

**Annexure 5 B of the SOPs of ATL**

**List of Viruses and Phytoplasmas reported to naturally infect plants currently covered under National Certification System for Tissue Culture Plants (Approved on 23/04/2019 – Ref. 8<sup>th</sup> meeting of Apex Committee)**

Note: Only those viruses which are reported in India need to be tested. However, if initiating culture/material is imported from other countries, there should be additional testing of those viruses which may be present in those country and are not reported from India)

S. No.	Common / Scientific Name	Viruses/Phytoplasma Revised list suggested	Report from India	Tests to Detect listed Virus/Phytoplasma		Commercial Positive/Negative control	Revision suggested for test
				ELISA	PCR/ RT-PCR		
1.	<b>Alstroemeria (Alstromeria spp.)</b>	<i>Alstroemeria mosaic virus (Potyvirus)</i>	No	+	+	✓	
		<i>Cucumber mosaic virus (Cucumovirus)</i>	Yes	+	+	✓	
		<i>Tospovirus</i>					
		<b><i>Alstroemeria necrotic streak virus (Tospovirus)</i></b> <b>Mehraban et al., 2010</b>	No	+		*NA	ANSV test by RT-PCR
		<b><i>Tomato yellow ring virus (Tospovirus)</i></b> <b>Beikzadeh et al., 2012</b>	No	+		✓	
		<b><i>Impatiens necrotic spot virus (Tospovirus)</i></b> <b>Ghotbi et al., 2015</b>	No	+		✓	
		<b><i>Tomato spotted wilt virus (Tospovirus)</i></b> <b>Ghotbi et al., 2015</b>	No	+		✓	
2.	<b>Apple (Malus)</b>	<i>Apple chlorotic leaf spot virus (Trichovirus)</i>	Yes	+	+	✓	

	<b>domestica)</b>	<i>Apple mosaic virus (Ilarvirus)</i>	Yes	+	+	✓	
		<i>Apple stem grooving virus (Capillovirus)</i>	1. Yes	+	+	✓	
		<i>Apple stem pitting virus (Foveavirus)</i>	Yes	+	+	✓	
		<i>Prunus necrotic ringspot virus (Ilarvirus)</i>	Yes	+	+	✓	
		<b>Apple scar skin viroid</b> (Apscaviroid)	Yes		+	-	ASSVd test by RT-PCR
3.	<b>Bamboo Bambusa spp</b>	<i>Bamboo mosaic virus (Potexvirus)</i>	Yes		+	*NA	BaMV test by RT-PCR
4.	<b>Banana (Musa spp.)</b>	<i>Banana streak virus (Badnavirus)</i>	Yes	+	+	✓	BSV & BBTV test by Duplex RT-PCR
		<i>Banana bunchy top virus (Babuvirus)</i>	Yes		+	✓	
		<i>Banana bract mosaic virus (Potyvirus)</i>	Yes	+	+	✓	BBrMV & CMV test by Duplex RT-PCR
		<i>Cucumber mosaic virus (Cucumovirus)</i>	Yes	+	+	✓	
5.	<b>Black Pepper (Piper nigrum)</b>	<i>Cucumber mosaic virus (Cucumovirus)</i>	Yes	+	+	✓	
		<i>Piper yellow mottle virus (Badnavirus)</i>	Yes		+	*NA	PYMoV test by RT-PCR
		Phytoplasma	Yes		+	-	
6.	<b>Calathea (Calathea lancifolia)</b>	Nil	-	-	-	-	
7.	<b>Calla lily</b>	<i>Cucumber mosaic virus</i>	No	+	+	✓	

	<b>(Zantedeschia aethiopica)</b>	(Cucumovirus)					
		Dasheen mosaic virus (Potyvirus)	No	+	+	✓	
		<b>Bean yellow mosaic virus (Potyvirus) Pham et al., 2002</b>	No	+	+	✓	
		<b>Konjak mosaic virus (Potyvirus) Pham et al., 2002</b>	No		+	*NA	KoMV test by RT-PCR
		<b>Turnip mosaic virus (Potyvirus) Chen et al., 2003a</b>	No	+		✓	
		<b>Zantedeschia mild mosaic virus (Potyvirus) Rizzo et al., 2015</b>	No		+	*NA	ZaMMV test by RT-PCR
		<b>Carnation mottle virus (Carmovirus) Chen et al., 2003b</b>	No	+		✓	
		Tospovirus					
		<b>Calla lily chlorotic spot virus (Tospovirus) Chen et al., 2005</b>	No		+	*NA	CCSV test by RT-PCR
		<b>Capsicum chlorosis virus (Tospovirus) Chen et al., 2012</b>	No		+	*NA	CaCV test by RT-PCR
		<b>Tomato spotted wilt virus (Tospovirus) Zettler and Hartman, 1995</b>	No	+		✓	
8.	<b>Cardamom Large (Amomum subulatum)</b>	Cardamom bushy dwarf virus (Babuvirus)	Yes		+	*NA	CBDV test by PCR
		Large cardamom chirke virus (Macluravirus)	Yes		+	*NA	LCCV test by RT-PCR
9.	<b>Cardamom Small (Elettaria cardamomum)</b>	Banana bract mosaic virus (Potyvirus)	Yes	+	+	✓	
		Cardamom mosaic virus (Macluravirus)	Yes		+	*NA	CdMV test by RT-PCR
10.	<b>Carnation (Dianthus caryophyllus)</b>	Carnation etched ring virus (Caulimovirus)	Yes	+	+	✓	
		Carnation latent virus (Carlavirus)	Yes	+	+	✓	

		<i>Carnation mottle virus</i> ( <i>Carmovirus</i> )	Yes	+	+	✓	
		<i>Carnation necrotic fleck virus</i> ( <i>Closterovirus</i> )	Yes	+	+	✓	
		<i>Carnation vein mottle virus</i> ( <i>Potyvirus</i> )	Yes	+	+	✓	
		<b><i>Carnation ring spot virus</i></b> ( <i>Dianthovirus</i> ) <b>Raikhy et al., 2006</b>	Yes	+	+	✓	
11.	<b>Cordyline</b> ( <i>Cordyline fruticosa</i> )	<b><i>Cordyline virus 1-4</i></b> ( <i>Closterovirus</i> ) <b>Melzer et al., 2013</b>	No		+	*NA	CoV1-4 test by RT-PCR
12.	<b>Date Palm</b> ( <i>Phoenix dactylifera</i> )	Phytoplasma	Yes		+	-	
13.	<b>Eucalyptus</b> ( <i>Eucalyptus spp.</i> )	Phytoplasma	No		+	-	
14.	<b>Fig</b> ( <i>Ficus spp.</i> )	<i>Cucumber mosaic virus</i> ( <i>Cucumovirus</i> )	Not reported	-	-		
		<b><i>Fig mosaic virus</i></b> ( <i>Emaravirus</i> ) <b>Tzanetakis et al., 2010</b>	No		+	*NA	FMV test by RT-PCR
		<b><i>Fig leaf mottle-associated virus-1</i></b> ( <i>Closterovirus</i> ) <b>Elbeaino et al., 2006</b>	No		+	*NA	FLMaV-1 test by RT-PCR
		<b><i>Fig leaf mottle-associated virus-2</i></b> ( <i>Closterovirus</i> ) <b>Elbeaino et al., 2007</b>	No		+	*NA	FLMaV-2 test by RT-PCR
		<b><i>Fig mild mottle-associated virus</i></b> ( <i>Closterovirus</i> ) <b>Elbeaino et al., 2010</b>	No		+	*NA	FMMaV test by RT-PCR
		<b><i>Fig cryptic virus</i></b> ( <i>Alphacryptovirus</i> ) <b>Elbeaino et al., 2011a</b>	No		+	*NA	FCV test by RT-PCR
		<b><i>Fig latent virus 1</i></b> ( <i>Trichovirus</i> ) <b>Gattoni et al., 2009</b>	No		+	*NA	FLV-1 test by RT-PCR
		<b><i>Fig fleck-associated virus</i></b> ( <i>Maculavirus</i> ) <b>Elbeaino et al., 2011b</b>	No		+	*NA	FFKaV test by RT-PCR
15.	<b>Gerbera</b>	<i>Cucumber mosaic virus</i> ( <i>Cucumovirus</i> )	Yes	+	+	✓	

	<b>(Gerbera spp.)</b>	<i>Tobacco rattle virus</i> ( <i>Tobravirus</i> )	No	+	+	✓		
		Tospovirus						
		<b>Tomato spotted wilt virus</b> ( <i>Tospovirus</i> ) <b>Stanković et al., 2011</b>	No	+			✓	
		<b>Impatiens necrotic spot virus</b> ( <i>Tospovirus</i> ) Whipker, 2014	No	+			✓	
16.	<b>Ginger</b> ( <i>Zingiber officinale</i> )	<i>Cucumber mosaic virus</i> ( <i>Cucumovirus</i> )	No	+	+	✓		
		<i>Ginger chlorotic fleck virus</i> ( <i>Sobemovirus</i> )	No	+	+	✓		
17.	<b>Gladiolus</b> ( <i>Gladiolus spp.</i> )	<i>Bean yellow mosaic virus</i> ( <i>Potyvirus</i> )	Yes	+	+	✓		
		<i>Cucumber mosaic virus</i> ( <i>Cucumovirus</i> )	Yes	+	+	✓		
		<i>Tobacco rattle virus</i> ( <i>Tobravirus</i> )	Yes	+	+	✓		
		<i>Tobacco ringspot virus</i> ( <i>Nepovirus</i> )	Yes	+	+	✓		
		<i>Tobacco mosaic virus</i> ( <i>Tobamovirus</i> )	No	+	+	✓		
		<b>Ornithogalum mosaic virus</b> ( <i>Potyvirus</i> ) <b>Kaur et al., 2011</b>	Yes		+	*NA	OrMV test by RT-PCR	
18.	<b>Lily (<i>Lilium longifolium</i>)</b>	<i>Cucumber mosaic virus</i> ( <i>Cucumovirus</i> )	Yes	+	+	✓		
		<i>Lily mottle virus</i> ( <i>Potyvirus</i> )	Yes	+	+	*NA		
		<i>Lily symptomless virus</i> ( <i>Carlavirus</i> )	Yes	+	+	✓		
		Tospovirus						
		<b>Tomato spotted wilt virus</b> ( <i>Tospovirus</i> ) <b>Dapkūnienė et al. , 2000</b>	No	+			✓	
		<b>Phytoplasma</b>	No		+	-	Phytoplasm	

		<b>Kaminska &amp; Korbin, 2002</b>					a test by PCR	
19.	<b>Neem (<i>Azadirachta indica</i>)</b>	Nil	Nil	-	-	-	-	
20.	<b>Orchids <i>Cymbidium</i> spp., <i>Dendrobium</i> spp., <i>Cattleya</i> spp., <i>Phalaenopsis</i> spp. etc.</b>	<i>Cymbidium mosaic virus (Potexvirus)</i>	Yes	+	+	✓		
		<i>Odontoglossum ringspot virus (Tobamovirus)</i>	Yes	+	+	✓		
		<i>Tobacco mosaic virus (Tobamovirus)</i>	No	+	+	✓		
		<i>Tospovirus</i>						
		<b>Tomato spotted wilt virus (Tospovirus) Baker et al., 2007</b>	No	+	+	✓		
		<b><i>Impatiens necrotic spot virus (Tospovirus) Hu et al., 1993; Koike and Mayhew, 2001</i></b>	No	+	+	✓		
		<b><i>Capsicum chlorosis virus (Tospovirus) Hu et al., 1993; Koike and Mayhew, 2001</i></b>	No		+	*NA	CaCV test by RT-PCR	
21.	<b>Pineapple (<i>Ananas comosus</i>)</b>	<i>Pineapple mealybug wilt- associated virus (Ampelovirus)</i>	No		+	*NA	PMWaV-1 test by RT-PCR	
		<i>Pineapple bacilliform virus (Badnavirus)</i>	No		+	*NA	PBV test by RT-PCR	
22.	<b>Pointed gourd (<i>Trichosanthes dioica</i>)</b>	<i>Ageratum enation virus (Begomovirus)</i>	Yes		+	*NA	AEV test by PCR	
23.	<b>Potato (<i>Solanum tuberosum</i>)</b>	<i>Potato apical leaf curl virus (Tomato leaf curl New Delhi virus) Begomovirus</i>	Yes			+	✓	ELISA or PALCV test by PCR
		<i>Potato leafroll virus (Polerovirus)</i>	Yes	+	+	✓		
		<i>Potato virus A (Potyvirus)</i>	Yes	+	+	✓		
		<i>Potato virus M (Carlavirus)</i>	Yes	+	+	✓		
		<i>Potato virus S (Carlavirus)</i>	Yes	+	+	✓		

		<i>Potato virus X</i> (Potexvirus)	Yes	+	+	✓	
		<i>Potato virus Y</i> (Potyvirus)	Yes	+	+	✓	
		Tospovirus					
		<b><i>Groundnut bud necrosis virus</i></b> (Tospovirus) <b>Pundhir et al., 2012</b>	Yes		+	*NA	GBNV test by RT-PCR
		<b><i>Potato spindle tuber viroid</i></b> (Pospiviroid)	Yes		+		RT-PCR test for PSTVd
24.	<b>Strawberry</b> <b>(<i>Fragaria</i> spp.)</b>	<i>Strawberry latent ringspot virus</i> (Nepovirus)	No	+	+	✓	
		<i>Strawberry mild yellow edge-associated virus</i> (Potexvirus)	No		+	*NA	SMYEaV test by RT-PCR
		<i>Tobacco streak virus</i> (Ilarvirus)	No	+	+	✓	
25.	<b>Sugarcane</b> <b>(<i>Saccharum officinarum</i>)</b>	<i>Sugarcane bacilliform virus</i> (Badnavirus)	Yes	+	+	✓	
		<i>Sugarcane mosaic virus</i> (Potyvirus)	Yes	+	+	✓	
		<b><i>Sugarcane streak mosaic virus</i></b> (Poacevirus) <b>Rao et al., 2006</b>	Yes	+		✓	
		<i>Sugarcane yellow leaf virus</i> (Polerovirus)	Yes		+	*NA	SCYLV test by RT-PCR
		<b><i>Sorghum mosaic virus</i></b> (Potyvirus) <b>Mali et al., 1978</b>	Yes	+		✓	
		<b><i>Peanut clump virus</i></b> (Pecluvirus) <b>Rao et al., 2002</b>	Yes		+	*NA	PCV test by RT-PCR
		Phytoplasma	Yes		+		
26.	<b>Syngonium</b> <b>(<i>Syngonium</i> spp.)</b>	Tospovirus <b>(Not reported)</b>					
27.	<b>Vanilla</b> <b>(<i>Vanilla</i> spp.)</b>	<i>Bean common mosaic virus</i> (Potyvirus)	Yes	+	+	✓	
		<i>Bean yellow mosaic virus</i> (Potyvirus)	Yes	+	+	✓	

		<i>Cowpea aphid borne mosaic virus (Potyvirus)</i>	No	+	+	✓	
		<i>Cucumber mosaic virus (Cucumovirus)</i>	Yes	+	+	✓	
		<i>Cymbidium mosaic virus (Potexvirus)</i>	Yes	+	+	✓	
		<i>Dasheen mosaic virus (Potyvirus)</i>	No	+	+	✓	
		<i>Odontoglossum ringspot virus (Tobamovirus)</i>	No	+	+	✓	
		<i>Ornithogalum mosaic virus (Potyvirus)</i>	No		+	*NA	OrMV test by RT-PCR
		<i>Watermelon mosaic virus (Potyvirus)</i>	No	+	+	✓	
28.	<b>Yucca (Yucca spp.)</b>	<i>Yucca bacilliform virus (Badnavirus)</i>	No		+	*NA	YBV test by RT-PCR
		<b><i>Cucumber mosaic virus (Cucumovirus)</i></b> <b>Parrella &amp; Greco, 2014</b>	No	+	+	✓	

**ELISA:** Enzyme-linked Immunosorbent Assay; **RT-PCR:** Reverse transcription polymerase chain reaction; **PCR:** Polymerase chain reaction

✓ ELISA kits/ Positive control commercially available; \*NA: ELISA kits/ Positive control for the viruses not available Commercially

# Virus/viroid name given in bold have been added recently