

National regulatory control systems Systèmes de lutte nationaux réglementaires

Ralstonia solanacearum

Specific scope

This standard describes a national regulatory control system for *Ralstonia solanacearum* that provides guidance on surveillance for the pathogen and its containment and eradication if found.

Specific approval and amendment

First approved in 2003–09.
Revision approved in 2011–09.

Introduction

Ralstonia solanacearum is an A2 pest for EPPO, in particular with respect to its race 3 which causes brown rot of potato and bacterial wilt of tomato. Prevention of spread of the pest within the region is achieved mainly by international phytosanitary measures and the operation of certification schemes for seed potato. If countries can demonstrate that they are pest-free areas, or can establish pest-free areas within their territories, potatoes and plants from these areas will not be subject to the brown rot restrictions which otherwise apply. Requirements for establishing pest-free areas are described in EPPO Standard PM 3/61(1) (OEPP/EPPO, 2004a). EPPO Standard PM 8/1 on commodity-specific phytosanitary measures specifies requirements for commodities of potatoes with respect to *R. solanacearum* (OEPP/EPPO, 2004b). This standard presents the basis of a national regulatory control system for the containment and eradication of *R. solanacearum*.

Outline of the system

A national regulatory control system is recommended to all EPPO countries for the surveillance, containment and eradication of the organism if present, and provides sufficient guarantees to allow export of potatoes within the region, in conformity with EPPO Standard PM 8/1. This system is described in the present standard and takes into account the relevant EU Council control directive 98/57/EC amended by the Commission directive 2006/63/EC (EU, 1998, 2006). It is also recommended that EPPO member countries at risk prepare a pest-specific contingency plan (based on EPPO standard PM 9/10 *Generic elements for contingency plans*) to ensure that the necessary management and operational arrangements are in place to deal with an outbreak.

Visual inspection of potato tubers is not adequate to prevent the spread of brown rot because the disease can often be latent. Brown rot control therefore depends primarily on the production and use of certified seed potatoes and on the testing of seed potato samples by internationally agreed methods for detection and identification of *R. solanacearum*. Whenever the disease is found, measures should be taken to contain and eliminate it from the production system, especially by delimitation of the regulated area, by restriction of the cultivation of host plants of *R. solanacearum* for several years (including control of volunteer potatoes). Strict hygiene measures are also a key element in disease control.

Ralstonia solanacearum can also contaminate water courses by infecting and multiplying within *Solanum dulcamara* growing in the margins of waterways. Indeed, the use of contaminated water for irrigation has resulted in numerous outbreaks in both potatoes and tomatoes in the EPPO region. The irrigation of host plants with water from contaminated waterways should therefore be prohibited.

The national regulatory control system is devised to ensure that countries, which demonstrate that they apply it, can export potatoes and other plants on the same basis as countries which have demonstrated that *R. solanacearum* does not occur.

Control system

This control system for *R. solanacearum* has four objectives:

- to determine if the pest is present in the country and, if present, to locate it and determine its distribution.
- to prevent its spread.
- to eradicate incursions.
- to eradicate the pest from potato and tomato production systems in areas where it is present.

1. Surveillance

The holding and handling of *R. solanacearum* should be prohibited, except under special licence; see EPPO Standard PM 3/64(1) *Intentional import of organisms that are plant pests or potential plant pests*. *R. solanacearum* should be considered as a notifiable pest. All persons suspecting or confirming the presence of the disease should notify the fact to the NPPO.

Surveillance for the presence of *R. solanacearum* in a country or area not known to have potato brown rot, is usually based on a systematic detection survey. The intensity of the surveillance should be designed and conducted based on risk assessment and should provide assurance for pest freedom covering the whole production system.

Surveys should be undertaken on potato, tomato, surface water and, possibly, other host plants. In addition, a targeted survey on liquid waste discharged from industrial processing or packaging premises may be appropriate but this will be based on a risk assessment of the possible reintroduction of the pest into the potato or tomato production. Surveys should comprise the following elements:

1.1 Potato

In the case of seed potatoes, a survey should preferably be undertaken on potato tubers in storage. If sampling of tubers is undertaken in the field (e.g. early potatoes) it should preferably be done shortly before harvest. Samples should be taken at random to ensure they are representative and reliable results can be obtained. An individual sample for analysis should not comprise more than 200 tubers. In addition, other samples may be inspected visually by cutting tubers at the stolon end, and growing potato crops may be inspected visually at appropriate times for typical signs and symptoms of the disease. ISPM No. 31 *Methodologies for sampling of consignments* may be used as a basis for establishing sampling rates and provides probability levels for detection at a given tuber sampling rate.

In the case of other potatoes, growing potato crops should be inspected visually at appropriate times for typical symptoms of the disease. In the case of any suspicious symptoms of the disease, samples should be taken and tested. In addition, testing of harvested potatoes should be carried out.

1.2 Tomato

Crops of tomato plants (grown outdoors or under protection) should be inspected visually during active growth. In the case of any suspicious symptoms of the disease, samples should be taken and tested.

1.3 Surface water

Samples from watercourses used for irrigation or spraying of host plants should be taken, especially close to fields found to be infested and close to the waste discharges of potato industrial processing or packaging premises or from near domestic sewage

outfalls. Surface water samples should be taken in the vicinity of *Solanum dulcamara* plants if present.

It should be considered that detection of *R. solanacearum* in surface water is most reliable during late spring, summer and early autumn seasons when water temperatures exceed 15°C. Repeated sampling at different times in the above-mentioned period at designated sampling points will increase the reliability of detection by reducing the effects of climatic variation (e.g. after heavy rainfall, high flow rates can reduce detection).

1.4 Other host plants

Samples of other host plants, including known weed hosts (e.g. *S. dulcamara* and *Urtica dioica*), should be taken in areas where the risk of spread of *R. solanacearum* has been identified. *S. dulcamara* is known to be a major alternative host and can be very important in the epidemiology of the disease. *U. dioica* has also been found to be infested in some countries but the significance of this is not known.

1.5 Solid and liquid waste

Samples from solid and liquid waste considered to pose a risk for the potato and tomato production may be taken from processing and packing plants.

1.6 Detection and identification

Processing, testing of samples and identification of *R. solanacearum* extracted from samples are described in EPPO Standard PM 7/21 (OEPP/EPPO, 2004c, under revision) which takes into account Council Directive 98/57/EC as amended by Commission Directive 2006/63/EC (EU, 1998, 2006).

2. Determination of presence

If an outbreak is detected by routine testing, or if an outbreak is suspected, the NPPO should prohibit all movement of the material directly concerned, and of any suspect material, and may as appropriate take various additional safeguarding measures, such as prohibiting the movement of other potatoes or other host plants from the place of production¹ concerned. Suspect material should be submitted for confirmatory testing as soon as possible, following EPPO Standard PM 7/21 (OEPP/EPPO, 2004c; under revision). The NPPO should preserve appropriate specimens (e.g. original sample, original extract, prepared IF-microscope slides from extracts, cultures of the organism, relevant documentation) for at least 1 month after finalization of the tests.

If the material presents a risk for another country, the NPPO of that country should be informed immediately of the suspect

¹A place of production is defined as 'Any premises or collection of fields operated as a single production or farming unit. This may include production sites which are separately managed for phytosanitary purposes' (ISPM 5, 2010).

finding. Information for the potato lots exported should at least consist of:

- the variety name of the potato lot.
- the type (ware, seed, etc.) and where applicable the seed category of potatoes.
- the name and address of the consignor and the consignee.
- the date of delivery of the potato lot.
- the size of the potato lot delivered.

Additionally, the registration number of the grower or merchant and a copy of the delivery notice should be provided if available.

If the outbreak is associated with material from another country, evidence such as appropriate specimens or material and documentation should be kept for up to 1 year according to the requirements in ISPM No. 13 *Guidelines for the notification of non-compliance and emergency action*, as appropriate.

The NPPO should investigate the extent and primary source of the outbreak. This investigation should include sampling and testing at least all other potatoes grown at the place of production concerned and all clonally-related seed potato stocks. In the case of an outbreak in tomato production, tomato plants having the same source should be investigated. Where relevant, it should also include:

- places of production in contact with infected material through machinery, etc.
- places of production using common sources of surface water for spraying or irrigation, or flooded, from a source suspected or confirmed to be contaminated.
- the surface water used for such irrigation (river, lake, reservoir, canal, etc.).

The NPPO should designate as ‘infested’, as appropriate:

- the lot from which the sample was taken.
- the waste from an infested lot (e.g. soil, processing waste).
- contaminated equipment and other articles (machinery, packing material, storage areas, etc.) which have been in contact with the lot.
- the place of production, where the lot was grown.

It should also determine the extent of ‘probable infestation’,² considering all other potatoes grown at the place of production concerned and, where relevant, all clonally related stocks, seed and ware potato lots that may have been in contact with the infested lot, host plants, places of production, storage areas, machinery and irrigation/spraying linked with the designated infestation. It should demarcate a regulated area composed of places of production designated as ‘infested’ and of places of production designated as ‘probably infested’, including where relevant other places of production in the vicinity of the designated contamination (e.g. places of production irrigated with contaminated surface water).

If surface water is found contaminated, it should be demarcated and regulated. The extent of this should depend on the results of water testing, taking into account the direction of flow of water, and where appropriate the presence of infected *S. dulcamara* and other weed hosts.

²No positive test result, but a strong presumption that infection is possible.

In some cases, the regulated areas may extend into other countries, in which case the NPPO concerned will also have to establish an equivalent regulated area. As a result of these operations, the extent of the area possibly connected with the outbreak is determined, not only geographically but also in relation to production links, clonal links and links through surface water systems (e.g. rivers, canals).

3. Containment

The planting of tubers or plants designated as ‘infested’ or ‘probably infested’ should be prohibited.

To reduce the risk of spread of the disease with seed potatoes, all seed potatoes intended for marketing should meet the requirements laid down in EPPO Standard PM 4/28 (*Potato certification scheme*) (OEPP/EPPO, 1999) and also additional tests for *R. solanacearum* should be done either on each plant of the initial clonal selection or on representative samples of basic seed potatoes (or higher grades of propagation stock).

If *R. solanacearum* is detected (and confirmed by testing) in the seed-potato production system, earlier propagations should be tested for the organism, including the initial clonal selection and systematically the basic seed-potato clones. If no clonal or contact relationships are found, investigations should be extended to other basic seed clones or earlier propagations.

If the source of infestation could not be identified, sampling and testing for *R. solanacearum* in the seed-potato production system should be intensified in accordance with sound scientific and statistical principles. It also is recommended that each seed potato crop within the seed potato certification scheme is sampled and tested.

Plants of tomato and other hosts intended for transplanting should be subject to regular visual inspections within the regulated area.

Surface water found to be contaminated by *R. solanacearum* should be prohibited for use for irrigation or spraying of crops of host plants.

If waste from industrial tomato or potato processing or packaging premises is found to be contaminated by *R. solanacearum*, the procedures of EPPO Standard PM 3/66 *Guidelines for the management of plant health risks of biowaste of plant origin* should be followed to eliminate contamination and/or prevent spread (OEPP/EPPO, 2008).

4. Eradication from potato or tomato production systems

In order to ensure that *R. solanacearum* is eradicated from the potato production system a programme of phytosanitary measures should be undertaken. The following requirements should be made.

4.1 Measures for ‘infested’ and ‘probably infested’ material

Successful application of the disposal methods recommended below for all material designated as ‘infested’ or ‘probably

infested' will require careful implementation to ensure pathogen containment during treatment and thorough pathogen elimination prior to release from containment of treated material. Regular monitoring and auditing of disposal procedures should ensure their efficient and effective application at all times. In addition, if material is transported for processing a system of cleansing and disinfection (see below) should be in place, at least for all vehicles that have been used for transportation.

4.1.1 All tubers or plants of potato, or plants of tomato, designated as 'infested'

These should be disposed of. Possibilities for disposal include:

- incineration.
- heat sterilization.
- industrial processing at a processing plant with appropriate waste facilities.
- controlled composting at an officially approved composting site (see EPPO Standard PM 3/66).
- feeding to animals after steaming.
- deep burial where there is no risk of seepage to agricultural land or surface water.

Alternatively:

- tubers can be fed directly to cattle on a contained hard-standing area provided all the manure and tuber debris is collected and composted in a contained area for a period of at least 2 months and is not subsequently returned to arable land.
- fermentation of contaminated potatoes during silage production may also be a convenient pre-treatment prior to direct feeding to animals under the same controlled conditions as for direct tuber feeding.

Additionally, in cases where a crop is found to be infected during the growing season, destruction of the growing plants (e.g. by glyphosate herbicide application) is recommended. If progeny tubers have formed these should be harvested and disposed of appropriately.

Any remaining waste associated with and arising from the 'infested' material should be disposed under conditions ensuring that no further risk for spreading the bacteria remains. Furthermore, liquid waste can be heated to a minimum of 60°C throughout the entire volume during at least 30 min prior to disposal, or treated by another measure (authorized by the NPPO) ensuring that further spread of the bacterium is excluded.

4.1.2 All tubers or plants of potato, or plants of tomato, designated as 'probably infested'

These should also be disposed of, as noted in 4.1.1

Alternatively:

- Tubers can be used as ware potatoes under the control of the NPPO for direct consumption, provided that they are packed, ready for direct delivery and use without repacking, on a site with appropriate waste disposal facilities.
- On-farm composting at the place of production is also suitable provided it is conducted under official supervision to ensure that the entire quantity of material is adequately composted by

exposure to a temperature of at least 55°C during an uninterrupted period of at least 2 weeks.

- Under official control, and provided there is no significant risk of any movement of the material away from the field, tubers may also be returned to the field of origin during winter and left on the surface to be killed by exposure to frost.
- Anaerobic digestion for production of bio-gas at an officially approved site is also a suitable method for disposal provided the entire volume of material is subjected to a minimum temperature of 55°C maintained over a period of 24 h without interruption with an hydraulic dwell time in the reactor of at least 20 days.

All equipment and other objects classed as 'infested' or 'probably infested' should be thoroughly cleaned and disinfected (see below) before further use (unless authorized otherwise by the NPPO), or destroyed.

4.2 Measures applied in the regulated area

4.2.1 Measures applied at infested places of production

All machinery and storage facilities which have or might have been in contact with 'infested' or 'probably infested' potatoes and other hosts, or fields, should be immediately and thoroughly cleaned and disinfected according to EPPO Standard PM 10/1 *Disinfection procedure in potato production* before being used or moved (OEPP/EPPO, 2006a). In addition any machinery and storage facilities involved in potato production shall be cleansed and disinfected in the year of the infection and after the first subsequent growing year.

Volunteer potato plants, and other natural hosts of *R. solanacearum*, should be eliminated from all fields of the place of production.

4.2.1.1 Measures for infested fields

- No potatoes or other host plants of the organism, or crops for which there is an identified risk of the organism spreading, should be grown for at least 4 years and until no volunteer potato plants are found for two consecutive years.
- When potatoes are grown for the first time after the infestation was found, only ware potatoes should be produced (with a laboratory test on the harvested tubers).
- When tomato plants are grown for the first time, the plants should be tested for *R. solanacearum* at the appropriate growth period.
- When the second crop of potatoes are grown after an appropriate rotation cycle, either seed or ware potatoes may be produced and a survey should be conducted (in the case of seed potatoes, testing is required).

Alternatively:

- Infested fields may be left fallow or under close-cut pasture for 3 years, followed by planting in the succeeding 2 years with non-host plants of the organism for which there is no identified risk of the organism surviving or spreading.
- When potatoes are grown for the first time, either seed or ware potatoes may be produced, provided no volunteer potato plants

were found for two consecutive years, with a laboratory test on the harvested tubers.

- When tomatoes are grown for the first time, the plants should be tested for *R. solanacearum* at the appropriate growth period.

4.2.1.2 Measures for other fields

For potato production

- In the first year either no host plants of *R. solanacearum* should be planted or only ware potatoes produced from certified seed potatoes, with a laboratory test on the harvested tubers.
- In the second and third years, either seed or ware production from certified seed potatoes is allowed, with laboratory tests on tubers each year that potatoes are grown.

Alternatively: in the third year, potatoes grown under official control from certified seed may be planted instead of certified seed potatoes

For tomato production

- In the first year plants may be planted for fruit production, only.
- In the second and third year tomato crops can be grown for either the production of plants for planting or fruits.

In each year an official inspection of the growing crop at appropriate times should be conducted.

4.2.1.3 Measures for protected crop production

In a unit of protected crop production where changing of the growing medium is possible

Host plants should not be planted until the unit has been subjected, under official control, to measures to eliminate *R. solanacearum*, including the removal of all host-plant material, change of the growing medium, and cleaning and where appropriate disinfection of the unit and all equipment.

4.2.2 Further measures applied in the whole regulated area³

4.2.2.1 In the year of the infection

Machinery and storage facilities involved in potato or tomato production should be cleansed and disinfected (but within infested places of production stricter measures are required, see 4.2.1)

4.2.2.2 For 3 years

- Potato and tomato production, handling and storage should be kept under official supervision.
- Harvested seed and ware potato stocks should be kept separate or cleansing and disinfection should be carried out between the handling of seed and ware stocks.
- Only certified seed potatoes, or potatoes grown under official control, should be planted (but with additional restrictions within infested places of production, see above).
- Harvested seed potato crops on probably infested places of production should be tested for *R. solanacearum*.

- An official survey should be conducted annually (see Section 1: Surveillance).
- All seed-potato stocks within the regulated area should, if appropriate, be replaced over a suitable period of time.

4.3 Measures for the regulated surface water

- Regulated surface water should not be used for irrigation or spraying host crops, unless appropriately treated.
- Where a complete water course has been regulated, and it is likely to remain contaminated (e.g. due to the presence of infested *S. dulcamara*) no further testing is necessary. In all other situations, samples of surface water should be taken and tested within and around the regulated areas at appropriate times each year according to EPPO Standard PM 7/21 (OEPP/EPPO, 2004c; under revision).
- Where appropriate, all potato and tomato crops should be inspected and in this area, in the case of seed potatoes, tested.
- Samples of *S. dulcamara* or *U. dioica* may also be tested. According to the results of these inspections and tests, the regulated area may be adjusted.
- In cases where host crops may have been in contact with contaminated surface water, these crops should be designated as 'probably infested'
- Conditions for the partial or complete 'descheduling' of regulated areas, in the case of negative results, are under consideration.

References

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- EU (2006) Commission Directive 2006/63/EC of 14 July 2006 amending the Annexes ii to VII to Council Directive 98/57/EC on the control of *Ralstonia solanacearum* (Smith) Yabuuchi *et al.* Official Journal of the European Communities no. L206, 36–106.
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- OEPP/EPPO (2006a) EPPO Standards PM 10/1(1) *Disinfection procedure in potato production.* *Bulletin OEPP/EPPO Bulletin* **36**, 463–466.
- OEPP/EPPO (2008) EPPO Standards PM 3/66 *Guidelines for the management of plant health risks of biowaste of plant origin.* *Bulletin OEPP/EPPO Bulletin* **38**, 4–9.

³i.e. within both 'infested' and 'probably infested' places of production.