

## **DETECTION OF MICROORGANISMS – PLANT PATHOGENS**

Depending on pests, host plants, time of the year and others relevant information different methods for testing are chosen:

- Bacteria: plating, immunofluorescence, PCR, real time PCR, digital PCR, test plants (enrichment, pathogenicity test), RFLP, hypersensitive reaction, biochemical tests, DNA barcoding, sequencing, repetitive PCR, MALDI-TOF
- Viruses: serological test ELISA, test plants, electron microscopy, PCR, RT-PCR, sequencing of PCR products, real time PCR/RT-PCR, high throughput sequencing (HTS)
- Pospiviroids: RT-PCR, sequencing of PCR products, RT- real time PCR, test plants, high throughput sequencing (HTS)
- Phytoplasms: real time PCR, nested PCR, RFLP, sequencing, LAMP

According to the legislation, we are obliged to inform The administration of the Republic of Slovenia for food safety, veterinary and plant protection in case we identify in Slovenia (i) harmful organisms (HO) listed in the annex IIA, IIB and III of the Annexes of EU Regulation 2019/2072 and also non-compliance with other Annexes of this Regulation, (ii) HO for which the European Commission has prescribed the temporary emergency measures or HO that pose a danger to plant health in the territory of Slovenia (provision of the Phytosanitary administration) (iii) other HO that have not yet been confirmed in Slovenia (the first finding) (iv) in case of the outbreak of the regulated and non-regulated harmful organisms. This laboratory agrees it will take care, within its power, to provide credible identification of delivered samples. Laboratory cannot accept liability in case of damages suffered by clients, which result from determination of harmful organisms.

### **Contact address for additional information and conditions and prices of testing:**

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## Laboratory testing catalogue: detection of microorganisms - plant pathogens

<b>P O T A T O</b>	
<b>VIRUSES</b>	<p>Begomoviruses that can infect potato plants:</p> <ul style="list-style-type: none"> <li>- ChiLCV (chilli leaf curl virus)</li> <li>- PYMV (potato yellow mosaic virus)</li> <li>- ToLCNDV (tomato leaf curl New Delhi virus)</li> <li>- ToMHaV (tomato mosaic Havana virus)</li> <li>- ToMoTV (tomato mottle Taino virus)</li> <li>- ToSRV (tomato severe rugose virus)</li> <li>- ToYVSV (tomato yellow vein streak virus)</li> </ul>
	* testing by agreement: other viruses
<b>POSPIVIROIDS</b>	PSTVd (Potato spindle tuber viroid)
<b>PHYTOPLASMAS</b>	' <i>Candidatus</i> Phytoplasma solani' (stolbur fitoplazma)
	<p>Other phytoplasmas that can infect potato, e.g.:</p> <ul style="list-style-type: none"> <li>- '<i>Candidatus</i> Phytoplasma americanum'</li> <li>- '<i>Candidatus</i> Phytoplasma aurantifolia'</li> <li>- '<i>Candidatus</i> Phytoplasma fragariae'</li> <li>- '<i>Candidatus</i> Phytoplasma pruni'</li> </ul>
<b>BACTERIA</b>	RSSC ( <i>Ralstonia solanacearum</i> species complex)
	Cms ( <i>Clavibacter sepedonicus</i> )
	soft-rot bacteria from the genera <i>Pectobacterium</i> and <i>Dickeya</i>
	<i>Candidatus</i> Liberibacter solanacearum (Lso)
	ARSEPH ( <i>Candidatus</i> Arsenophonus phytopathogenicus)

<b>PEPPER and TOMATO</b>	
<b>VIRUSES</b>	ToBRFV (Tomato brown rugose fruit virus) (seeds, fruits and plants)
	ToMMV (tomato mottle mosaic virus) (seeds and plants)
	TMMoV (tomato mild mottle virus) (tomato)
	PVY (Potato virus Y)
	TMV (Tobacco mosaic virus)
	CMV (Cucumber mosaic virus)
	PepMV (Pepino mosaic virus) (tomato) (seeds and plants)
	AMV (Alfalfa mosaic virus)
	TSWV (Tomato spotted wilt virus)
	INSV (Impatiens necrotic spot virus)
	CSNV (Chrysanthemum stem necrosis virus)
	ToMV (Tomato mosaic virus)
	TYLCV (Tomato yellow leaf curl virus) (tomato)
	ToLCNDV (Tomato leaf curl New Delhi virus)
	Begomoviruses listed on 13.F. Annex II of 2019/2072/EU
	ToRSV (Tomato ringspot virus) (tomato)
	TAV (Tomato aspermy virus) (tomato)
	TICV (Tomato infectious chlorosis virus) (tomato)
	ToCV (Tomato chlorosis virus) (tomato)
	BBWV 1 (Broad bean wilt virus 1) (pepper)
BBWV 2 ((Broad bean wilt virus 2) (pepper)	
PVX (Potato virus X) (tomato)	
* testing by agreement: other viruses	

<b>POSPIVIROIDS</b>	PSTVd (Potato spindle tuber viroid) and other pospiviroids (seeds and plants)
<b>PHYTOPLASMAS</b>	Various phytoplasmas that can infect pepper/tomato
<b>BACTERIA</b>	<i>Xanthomonas</i> spp. ( <i>Xanthomonas euvesicatoria</i> , <i>Xanthomonas gardneri</i> , <i>Xanthomonas perforans</i> , <i>Xanthomonas vesicatoria</i> )
	RSSC ( <i>Ralstonia solanacearum</i> species complex)
	Cmm ( <i>Clavibacter michiganensis</i> ssp. <i>michiganensis</i> )
	Ps ( <i>Pseudomonas syringae</i> )
	<i>Candidatus Liberibacter solanacearum</i> (Lso)
	soft rot bacteria from the genera <i>Pectobacterium</i> and <i>Dickeya</i>

<b>B E A N</b>	
<b>VIRUSES</b>	* testing by arrangement
<b>BACTERIA</b>	<i>Xanthomonas phaseoli</i> pv. <i>phaseoli</i> (Xpph) in <i>Xanthomonas citri</i> pv. <i>fuscans</i> (Xcf)
	Cff ( <i>Curtobacterium flaccumfaciens</i> pv. <i>flaccumfaciens</i> )
	* testing by arrangement: <i>Pseudomonas savastanoi</i> pv. <i>phaseolicola</i>

<b>G A R L I C, O N I O N, L E E K</b>	
<b>VIRUSES</b>	IYSV (Iris yellow spot virus)
	* testing by arrangement: OYDV ( <i>Onion yellow dwarf virus</i> ), GCLV ( <i>Garlic common latent virus</i> ), LYSV ( <i>Leek yellow stripe virus</i> ), SLV ( <i>Shallot latent virus</i> ), aleksiviruses and other viruses
<b>BACTERIA</b>	* testing by agreement: pathogenic bacteria from the genus <i>Pseudomonas</i>
	* testing by agreement: pathogenic bacteria from the genus <i>Burkholderia</i>
	* testing by agreement: pathogenic bacteria from the genus <i>Xanthomonas</i>
	* testing by agreement: soft-rot bacteria from the genera <i>Pectobacterium</i> and <i>Dickeya</i>

<b>C U C U M B E R</b>	
<b>VIRUSES</b>	TSWV (Tomato spotted wilt virus)
	INSV (Impatiens necrotic spot virus)
	CSNV (Chrysanthemum stem necrosis virus)
	PRSV (Papaya ringspot virus)
	SqMV (Squash mosaic virus)
	TNV (Tobacco necrosis virus)
	ToRSV (Tomato ringspot virus)
	TRSV (Tobacco ringspot virus)
	ToLCNDV (Tomato leaf curl New Delhi virus)
	Begomoviruses listed on 13.F. Annex II of 2019/2072/EU
	WMV (Watermelon mosaic virus)
	ZYMV (Zucchini yellow mosaic virus)
	CMV (Cucumber mosaic virus)
	CGMMV (Cucumber green mottle mosaic virus)
* testing by arrangement: MWMV (Moroccan watermelon mosaic virus) , WCLaV-1 and WCLaV-2 (watermelon crinkle leaf-associated virus 1 and 2), and other viruses	
<b>BACTERIA</b>	* testing by arrangement: pathogenic bacteria from the genus <i>Xanthomonas</i>
	* testing by arrangement: pathogenic bacteria from the genus <i>Pseudomonas</i>
	* testing by arrangement: pathogenic bacteria from the genus <i>Acidovorax</i>
	* testing by agreement: soft-rot bacteria from the genera <i>Pectobacterium</i> and <i>Dickeya</i>

<b>S T R A W B E R R Y</b>	
<b>PHYTOPLASMAS</b>	Various phytoplasmas that can infect strawberry
<b>BACTERIA</b>	* testing by arrangement: Xf ( <i>Xanthomonas fragariae</i> )

FRUIT TREES	
PHYTOPLASMAS	AP (Apple proliferation)
	ESFY (European stone fruit yellow disease)
	PD (Pear decline)
	AY (Aster yellows), ' <i>Candidatus</i> Phytoplasma pruni', ' <i>Candidatus</i> Phytoplasma phoenicium' and other phytoplasmas
BACTERIA	Xap ( <i>Xanthomonas arboricola</i> pv. <i>pruni</i> )
	Ea ( <i>Erwinia amylovora</i> )
	pathogenic bacteria from the genus <i>Pseudomonas</i>
	Xyf ( <i>Xylella fastidiosa</i> )
	* testing by agreement: bacteria from the genus <i>Agrobacterium</i>

GRAPEVINE	
VIRUSES	* testing by arrangement
BACTERIA	Xamp ( <i>Xylophilus ampelinus</i> )
	Xyf ( <i>Xylella fastidiosa</i> )
	* testing by arrangement: pathogenic bacteria from the genus <i>Xanthomonas</i>
	* testing by arrangement: pathogenic bacteria from the genus <i>Pseudomonas</i>
	* testing by arrangement: pathogenic bacteria from the genus <i>Agrobacterium</i>
PHYTOPLASMAS	* testing by arrangement: AY (Aster yellows), ' <i>Candidatus</i> Phytoplasma pruni'
	FD (Flavescence doree)
	BN (Bois noir phytoplasma)
	AY (Aster yellows), ' <i>Candidatus</i> Phytoplasma pruni' and other phytoplasmas

<b>MAIZE</b>	
PHYTOPLASMAS	MR (Maize redness)
BACTERIA	Erwist ( <i>Pantoea stewartii</i> subsp. <i>stewartii</i> )

<b>P E L A R G O N I U M</b>	
<b>VIRUSES</b>	PFBV (Pelargonium flower break virus)
	PLPV (Pelargonium line pattern virus)
	PLCV (Pelargonium leaf curl virus)
	ToRSV (Tomato ringspot virus)
	TSWV (Tomato spotted wilt virus)
	TRSV (Tobacco ringspot virus)
	INSV (Impatiens necrotic spot virus)
	CMV (Cucumber mosaic virus)
	* testing by agreement: other viruses
<b>BACTERIA</b>	Xcp ( <i>Xanthomonas hortorum</i> pv. <i>pelargonii</i> )
	RSSC ( <i>Ralstonia solanacearum</i> species complex)
	soft rot bacteria from the genera <i>Pectobacterium</i> and <i>Dickeya</i>
	* testing by arrangement: pathogenic bacteria from the genus <i>Rhodococcus</i>

<b>C H R Y S A N T H E M U M</b>	
<b>VIRUSES</b>	TSWV (Tomato spotted wilt virus)
	INSV (Impatiens necrotic spot virus)
	CSNV (Chrysanthemum stem necrosis virus)
	CVB (Chrysanthemum virus B)
	TAV (Tomato aspermy virus)
	* testing by agreement: other viruses
<b>BACTERIA</b>	soft rot bacteria from the genera <i>Pectobacterium</i> and <i>Dickeya</i>

	* testing by arrangement: pathogenic bacteria from the genus <i>Pseudomonas</i>
	* testing by arrangement: pathogenic bacteria from the genus <i>Rhodococcus</i>
<b>VIROID</b>	CSVd (Chrysanthemum stunt viroid)

<b>EUPHORBIA PULCHERRIMA</b>	
<b>BACTERIA</b>	Xapoin ( <i>Xanthomonas axonopodis</i> pv. <i>poinsettiicola</i> )
	* testing by arrangement: pathogenic bacteria from the genus <i>Curtobacterium</i>
	* testing by arrangement soft rot bacteria from the genera <i>Pectobacterium</i> and <i>Dickeya</i>
	* testing by arrangement: pathogenic bacteria from the genus <i>Pseudomonas</i>

<b>WATER AND HOST PLANTS BESIDE THE WATER</b>	
<b>BACTERIA</b>	RSSC ( <i>Ralstonia solanacearum</i> species complex)
<b>VIRUSES</b>	ToBRFV (Tomato brown rugose fruit virus)
	* testing by agreement: other viruses

<b>KIWI</b>	
<b>BACTERIA</b>	Psa ( <i>Pseudomonas syringae</i> pv. <i>actinidiae</i> )

<b>SUGAR BEET</b>	
<b>PHYTOPLASMAS</b>	' <i>Candidatus</i> Phytoplasma solani'
<b>BACTERIA</b>	ARSEPH ( <i>Candidatus</i> <i>Arsenophonus</i> <i>phytopathogenicus</i> )

<b>I N S E C T   V E C T O R S</b>	
<b>VIRUSES</b>	* testing by agreement
<b>PHYTOPLASMAS</b>	AP (Apple proliferation) / ESFY (European stone fruit yellow disease) / PD (Pear decline) / FD (Flavescence doree) / BN (Bois noir phytoplasma) oziroma MR (Maize redness)
<b>BACTERIA</b>	Xyf ( <i>Xylella fastidiosa</i> )
	Erwist ( <i>Pantoea stewartii</i> <i>supsp. stewartii</i> )

<b>O T H E R   P L A N T S</b>	
<b>BACTERIA</b>	Ea ( <i>Erwinia amylovora</i> ) - cotoneaster, <i>Pyracantha coccinea</i> , crataegus and <i>Sorbus aucuparia</i> and other host plants
	Xyf ( <i>Xylella fastidiosa</i> )
	* testing by arrangement: pathogenic bacteria from the genus <i>Xanthomonas</i>
	* testing by arrangement: pathogenic bacteria from the genus <i>Pseudomonas</i>
	* testing by arrangement: soft rot bacteria from the genera <i>Pectobacterium</i> and <i>Dickeya</i>
<b>PHYTOPLASMAS</b>	* testing by arrangement
<b>VIRUSIES</b>	* testing by arrangement
<b>POSPIVIROIDI</b>	* testing by arrangement

LEGEND:

\* testing by arrangement: for those plant pathogens that are rarely tested in our lab; please contact us by e-mail: labfito@nib.si