

Phytopsanitary treatments

Disinfection procedures in potato production

Specific scope

This standard describes cleaning and disinfection procedures in potato production, in particular against the quarantine pests *Clavibacter michiganensis* subsp. *sepedonicus* (ring rot bacterium) and *Ralstonia solanacearum* (brown rot bacterium).

Specific approval and amendment

First approved in 2006-09.

Introduction

Disinfection procedures should form part of good plant protection practice. As a general phytosanitary measure, potato storage and handling equipment should be regularly cleaned to reduce general pest and disease problems in potato production. Moreover, cleaning and disinfection procedures are obligatory where quarantine diseases such as ring rot and brown rot are found. This is because all machines, materials and equipment that come into *contact* with infected potato material can become contaminated with the bacteria and subsequently act as a potential source of infection. *C. m. sepedonicus* in particular is very persistent. It can remain viable for over two years in a dry state on many surfaces at low relative humidity. The bacterium is, however, much less persistent under moist conditions. *C. m. sepedonicus* is relatively short-lived in water, surviving for approximately 35–52 days. *R. solanacearum* does not appear to survive as long as *C. m. sepedonicus* in the absence of a host, although it has been shown to survive in a dried state for at least 78 days on some surfaces. Survival of *R. solanacearum* in river water in the absence of its alternative host *Solanum dulcamara* is limited with it usually surviving only a few weeks due to predation by protozoa.

The long survival periods of the bacteria in the absence of a host, particularly *C. m. sepedonicus*, means that thorough cleaning and disinfection is essential to eliminate the bacterium so as to prevent further contamination of potatoes and spread of the disease.

To minimise the risk of introducing or spreading ring rot or brown rot on potato production premises special attention should be given to:

- Sourcing seed potatoes from areas or places of production which are known to be free from ring rot and brown rot

- Separating the handling and processing of seed and ware potatoes unless suitable cleaning and disinfection has been undertaken
- Storing seed potatoes in clean or new boxes or sacks
- Avoiding cutting or de-sprouting seed potatoes
- Employing good routine hygiene measures.

Routine hygiene measures

Cleaning should form an integral part of good plant protection practice. As a general phytosanitary measure, potato storage and handling equipment should be regularly cleaned to reduce the risk of disease. Chemical disinfection can be used in addition to cleaning as part of general good hygiene but is not as important as cleaning. The most effective decontamination programme will include the following steps: cleaning, disinfection, rinsing (where appropriate), drying.

Cleaning

Cleaning is very important as it removes plant residues and soil which may harbour pests and pathogens.

Cleaning should involve the following processes:

- Systematic cleaning starting at the top of equipment and working down
- Removal of plant residues and soil from surfaces.

Brushing or an industrial vacuum cleaner can be used to remove much of the dust and loose debris. Care should be taken to dispose of the dust appropriately. Any remaining plant residues and dirt can then be removed using water and detergent. High-pressure washing with a non-foaming industrial detergent, or steam-cleaning, may be appropriate in certain situations, such as for wooden boxes, where damage will not result. If a

detergent is used for washing, it should be rinsed off before a chemical disinfectant is used.

Disinfection

Chemical disinfection is not an essential part of routine hygiene measures. If it is used, disinfection should be carried out following thorough cleaning as the presence of organic matter impedes and may neutralize the action of many chemical disinfectants, in particular chlorine-based products.

Where chemical disinfection is carried out it is important to ensure that the rate of application is correct for the method of application. In addition the following points should also be taken into account:

- The efficacy of disinfection may vary according to the surface type
- The efficacy of some disinfectants may be reduced by low temperatures and hard water. Best results are achieved at a temperature of 15–20°C
- Some disinfectants will require a longer contact period than others
- Fumigants or fogs may be appropriate in some cases; such treatments should be carried out according to the manufacturers' instructions.

Disinfection following an outbreak of ring rot or brown rot

Where ring rot or brown rot has been confirmed disinfection forms an obligatory part of the 'clean up' procedure and will usually be carried out under the supervision of the NPPO. Following an outbreak of ring rot or brown rot all machines, tools, stores, boxes and vehicles, that have been used in the cultivation of potatoes during the year of outbreak or in preceding years are designated as contaminated and should be cleaned and disinfected.

It is essential to ascertain if any machines, boxes, etc. that have been used in the cultivation of potatoes are temporarily located elsewhere. These should also be cleaned and disinfected.

Measures should include:

- Removal of plant residues from stores and processing areas in leak-proof sacks or containers. All debris should be subjected to an appropriate treatment that aims to destroy the quarantine pests or disposed of to prevent the further spread of the quarantine pests (e.g. incineration, heat treatment, dumping). The kind of treatment or disposal should be authorized and supervised by the NPPO
- EPPO Standard PM 3/66 Management of plant health risks associated with the use of biowaste of plant origin provides further information on the sanitization of biowaste containing quarantine pests by means of composting, heat treatment and anaerobic digestion

- Use of disinfectants with proven activity against the target pest. Some disinfectants, such as peroxide/peroxygen types, are more effective when applied to a surface that has been moistened
- Disposal, disinfection or washing in very hot water (95°C) of boots, shoes and clothing that may have come into contact with contaminated material
- Wearing of dedicated overalls and boots or (over) shoes in contaminated areas
- Strict use of disinfectant footbaths placed at entrances and exits. These should be wet at all times, refilled if necessary and refreshed regularly
- Washing of hands with soap and hot water after leaving contaminated areas
- Limiting access to the outbreak farm or site of contamination to authorized persons.

Examples of disinfectants used in the EPPO region are listed in Appendix 1. This list is largely based on products with proven activity against ring rot that are used by NPPOs within the EPPO region. However it is likely that these products will be effective for brown rot.

It is essential that the user reads and follows the manufacturers' instructions on the product label and that the product being used is approved in the country of use. Potential hazards associated with particular products should be considered. Appropriate precautions should be taken to protect the user, the material and the environment. Depending on the disinfectant used, run-off may be considered to be chemical waste. Consideration should therefore be given to its appropriate disposal, which may be limited by environmental regulations.

Decontamination can also be carried out using steam or boiling water. When using a high-pressure steam cleaner or boiling water to decontaminate a surface, the temperature of the steam or water should be at least 80°C and the duration of action should be at least 5 min on the surface. These treatments can however, cause damage.

Rinsing

Rinsing may be necessary, especially when the disinfectant is corrosive. It is essential to use uncontaminated water, to prevent re-contamination of surfaces.

Drying

Drying is the final step in the cleaning process. The aim is to eliminate humidity which may provide an ideal environment for the development of rots and moulds, for example on seed potatoes stored in a wet wooden box.

Appendix 1 Examples of disinfectants used in potato production (data gathered in 2006). Other products might be available and effective (Products should be used following the instructions on the label for the particular use in the country concerned)

Disinfectant type	Commercial Product	Country*	Active Against			Application Rates			Corrosive	Efficacy in the presence of organic matter	Efficacy against Ring rot	Efficacy against Brown rot
			Bacteria	Fungi	Viruses	Spray	Fog	Dip				
Aldehyde-based	Ren-cid/Glu-cid ¹	GB	√	√	√	1:20–1:50	1:1	1:10	No	No	Not tested	–
Aldehyde-based	Unifect G	GB	√	√	√	1:50–1:25	1:50–1:25	1:50–1:25	Aluminium, Tin, Zinc	No	Not tested	–
Aldehyde-based	Korsolin	FI	√	–	–	–	–	–	–	–	Yes	–
Aldehyde-based	Horti-Desin	BE	√	√	–	1:400	N/A	1:400	No	?	Yes	Yes
Aldehyde-based	Virakil	FR	√	√	√	1%	1%	1%	Not tested	Yes	Yes	Yes
Aldehyde-based	Agri germ 2000 SL	PL	√	√	–	0.1L/m ² with 2% spray	–	2–3 L/m ² with 1–2% spray	Not tested	–	Yes	–
Ammonia solution (24%)	–	SK	√	–	–	10%	–	–	–	–	Yes	Yes
Chlorine-based	Numerous products	GB, PL	√	√	√	1% available chlorine ²	N/A	1% available chlorine ²	Metals (except stainless steel)	No	Yes	–
Chlorinated phenol-based	Hycolin	SK, GB	√	–	–	10%	–	–	–	–	–	–
Chlorinated phenol-based	Panacide M ⁴ Enforcer ⁴	GB	√	√	No	1:100	1:20–1:100 ³	1:100	Perspex, Natural Rubber	Yes	Yes	–
Chlorinated phenol-based	Panacide M ⁴ Enforcer ⁴	GB	√	√	No	1:100	N/A	1:60	Zinc, Aluminium	Yes	Yes	–
Chloramide compound	Halamid-d	NL	√	–	–	1%	–	1%	–	–	Yes	–
Iodine based	FAM 30	GB	√	√	√	1:400	N/A	1:180	Aluminium, Zinc, Tin	Yes	Yes	–
Iodine based	Iopac P	FI	√	–	–	–	–	–	–	–	Yes	–
Organic acid	Menno Florades	DE	√	–	–	2:100 (for containers, storage room, machinery)	–	2:100	Not enough data for assessment	Yes	Yes	Yes
		GB	√	√	√	1:100–1:25	–	1:100–1:50	No?	No	Not tested	–
		AT, LT	√	√	√	2:100 (packing and processing material)	–	2:100 (containers)	–	–	Yes	–
		LV	√	√	–	2:100, 0.6–0.8 L/m ² for 4 hours (containers, storage room, machinery)	–	2:100 dipping before use, for 3 min (equipment e.g. knives); soaking, after use, for 4 h (handling equipment)	–	–	Yes	Yes
Peroxide/peroxygen based	Agrosteril 110 SL	PL	√	√	–	0.2 L/m ² with 2.5–5% spray	–	2–3 L/m ² with 2.5–5% spray	Not tested	–	Yes	–

Appendix 1 Continued.

Disinfectant type	Commercial Product	Country*	Active Against			Application Rates			Corrosive	Efficacy in the presence of organic matter	Efficacy against Ring rot	Efficacy against Brown rot
			Bacteria	Fungi	Viruses	Spray	Fog	Dip				
Peroxide/peroxygen based	Jet 5	GB	√	√	√	1:125	1:12	1:125	Copper, Bronze, Brass	No	Yes	–
		NL	√	√	–	–	1:100	–	–	–	Yes	–
Peroxide/peroxygen based	Persteril	SK	√	–	–	1.5%	–	–	–	–	Yes	Yes
Peroxide/peroxygen based	Sanprox P	GB	–	–	–	1:50	1:12	N/A	Metals	No	Not tested	–
Peroxide/peroxygen based	Vanodox	GB	√	√	√	1:50	N/A	N/A	No	Yes	Not tested	–
Peroxide/peroxygen based	Virkon S	GB, FI	√	√	√	1:100	1:25	1:100	No	Yes	Yes	–
Quaternary ammonium	Eskem	FI	√	–	–	–	–	–	–	–	Yes	–
Quaternary ammonium	Ipasept	FI	√	–	–	–	–	–	–	–	Yes	–
Quaternary ammonium	Menno-Ter-Forte	FI, NL	√	–	–	4%	–	–	–	–	Yes	–
Quaternary ammonium	D9, Fervent	NL	√	–	–	3%	–	–	–	–	Yes	–
Quaternary ammonium	groen weg Dimanin algae killer	NL	√	√	–	4%	–	–	–	–	–	–
Triazin-based	Trisep 210	PL	√	√	–	1%	–	2%	Not tested	–	Yes	–
Sodium hydroxide		SK	√	–	–	3–5%	–	–	–	–	Yes	Yes

*ISO codes are used to indicate countries: AT: Austria, BE: Belgium, DE: Germany, FI: Finland, FR: France, GB: The United Kingdom, LT: Lithuania, LV: Latvia, NL: The Netherlands, PL: Poland, SK: Slovakia.

¹Ren-cid is a detergent which is recommended for use before Glu-cid, other information in this line refers only to Glu-cid.

²A solution of 1% available chlorine is required, therefore the dilution required is determined by the available chlorine in the stock solution of hypochlorite.

³Depending on the area being fogged.

⁴Dichlorophen-based products will be withdrawn from sale in June 2007 in some EPPO countries.