EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION
ORGANISATION EUROPEENNE ET MEDITERRANEENNE POUR LA PROTECTION DES PLANTES
(11-17239)
Summary sheet of validation data for a diagnostic test

The EPPO Standard PM 7/98 *Specific requirements for laboratories preparing accreditation for a plant pest diagnostic activity* describes how validation should be conducted. It also includes definitions of performance criteria.

Target Organism	Potato spindle tuber viroid Tomato chlorotic dwarf viroid Mexican papita viroid	
Short description	Validation of a conventional RT-PCR test for detection and identification of PSTVd, TCDVd, MPVd and TPMVd using primers 2H1/3H1 described by Shamoul et al. (1997)	
Laboratory contact details	Netherlands Institute for Vectors, Invasive plants and Plant health P.O. Box 9102, 6700 HC Wageningen, Netherlands	
Date and reference of the validation report	2013-09-17 - NRC-ref: 2011.molbio.006	
Validation process according to EPPO Standard PM 7/98:	Yes	
Reference of the test description	N/R Update ISPM 27:2006 – Potato spindle tuber viroid (2006-022), section 3.3.4.1 Conventional RT-PCR using the primers of Shamloul et al. (1997) Shamloul AM, Hadidi A, Zhu SF, Singh RP, Sagredo B (1997) Sensitive detection of potato spindle tuber viroid using RT-PCR and identification of a viroid variant naturally infecting pepino plants. Can. J. Pl. Pathol. 19: 89-96.	
Is the test the same as described in the EPPO DP?		
Is the lab accredited for this test?	No	
Plant species tested (if relevant)	Solanum lycopersicum	
Matrices tested (if relevant)	leaves	
List of methods used		
Method for extraction / isolation / baiting of target organism from matrix		
Molecular methods, e.g. hybridization, PCR and real time PCR	X	RNA isolation using the RNeasy Plant Mini Kit (Qiagen), followed by RT-PCR by 2H1/3H1 primers and sequencing of the amplicon
Serological methods: IF, ELISA, Direct Tissue Blot Immuno Assay		
Plating methods: selective isolation		
Bioassay methods: selective enrichment in host plants, baiting, plant test and grafting.		

Pathogenicity test		
Fingerprint methods: protein profiling, fatty acid profiling & DNA profiling		
Morphological and morphometrical methods intended for identification		
Biochemical methods: e.g. enzyme electrophoresis, protein profiling		
Other		
Analytical sensitivity (= limit of detection)		
What is smallest amount of target that can be detected reliably?	Undiluted leaf sap was considered 100% infected. Starting with undiluted plant sap from PSTVd and TCDVd infected hosts up to 10^7 times dilutes in sap of healthy tomato leaves, all PSTVd and TCDVd strains were detected up to a relative infection rate of 10% (=10 times diluted) .	
Diagnostic sensitivity		
Proportion of infected/infested samples tested positive compared to results from the standard test , see appendix 2 of PM 7/98	100 %	
Specify the standard test	PCR sequencing of the complete viroid genome is considered the standard test. This can be achieved with primers Vid-FW/Vid-RE (CLVd, PSTVd and TCDVd) and 3H1/2H1 (PSTVd, TCDVd, MPVd and TPMVd). For other pospiviroids primers Pospi1-FW/Pospi1-RE are used to sequence the partial viroid genome.	
Analytical specificity		
Specificity value	100 %	
Number of strains/populations of target organisms tested	7 pospiviroid strains, see table 4 validation report	
Number of non-target organisms tested	10 (4 Avsunviroidae and 6 Pospiviroidae strains), see table 6 validation report	
Cross reacts with (specify the species)		
Diagnostic Specificity		
Proportion of uninfected/uninfested samples (true negatives) testing negative compared to results from a standard test	100 %	
Specify the standard test	PCR sequencing of the complete viroid genome is considered the standard test. This can be achieved with primers Vid-FW/Vid-RE (CLVd, PSTVd and TCDVd) and 3H1/2H1 (PSTVd, TCDVd, MPVd and TPMVd). For other pospiviroids primers Pospi1-FW/Pospi1-RE are used to sequence the partial viroid genome.	
Reproducibility		
Provide the calculated % of agreement for a given level of the	100% at undilluted, 2x and 4x diluted	

pest (see PM 7/98)	
Repeatability	
Provide the calculated % of agreement for a given level of the pest (see PM 7/98)	100% at undilluted, 2x and 4x diluted
Test performance study	
Test performance study?	No
Include brief details of the test performance study and its output.It available, provide a link to published article/report	
Other information	
Any other information considered useful **e.g. robustness, ease of performing the test, etc.**	To determine the robustness of the test two different reaction mixes were used to generate PCR products: OneStep RT-PCR kit (Qiagen) and SuperScript One-Step RT-PCR System with Platinum Taq (Invitrogen). The latter yielded the best results. Different extraction buffers were used. Using a GH plus buffer with a heating step yielded the best results. Freezing the samples prior to analysis did not influence the qualitative results obtained.
The following complementary files are available online:	• Validation of a conventional RT-PCR test for detection and identification of PSTVd, TCDVd, MPVd and TPMVd using primers described by Shamoul et al. (1997). (In Dutch)