quantitative data were provided. More recent infectivity trials involving these and other pospiviroids failed to confirm these results, however (Verhoeven et al., 2011 and unpublished data). Inoculation of both plant species failed to discriminate among several isolates of TPMVd and MPVd (Annex, Table 2), thus further supporting the proposed reclassification.
- 3) Phylogenetic analysis of MPVd, PSTVd, TCDVd, and TPMVd sequences (which are related species in the genus *Pospiviroid*) show that MPVd and TPMVd form a monophyletic group, thereby satisfying the current species definition of the ICTV (Annex, Fig. 1).
- 4) The following genomic sequences of MPVd should be reclassified as TPMVd: GQ131573; FJ824844; L78463; L78462; L78461; L78460; L78459; L78458; L78457; L78455; L78454; HG739081.

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Part (b) re-assign to a higher taxon

Code		(assigned by ICTV officers)
To re-assign the taxon (or taxa) listed in Part (a) as follows:		
Genus:		Fill in all that apply. • If the higher taxon has yet to be created write “ (new) ” after its proposed name and complete relevant module to create it. If no genus is specified, enter “ unassigned ” in the genus box.
Subfamily:		
Family:		
Order:		

Reasons to justify the re-assignment:

- If it is proposed to re-assign species to an existing genus, please explain how the proposed species differ(s) from all existing species.
 - If species demarcation criteria (see module 3) have previously been defined for the genus, explain how the new species meet these criteria.
 - If criteria for demarcating species need to be defined (because there will now be more than one species in the genus), please state the proposed criteria.
- Provide accession numbers for genomic sequences
- Further material in support of this proposal may be presented in the Appendix, Module 9

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MODULE 9: **APPENDIX**: supporting material

additional material in support of this proposal

References:

Martínez-Soriano JP, Galindo-Alonso J, Maroon CJ, Yucel I, Smith DR, Diener TO (1996) Mexican papita viroid: putative ancestor of crop viroids. Proc Natl Acad Sci U S A 93:9397-401.

Verhoeven JThJ, Roenhorst JW, Owens RA (2011) Mexican papita viroid and Tomato planta macho viroid belong to a single species in the genus Pospiviroid. Arch Virol 156:1433-1437

Annex:

Include as much information as necessary to support the proposal, including diagrams comparing the old and new taxonomic orders. The use of Figures and Tables is strongly recommended but direct pasting of content from publications will require permission from the copyright holder together with appropriate acknowledgement as this proposal will be placed on a public web site. For phylogenetic analysis, try to provide a tree where branch length is related to genetic distance.

Table 1. Sequence identity¹ of relevant isolates of MPVd² and TPMVd.

Isolate	GQ131573	L78454	K00817	FJ824844
GQ131573 (MPVd)		94.2	92.6	94.0
L78454 (MPVd)			92.8	99.2
K00817 (TPMVd)				91.7
FJ824844 (MPVd)				

¹ For pairwise alignments details, see page 2 -5 of this document.

²Because MPVd isolates OG1 to OG6 deposited in GenBank show minimal variation, only results for OG1 (L78454) are shown. MPVd HG739081 was excluded because this sequence was probably found in the progeny of L78454 since a known isolate of MPVd was used in the study (Olivier et al, online) and it only shows one insertion in comparison with L78454.

³ This genotype was initially identified as MPVd (Ling & Zhang, 2009); later, Verhoeven et al. (2011) reidentified this isolate as TPMVd.

Table 2. Infection of herbaceous indicators by selected pospiviroids following mechanical inoculation

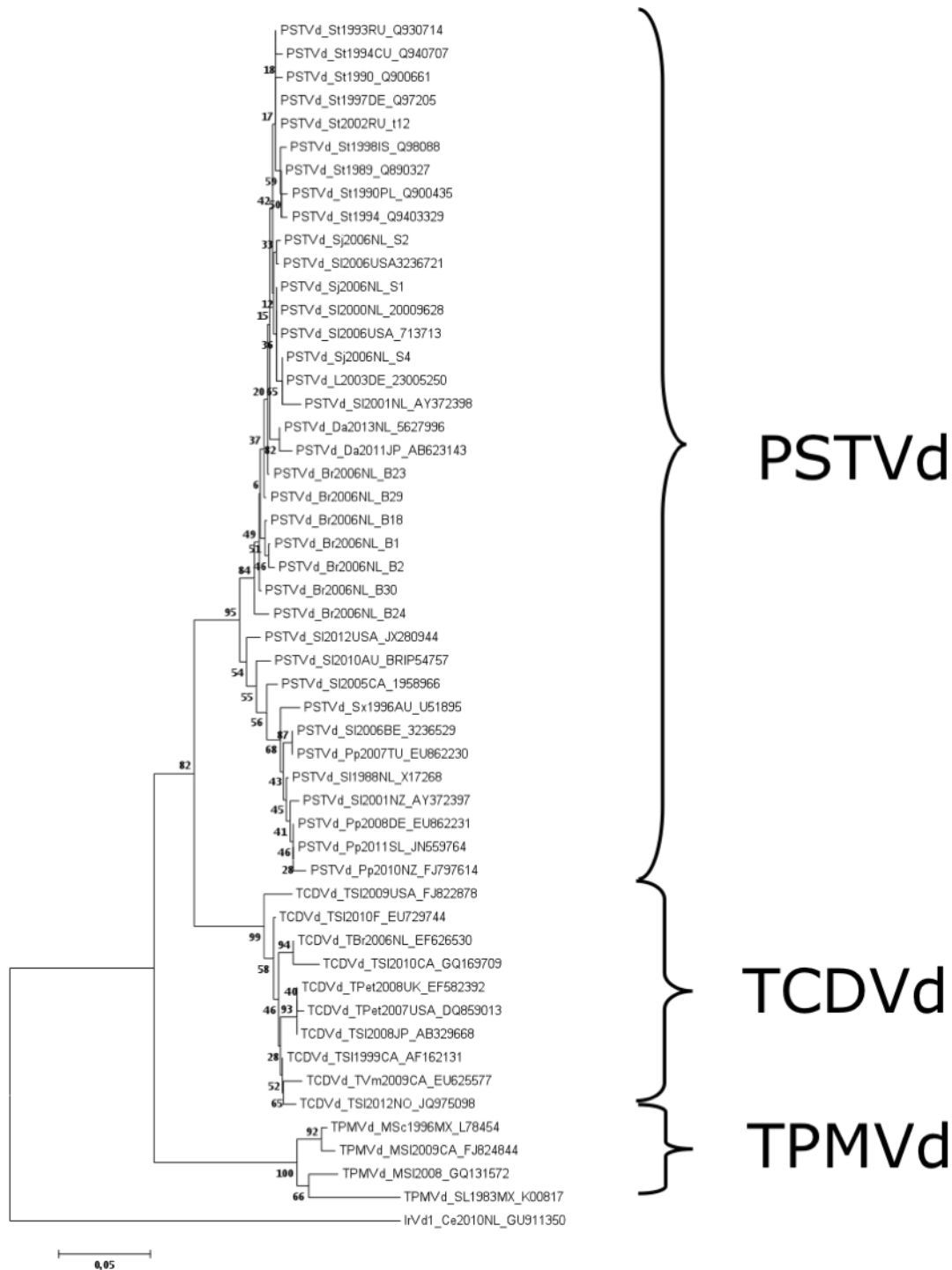
Viroid	Isolate	<i>Gomphrena globosa</i>		<i>Nicotiana glutinosa</i>	
		I	II	I	II
TPMVd	K00817	0/3	0/3	0/3	1/6 ^a
		+ ^b		- ^b	
MPVd	L78454	0/3	0/3	3/3	0/6
	3601768 ^c	0/3	0/3	0/3	1/6
		- ^b		+ ^b	
PSTVd	EF192393	0/3	0/3	3/3	0/6
	AY372400	0/3	0/3	1/3	0/6
	X17268	0/3	0/3	3/3	3/6
		+ ^b		+ ^b	
TCDVd	FJ822877	0/3	0/3	3/3	6/6
CLVd	AY372392	0/3	0/3	2/3	4/6

^a Data from Verhoeven et al. (2011) expressed as number of systemically infected plants / number of inoculated plants. Flowers of all *N. glutinosa* plants shown to be infected by RT-PCR also showed colour-break. I and II, first and second experiments.

^b Results reported by Martinez-Soriano et al. (1996). Isolates tested were not identified.

^c The sequence of isolate 36017768 is identical to GQ131573.

Figure 1. Phylogenetic analysis of MPVd, PSTVd, TCDVd, and TPMVd sequences (genus *Pospiviroids*) showing that MPVd and TPMVd form a monophyletic group. The acronym TPMVd is also used for current isolates of MPVd (GQ131573 and L78454). The alignment was made by ClustalW (Thompson et al., 1994). Phylogenetic and molecular evolutionary analyses were conducted using MEGA version 5 (Tamura et al., 2011).



References

Ling KS, Zhang W. 2009. First report of a natural infection of Mexican papita viroid and Tomato chlorotic dwarf viroid in greenhouse tomatoes in Mexico. *Plant Disease* 93 (11), 1216.

Martínez-Soriano JP, Galindo-Alonso J, Maroon CJM, Yucel I, Smith DR & Diener TO. 1996. Mexican papita viroid: putative ancestor of crop viroids. *Proceedings of the National Academy of Science of the United States of America* 93, 9397-9401.

Olivier T, Demonty E, Fuache F, Steyer S. (online) Generic detection and identification of pospiviroids. *Archives of Virology*. DOI 10.1007/s00705-014-1978-6.

Tamura K, Peterson D, Peterson N, Stecher G, Nei M, and Kumar S. 2011. MEGA5: Molecular Evolutionary Genetics Analysis using Maximum Likelihood, Evolutionary Distance, and Maximum Parsimony Methods. *Molecular Biology and Evolution* 28, 2731-2739.

Thompson JD, Higgins DG, Gibson TJ. 1994. CLUSTAL W: improving the sensitivity of progressive multiple sequence alignment through sequence weighting, position-specific gap penalties and weight matrix choice. *Nucleic Acids Research* 22, 4673-80.

Verhoeven JThJ, Roenhorst JW, Owens RA. 2011. Mexican papita viroid and Tomato planta macho viroid belong to a single species in the genus Pospiviroid. *Archives of Virology* 156:1433-1437.