



## **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-fifth session**

Geneva, 19– 21 March 2018

Item 5 of the provisional agenda

##### **Draft survey on bacterial testing methodologies**

#### **Draft survey on bacterial testing methodologies \***

The following document contains a draft survey of potato bacterial pathogen testing methods associated with seed potato certification. The survey was prepared by the working group (led by the United States with Finland, Israel, Netherlands, United Kingdom). The document is presented for discussion.

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\* Submitted on the above date to include all contributions.

## **I. Introduction**

The goal of the Seed Potato Certification Standard of the United Nations Economic Commission for Europe (UNECE) 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 UNECE 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)).

## **II. Purpose of the survey**

The purpose of this survey is to:

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

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

## **III. 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.

## IV. Proposed survey

### General Information

Country

Region/State (if applicable)

Name of seed potato certification authority

Date of completion

### Laboratory bacterial pathogen testing that is associated with seed potato certification

1. Potato bacterial pathogen 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. Bacterial pathogen testing is conducted under specific conditions – check all that apply

i.	<input type="checkbox"/>	Origin
ii.	<input type="checkbox"/>	Varieties
iii.	<input type="checkbox"/>	Crop Rotation
iv.	<input type="checkbox"/>	Risk
v.	<input type="checkbox"/>	Other - Describe

3. Bacterial pathogen 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"/>	If other, please specify: <input type="text"/>

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

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

5. Type of potato tissue tested for bacterial pathogens

i.	<input type="checkbox"/>	Microplants
ii.	<input type="checkbox"/>	Stems during growing season
iii.	<input type="checkbox"/>	Post -harvest tuber testing
iv.	<input type="checkbox"/>	Both stems and tubers
v.	<input type="checkbox"/>	Tubers Pre-planting
vi.	<input type="checkbox"/>	If other, please specify: <input type="text"/>

If your certification scheme differs from the UNECE standard, please answer based on the equivalencies in your scheme. 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. 6.1 What methods are used for testing microplants?

<i>Bacterium</i>	<i>Test</i>	<i>Method</i>
Ralstonia solanacearum	<input type="radio"/> Yes	<input type="radio"/> PCR
	<input type="radio"/> No	<input type="radio"/> ELISA
	<input type="radio"/> NA	<input type="radio"/> IFAS
		<input type="radio"/> Selective Media
		<input type="radio"/> Other
Clavibacter CMS	<input type="radio"/> Yes	<input type="radio"/> PCR
	<input type="radio"/> No	<input type="radio"/> ELISA
	<input type="radio"/> NA	<input type="radio"/> IFAS
		<input type="radio"/> Selective Media
		<input type="radio"/> Other
Dickeya spp.	<input type="radio"/> Yes	<input type="radio"/> PCR
	<input type="radio"/> No	<input type="radio"/> ELISA
	<input type="radio"/> NA	<input type="radio"/> IFAS
		<input type="radio"/> Selective Media
		<input type="radio"/> Other
Pectobacterium spp.	<input type="radio"/> Yes	<input type="radio"/> PCR
	<input type="radio"/> No	<input type="radio"/> ELISA
	<input type="radio"/> NA	<input type="radio"/> IFAS
		<input type="radio"/> Selective Media
		<input type="radio"/> Other
Other	<input type="radio"/> Yes	<input type="radio"/> PCR
	<input type="radio"/> No	<input type="radio"/> ELISA
	<input type="radio"/> NA	<input type="radio"/> Other

## 6.2 Potato stem testing during growing season: Seed categories tested, bacterial pathogen tested and the method

<i>Bacterium</i>	<i>PBTC</i> ( <i>Greenhouse material</i> )	<i>PBTC</i>	<i>PB</i>	<i>PB</i>	<i>Basic</i>	<i>Basic</i>	<i>Certified</i>	<i>Certified</i>
<b>Ralstonia solanacearum</b>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <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"/> IFAS <input type="radio"/> Selective Media <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"/> IFAS <input type="radio"/> Selective Media <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"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
<b>Clavibacter CMS</b>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <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"/> IFAS <input type="radio"/> Selective Media <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"/> IFAS <input type="radio"/> Selective Media <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"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
<b>Dickeya spp.</b>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <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"/> IFAS <input type="radio"/> Selective Media <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"/> IFAS <input type="radio"/> Selective Media <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"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
<b>Pectobacterium spp.</b>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <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"/> IFAS <input type="radio"/> Selective Media <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"/> IFAS <input type="radio"/> Selective Media <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"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
<b>Other</b>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <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"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <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"/> Other

NA - Not applicable

If other methods are used, please specify.

6.3 Is enrichment used prior to conducting specific tests?

i.	<input type="checkbox"/>	Yes
ii.	<input type="checkbox"/>	No

6.4 If Yes, what methods are used for detection after enrichment?

<i>Bacterium</i>	<i>PBTC</i> ( <i>Greenhouse material</i> )	<i>PBTC</i>	<i>PB</i>	<i>PB</i>	<i>Basic</i>	<i>Basic</i>	<i>Certified</i>	<i>Certified</i>
<b>Ralstonia solanacearum</b>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
<b>Clavibacter CMS</b>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
<b>Dickeya spp.</b>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
<b>Pectobacterium spp.</b>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
<b>Other</b>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <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"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <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"/> Other

NA - Not applicable

If other methods are used, please specify.

6.5 Post-harvest bacterial pathogen testing, whether by direct tuber testing or on incubated tubers. Seed categories tested, bacteria tested and the method

<i>Bacterium</i>	<i>PBTC</i> ( <i>Greenhouse material</i> )	<i>PBTC</i>	<i>PB</i>	<i>PB</i>	<i>Basic</i>	<i>Basic</i>	<i>Certified</i>	<i>Certified</i>
<i>Ralstonia</i>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
<i>Clavibacter</i>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
<i>Dickeya</i>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
<i>Pectobacteria</i>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
<i>Other</i>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <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"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <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"/> Other

NA - Not applicable

If other methods are used, please specify.

6.6 Is incubation of tubers at controlled temperature and humidity used to enhance populations prior to conducting specific tests?

i.	<input type="checkbox"/>	Yes
ii.	<input type="checkbox"/>	No

If Yes, identify the specific tests for each class. (*Note: Group agreed that this should be included, but is it repetitive after the previous question that asks about testing on dormant or incubated tubers? Suggestions on restructuring so these can be combined?*)

<i>Bacterium</i>	<i>PBTC</i> ( <i>Greenhouse material</i> )	<i>PBTC</i>	<i>PB</i>	<i>PB</i>	<i>Basic</i>	<i>Basic</i>	<i>Certified</i>	<i>Certified</i>
Ralstonia	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
Clavibacter	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
Dickeya	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other
Pectobacteria	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <input type="radio"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <input type="radio"/> IFAS <input type="radio"/> Selective Media <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"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <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"/> Other	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> NA	<input type="radio"/> PCR <input type="radio"/> ELISA <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 (PCR, ELISA, IFAS, Selective Media or Other Diagnostic Method) and each seed category you use as described above in question 6.1. Fill in the blank following the method with sample size.

Example - PCR: PBTC 400 stems, PB 200 stems, Basic 200 stems, Certified NA. ELISA: PBTC + PB + Basic 400 stems, Certified 200 stems. Other Diagnostic Method: PBTC NA, PB NA, Basic 100 stems, Certified 100 stems.

	PBTC	PB	Basic	Certified
Ralstonia	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____
Clavibacter	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____
Dickeya	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____
Pectobacteria	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____
Other	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective Media _____ Other _____

If other methods are used, please specify.

8. Please specify the tuber sample size for each diagnostic method (PCR, ELISA, Visual Grow Out or Other Diagnostic Method) and each seed category you use as described above in question 6.2 (whether by direct tuber testing, sprout testing or grow out testing).

Example - PCR: PBTC 400 tubers, PB 200 tubers, Basic 200 tubers, Certified NA. ELISA: PBTC + PB + Basic 400 tubers, Certified 200 tubers. Other Diagnostic Method: PBTC NA, PB NA, Basic 100 tubers, Certified 100 tubers.

	PBTC	PB	Basic	Certified
Ralstonia	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____
Clavibacter	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____
Dickeya	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____
Pectobacteria	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____
Other	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____	PCR _____ ELISA _____ IFAS _____ Selective _____ Media _____ Other _____

If other methods are used, please specify.

**Test methods**

9. Please specify, using YES or NO, the official methods used for assessing bacterial infection, whether by stem testing during growing season or direct tuber testing

Test methods used	Stems (growing crop)	Direct tuber	Incubated tuber	Other
PCR				
ELISA				
Visual assessment				
IFAS				
Selective Media				
Other				

If Other, please specify:

10. If tuber testing is conducted, what part of the tuber is sampled?

i.	<input type="checkbox"/>	Peel taken at heel end
ii.	<input type="checkbox"/>	Plug taken at heel end
iii.	<input type="checkbox"/>	Both plug and peel
iv.	<input type="checkbox"/>	Rose end
v.		Other <input type="text"/>

11. If ELISA is used in the laboratory, how was it developed? Please provide answers to questions 11.1, 11.2 and 11.3 below. (Note: Combine 11.1 11.3)

11.1 In-house developed method.

iii.	<input type="checkbox"/>	Yes
iv.	<input type="checkbox"/>	No

Are you willing to share protocol?

11.2 Commercial kit method.

i.	<input type="checkbox"/>	Yes
ii.	<input type="checkbox"/>	No

If Yes, please specify supplier.

11.3 Other.

i.	<input type="checkbox"/>	Yes
ii.	<input type="checkbox"/>	No

If Yes, please specify.

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

If Yes, what is the total number of subsamples?

(Note: Insert question set on Selective Media using same format as PCR and ELISA for IFAS)

13. If PCR is used in the laboratory, how was it developed? Please provide answers to questions 13.1, 13.2 and 13.3 below. Combine 13.1 to 13.3

13.1 In-house developed method.

i.	<input type="checkbox"/>	Yes
ii.	<input type="checkbox"/>	No

13.2 Commercial kit method.

i.	<input type="checkbox"/>	Yes
ii.	<input type="checkbox"/>	No

If Yes, please specify supplier.

13.3 Other.

i.	<input type="checkbox"/>	Yes
ii.	<input type="checkbox"/>	No

If Yes, please specify.

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

If Yes, what is the total number of subsamples for

Stem samples:

Tuber samples:

15. Are the PCR primer sequences published?  Yes  No

Please specify by bacterial pathogen in table.

	<i>Yes</i>	<i>No</i>
Ralstonia solanacearum		
Clavibacter michiganensis subsp. sepedonicus		
Dickeya sp.		
Solani		
Dianthicola		
Dadantii		
Zea		
Pectobacterium sp.		
Atroseptica		
Caratovora subsp.		
Brasiliense		
Parmentieri (Wasabiae)		
Other		

Please provide references for the primer sequences

If primer sequences are not published, would laboratory be willing to share sequences and protocols?

i.	<input type="checkbox"/>	Yes
ii.	<input type="checkbox"/>	No

16. Is sequencing used to determine speciation?

i.	<input type="checkbox"/>	Yes
ii.	<input type="checkbox"/>	No

17. If Yes, how are the results statistically interpreted for use in certification (e.g. ISTA seedcalc)?

18. Does the authority use the lab result to downgrade or reject the crop?

List of pathogens	Downgraded	Rejected
Ralstonia		
Clavibacter		
Pectobacterium		
Dickeya		

Additional explanation

Otherwise, if the result of the testing does not directly affect the class of the seed lot, please specify how the bacterial pathogen testing information is used.

### Quality Assurance

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

Yes  No

If Yes, please mention by which accreditation/approval body:

Does the laboratory have an internal Quality Control system?  Yes  No

Has the laboratory validated their PCR bacterial pathogen testing method?

Yes  No  In progress

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

For stem testing:  Yes  No  NA

For tuber testing:  Yes  No  NA

If Yes, under which standard?

21. Does the laboratory participate in any ring tests/ proficiency tests of potato bacterial pathogen testing by PCR?

Yes  No

If Yes, with whom?

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

Laboratory:  Yes  No

Testing Procedures:  Yes  No

23. In your experience, does ELISA and PCR give equivalent results?

All of the time	<input type="checkbox"/>
Most of the time	<input type="checkbox"/>
Some of the time	<input type="checkbox"/>
Never	<input type="checkbox"/>

Please explain your answer

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

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

If Other criteria, please specify:

25. Other comments?