



## **Economic and Social Council**

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### **Economic Commission for Europe**

Steering Committee on Trade Capacity and Standards

**Working Party on Agricultural Quality Standards**

**Specialized Section on Standardization  
of Seed Potatoes**

**Forty-fourth session**

Geneva, 29 March (p.m.) – 31 March 2017

Item 7 of the provisional agenda

**Survey of potato virus testing methods**

### **Survey of potato virus testing methods \***

The following revised version of the survey was prepared by the Rapporteur (Finland). The Specialized Section is invited to review and comment.

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\* Submitted on the above date to include revisions to analysis methods indicated in tables 6.1 and 6.2.

## **Survey of potato virus testing methods that are associated with seed certification**

### **Introduction**

The goal of the UNCE Seed Potato Certification Standard is to act as a world reference intended to facilitate fair international trade by:

- Creating a harmonized commercial quality certification system
- Promoting its use
- Defining harmonized quality requirements for seed potatoes.

To reach this goal the UNCECE Standard covers the following requirements controlled by certification:

- Varietal identity and purity
- Genealogy and traceability
- Diseases and pests affecting commercial quality or yield
- External quality and physiology
- Sizing and labelling.

In maintaining the Standard, it is vital that the current practices used in seed potato certification are reviewed and the Standard updated ([http://www.unece.org/trade/agr/standard/potatoes/pot\\_e.html](http://www.unece.org/trade/agr/standard/potatoes/pot_e.html)).

### **Purpose of this survey**

The purpose of this survey is to

1. Capture information from around the world regarding potato virus testing methods that are used to support decisions in seed potato certification.
2. Develop a comparative list of the virus testing methods which can be used as a reference/guide for all seed potato certification authorities.
3. To determine how the UNECE standard should reflect the current practices of virus testing that is associated with seed potato certification

The data generated will be made publicly available through the UNECE seed program website

### **Target Audience**

This survey is intended to be completed by the authority responsible for seed certification. The authority may wish to liaise with testing services in order to complete the survey.

## General Information

Country

Name of seed potato certification authority

Date of completion

## Laboratory virus testing that is associated with seed potato certification

1. Potato virus testing in your country is

i.	<input type="checkbox"/>	Compulsory for all crops as part of seed potato certification
ii.	<input type="checkbox"/>	Compulsory for all crops with exemptions under certain conditions
iii.	<input type="checkbox"/>	Voluntary
iv.	<input type="checkbox"/>	Not done

2. Please explain if virus testing is exempt under certain conditions (i.e. aphid status, haulm killing time, varieties etc.)

3. Virus testing is done by

i.	<input type="checkbox"/>	Your organization
ii.	<input type="checkbox"/>	Other governmental laboratory
iii.	<input type="checkbox"/>	University or research institute
iv.	<input type="checkbox"/>	Private laboratory
v.	<input type="checkbox"/>	Laboratory in other country
vi.	<input type="checkbox"/>	Other <input type="text"/>

4. The criteria to choose the laboratory (tick all that apply)

i.	<input type="checkbox"/>	The efficacy and reliability of virus tests
ii.	<input type="checkbox"/>	The rapidity of virus tests
iii.	<input type="checkbox"/>	The price of the virus tests
iv.	<input type="checkbox"/>	Third party accreditation
v.	<input type="checkbox"/>	Other criteria <input type="text"/>
vi.	<input type="checkbox"/>	No possibility to choose

5. Type of potato virus testing

i.	<input type="checkbox"/>	Potato leaf testing during growing season
ii.	<input type="checkbox"/>	Post -harvest virus testing
iii.	<input type="checkbox"/>	Both
iv.	<input type="checkbox"/>	Other <input type="text"/>

6. Does your scheme use UNECE nomenclature? (Yes or No)

If no, please fill in the following questions according to your equivalent grade in the UNECE Standard. For definitions, please refer to the UNECE Standard [http://www.unece.org/trade/agr/standard/potatoes/pot\\_e.html](http://www.unece.org/trade/agr/standard/potatoes/pot_e.html)

## 6.1 Potato leaf testing during growing season: Seed categories tested, virus tested and the method

<i>Virus</i>	<i>PBTC</i>	<i>PBTC</i>	<i>PB</i>	<i>PB</i>	<i>Basic</i>	<i>Basic</i>	<i>Certified</i>	<i>Certified</i>
	<i>Greenhouse material</i>	<i>Method</i>		<i>Method</i>		<i>Method</i>		<i>Method</i>
PLRV	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>
PVY	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>
PVA	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>
PVX	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>
PVS	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>
PVM	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>
Other	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Other</li> </ul>

NA - Not applicable

If other methods are used, please specify.

6.2 Post -harvest virus testing, whether by direct tuber testing, sprouts, or leaves in grow out:  
Seed categories tested, virus tested and the method

<i>Virus</i>	<i>PBTC</i>	<i>PBTC</i>	<i>PB</i>	<i>PB</i>	<i>Basic</i>	<i>Basic</i>	<i>Certified</i>	<i>Certified</i>
	<i>Greenhouse material</i>	<i>Method</i>		<i>Method</i>		<i>Method</i>		<i>Method</i>
PLRV	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Visual grow out</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Visual grow out</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Visual grow out</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Visual grow out</li> <li>○ Other</li> </ul>
PVY	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Visual grow out</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Visual grow out</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Visual grow out</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Visual grow out</li> <li>○ Other</li> </ul>
PVA	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Visual grow out</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Visual grow out</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Visual grow out</li> <li>○ Other</li> </ul>	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> <li>○ NA</li> </ul>	<ul style="list-style-type: none"> <li>○ PCR</li> <li>○ ELISA</li> <li>○ Visual grow out</li> <li>○ Other</li> </ul>

<i>Virus</i>	<i>PBTC</i>	<i>PBTC</i>	<i>PB</i>	<i>PB</i>	<i>Basic</i>	<i>Basic</i>	<i>Certified</i>	<i>Certified</i>
	<i>Greenhouse material</i>	<i>Method</i>		<i>Method</i>		<i>Method</i>		<i>Method</i>
PVX	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other
PVS	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other
PVM	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other
Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> Visual grow out <input type="radio"/> Other

NA - Not applicable

If other methods are used, please specify.

## Sampling

7. Please specify the sample size during the growing season for each diagnostic method you use as described above in question 6.1.

<i>Virus</i>	<i>PBTC</i>	<i>PB</i>	<i>Basic</i>	<i>Certified</i>
<b>PLRV</b>				
<b>PVY</b>				
<b>PVA</b>				
<b>PVX</b>				
<b>PVS</b>				
<b>PVM</b>				
<b>Other</b>				

8. Please specify the tuber sample size for each diagnostic method you use as described above in question 6.2. (whether by direct tuber testing, sprout testing or grow out testing)

<i>Virus</i>	<i>PBTC</i>	<i>PB</i>	<i>Basic</i>	<i>Certified</i>
<b>PLRV</b>				
<b>PVY</b>				
<b>PVA</b>				
<b>PVX</b>				
<b>PVS</b>				
<b>PVM</b>				
<b>Other</b>				

### Test methods

9. Please specify, using YES or NO, the official methods used for assessing virus infection, whether by leaf testing during growing season, direct tuber testing, sprouts, or leaves in grow out.

<i>Sample</i>					
<b>Test methods used</b>	<b>Leaves (growing crop)</b>	<b>Direct tuber</b>	<b>Sprouts grown from tubers</b>	<b>Leaves grown from tubers (glasshouse)</b>	<b>Other</b>
<b>PCR</b>					
<b>ELISA</b>					
<b>Visual assessment</b>					
<b>Other</b>					

10. If tuber testing is conducted, at what stage is it usually tested?

i.	<input type="checkbox"/>	Direct tuber: Number of weeks after harvest	
ii.	<input type="checkbox"/>	Chitted tuber (eyes open, no green tissue)	
iii.	<input type="checkbox"/>	Green sprouts	
iv.	<input type="checkbox"/>	Other	

11. If ELISA is used in the laboratory, how was it developed?

i.	<input type="checkbox"/>	In-house developed method
ii.	<input type="checkbox"/>	Commercial kit method (please specify supplier)
iii.	<input type="checkbox"/>	Other

12. Are the samples pooled for ELISA testing? ☐ Yes ☐ No

If Yes, what is the total number of subsamples?

13. If PCR is used in the laboratory, how was it developed

i.	<input type="checkbox"/>	In-house developed method
ii.	<input type="checkbox"/>	Commercial kit method (please specify supplier)
iii.	<input type="checkbox"/>	Other

14. Are the tubers/leaves pooled/bulked for PCR testing? ☐ Yes ☐ No

If Yes, what is the total number of subsamples for

Leaf samples:

Tuber samples:

15. Are the PCR primer sequences publicly available for use? ☐ Yes ☐ No

Please specify by virus in table.

	<i>Yes</i>	<i>No</i>
<b>PLRV</b>		
<b>PVY</b>		
<b>PVA</b>		
<b>PVX</b>		
<b>PVS</b>		
<b>PVM</b>		
<b>Other</b>		

Please provide references for the primer sequences

## Results

16. How are the results statistically interpreted for use in certification e.g. ISTA seedcalc?

17. How does the authority use the lab result to determine the classification of the crop:

- Please supply the classification table, including the how the results determine the class of the crop
- Otherwise, if the result of the testing does not directly affect the class of the seed lot, please specify how the virus testing information is used.

## Quality Assurance

18. Is the laboratory accredited/approved for the above tests?

Yes ☐ No ☐

If Yes by which accreditation/approval body?

If no, does the laboratory have an internal Quality Control system? ☐ Yes ☐ No

Has the laboratory validated their PCR virus testing method?

☐ Yes ☐ No ☐ In progress

19. Have the PCR methods used for certification been independently validated/accredited?

For leaf testing: ☐ Yes ☐ No ☐ NA

For tuber testing: ☐ Yes ☐ No ☐ NA

If yes, under which standard?

20. Does the laboratory participate in any ring tests/ proficiency tests of potato virus testing by PCR?

☐ Yes ☐ No

If yes, with whom?

21. Does the seed potato certification authority audit the laboratory and testing procedures?

Laboratory: ☐ Yes ☐ No

Testing Procedures: ☐ Yes ☐ No

22. In your experience, does ELISA on sprouted tubers and direct tuber test by PCR give equivalent results

All of the time ☐

Most of the time ☐

Some of the time ☐

Never ☐

Please explain your answer

23. If you use PCR, please explain what the advantages are to your certification system:

i.	<input type="checkbox"/>	The efficacy and reliability of virus tests
ii.	<input type="checkbox"/>	Sensitivity of the tests
iii.	<input type="checkbox"/>	The price of the virus tests
iv.	<input type="checkbox"/>	The rapidity of the tests
v.	<input type="checkbox"/>	Other criteria <input type="text"/>

24. Other comments?

*Example table from NL (virus result interpretation)*

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