Department
for Environment
Food & Rural Affairs

Pest specific plant health response plan:

Outbreaks of *Clavibacter sepedonicus* (potato ring rot)

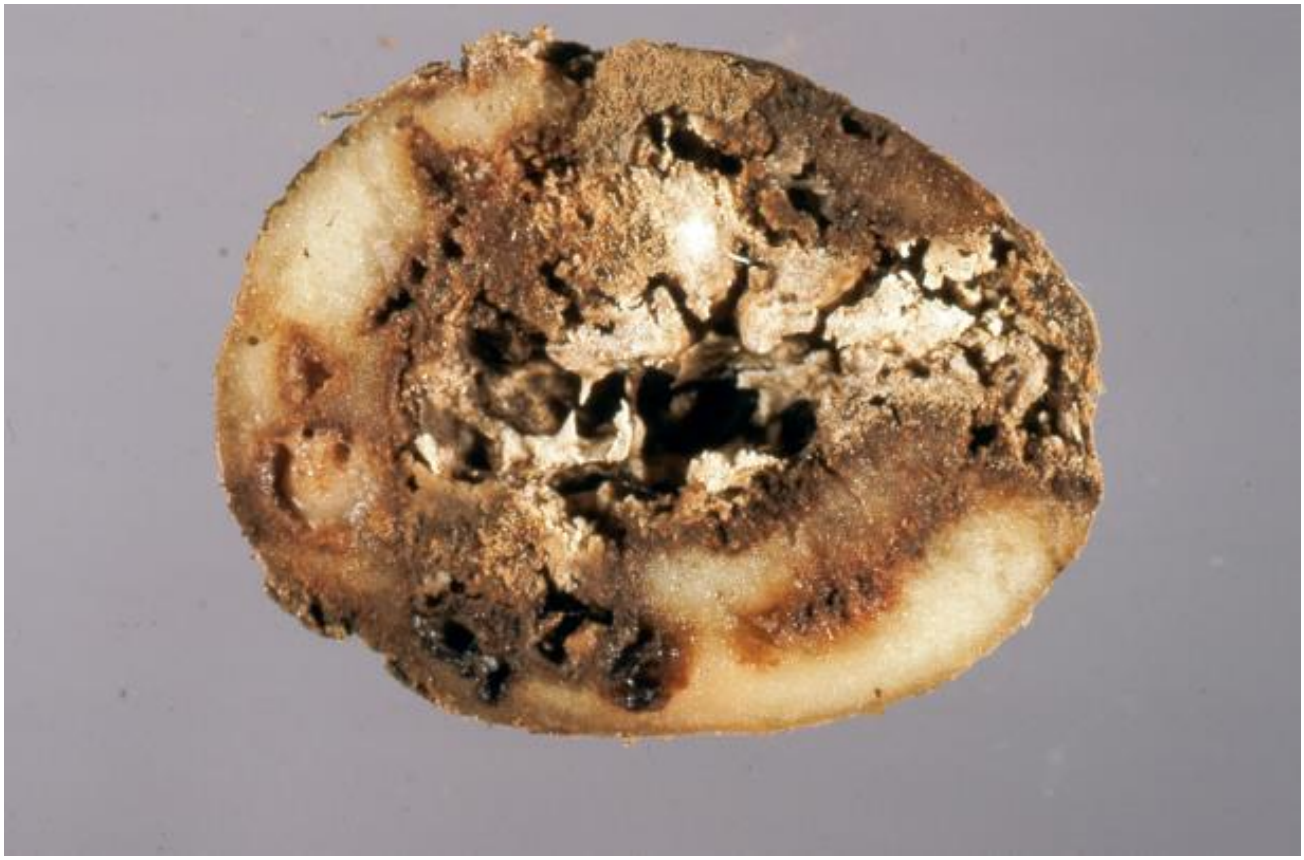

Figure 1. Late stages of rotting caused by *Clavibacter sepedonicus* (potato ring rot).

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This publication is available at

https://planthealthportal.defra.gov.uk/pests-and-diseases/contingency-planning/

This contingency plan has been undertaken taking into account the environmental principles laid out in the Environment Act 2021. Of particular relevance are:

The prevention principle, which means that any policy on action taken, or not taken should aim to prevent environmental harm.

The precautionary principle, which assists the decision-making process where there is a lack of scientific certainty.

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Executive summary

Background	
Regulation	GB Quarantine Pest
Key Hosts	Potatoes and other Solanaceous plants
Distribution	Widespread in eastern Europe and North America, also present in some Asian countries. Detail in Appendix A.
Key pathways	Seed and ware potatoes
Industries at risk	Ware and seed potato industries
Symptoms (2.3)*	• Wilting of leaves and whole plants late in the growing season • Initially, tubers develop a light-yellow glassy discoloration of the vascular ring at the stolon end, which can develop into a darker creamy yellow to light brown stain of the vascular ring. • In severe cases, rotting of the vascular tissue and subsequent hollowing of the cortex may be observed • Bacterial ooze may be expelled from the vascular tissue when tubers are cut and squeezed
Surveillance	
Demarcated zones (5.41-5.46)*	• Established based on the identification of infested and probably infested tubers, plants, other material, and the potential for spread
Surveillance activities (5.19, 5.42)*	• Surveillance will be carried out to identify infested and probably infested tubers or plants, places of production and other premises handling potatoes, machinery, vehicles, vessels, stores and any other objects including packaging material • Latent testing of tuber stocks with links to infested tubers
Response measures	
Interceptions (5.1-5.8)*	• Consignment should be destroyed if ring rot is confirmed • Infested vehicles, equipment etc., should be cleansed and disinfected • Tracing exercises carried out where required • UKPHINs notification to be made
Outbreaks (5.47-5.63)*	• Growing crops in demarcated zone should not be harvested • Any other harvested tubers must be destroyed • Infested vehicles, equipment etc., should be cleansed and disinfected • Volunteer potato plants and other hosts must be controlled
Key control measures	
Biological	N/A
Chemical	Plant Protection Product applications (e.g. herbicides)
Cultural	Cleaning of infested and probably infested equipment and machinery, removal and destruction of infested tubers / plants and waste
Declaration of eradication	
Eradication can be declared after at least 5 years if infested fields are left in bare fallow, or after at least 6 years if fields are not left in bare fallow. See section 6.1.	

*Numbers refer to relevant points in the plan

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1. Introduction and scope

1.1. This pest specific response plan has been prepared by the Defra Risk and Horizon Scanning team. It describes how the Plant Health Service for England will respond if an outbreak of *Clavibacter sepedonicus* (potato ring rot) is discovered. The plant health authorities in Northern Ireland, Wales and the Crown Dependencies have been consulted on this plan and will use it as the basis for the action they will take in the event of *C. sepedonicus* being detected in their territories. Scotland has its own contingency plan, which closely aligns with this contingency plan: https://www.sasa.gov.uk/category/collection-types/sg-contingency-plans.

1.2. This document will be used in conjunction with the *Defra Generic Contingency Plan for Plant Health in England* (https://planthealthportal.defra.gov.uk/pests-and-diseases/contingency-planning/), which gives details of the teams and organisations involved in pest response in England, and their responsibilities and governance. It also describes how these teams and organisations work together in the event of an outbreak of a plant health pest.

1.3. The aims of this response plan are to facilitate the containment and eradication of *C. sepedonicus* and to make stakeholders aware of the planned actions.

2. Summary of the threat

2.1. *Clavibacter sepedonicus* is a short, non-motile, Gram-positive rod-shaped bacterium, which causes disease in potato (Hayward and Waterston, 1964). There has been a single finding in tomato (*Solanum lycopersicum*) from a substrate crop in the Flanders region of Belgium, but this was limited to a row of 10 plants and additional inspection resulted in no further findings (CABI, 2023; Van Vaerenbergh *et al.*, 2016). *Clavibacter sepedonicus* has also been isolated under natural conditions from sugar beet seed and roots, but no symptoms were observed (Bugbee and Gudmestad, 1987, 1988). Transmission in sugar beet has not been reproducible under European conditions or with commonly grown varieties (Elphinstone, 2010). Several members of the Solanaceae family (e.g. *Solanum melongena*) and other plant species (e.g. *Urtica dioica*) have been found to be susceptible to *C. sepedonicus* under laboratory conditions (Knorr, 1948; van der Wolf et al., 2005). As reports of *C. sepedonicus* infections in crops other than potato are either rare or can only be reproduced in the laboratory, this contingency plan will focus on findings in potato.

2.2. It is unclear where the disease first originated, but *C. sepedonicus* is generally associated with cooler climates and has been reported from large areas of North America (Canada and the USA), China, Russia and northern Europe (Elphinstone, 2010). The disease has spread within Europe, with a number of outbreaks recorded

in recent years, including in Crete (Greece) and Georgia (EPPO, 2025; Goumas *et al.*, 2001, EPPO Reporting Service, 2020).

2.3. *Clavibacter sepedonicus* causes wilting, reduced yield, and in severe cases, the death of the plant (Figure 7, CABI, 2023; EPPO, 2025). In tubers, specifically, infection causes rotting of the vascular tissue and cortex, and later the discolouration and cracking of the outer skin (Figure 2-6, Elphinstone, 2010; EPPO, 2025).

2.4. The bacterium is associated with, and can be spread by, potato plants and tubers. The risk of introduction on these commodities is reduced by prohibitions which prevent the entry of solanaceous plants and tubers for planting into GB from any third country other than EU Member States, Liechtenstein, and Switzerland. Seed potatoes entering from the EU must have been produced in the EU or Switzerland from advanced breeding selections, free from GB quarantine pests. Ware potatoes are prohibited from third countries other than Algeria, Bosnia and Herzegovina, Egypt, EU Member States, Israel, Libya, Liechtenstein, Morocco, Serbia, Syria, Switzerland, Tunisia, and Türkiye. Therefore, the most likely route of entry is with ware potatoes coming from EU countries where *C. sepedonicus* is present.

2.5. There have been two outbreaks of *C. sepedonicus* in seed potatoes in the UK. The first outbreak was at a farm in Wales in 2003 (EPPO Reporting Service, 2004) and was subsequently eradicated (Giltrap, 2009). The second outbreak was detected in 2012-2013 following a warning from the Dutch NPPO that several exported seed lots could have been infected (EPPO, 2025). Trace-back exercises detected infected seed and ware crops at seven locations in England. All infected material was destroyed, and eradication was officially declared in 2017 (EPPO, 2025). There have been other outbreaks of *C. sepedonicus* in ware potatoes in Herefordshire and Lincolnshire in 2004 (John Elphinstone Personal Communication 2019). There have also been 14 interceptions of *C. sepedonicus* in England since 2001. The latest interceptions in 2017 and 2018 were both in ware potatoes from Poland (var. Innovator).

3. Risk assessments

3.1. *Clavibacter sepedonicus* has an unmitigated and mitigated UK Plant Health Risk Register score of 125 and 40, respectively. These scores are reviewed as and when new information becomes available (https://planthealthportal.defra.gov.uk/data/pests/10954).

3.2. The impact of the bacterium to potato crops in the UK is considered to be large, especially for seed potatoes.

3.3. The European Food Safety Authority (EFSA) published a scientific opinion on the pest categorisation of *C. sepedonicus* in 2019, which concluded that direct losses due to infection by *C. sepedonicus* can be very high. EFSA also noted that historic losses in the absence of regulatory control measures have been considerable.

4. Actions to prevent outbreaks

4.1. *Clavibacter sepedonicus* is a GB quarantine pests (Annex 2 part A of the GB Phytosanitary Conditions Regulations 2019/2072) and is therefore prohibited from being introduced into, or spread within GB. Further pest and host specific requirements are listed in Annex 6, Annex 7 and Annex 8. *Clavibacter sepedonicus* is also a GB Priority Pest listed in Annex 1 of the assimilated Commission Delegated Regulation (EU) 2019/1702, meaning it is a GB quarantine pest which has been assessed to have the most severe potential economic, environmental and social impacts to GB.

4.2. *Clavibacter sepedonicus* is on the EPPO A2 list and is therefore recommended for regulation by EPPO member countries.

4.3. The Plant Health Service for England (including the Animal and Plant Health Agency (APHA), Defra and Fera Science Ltd.) should be aware of the measures described in this plan and be trained in responding to an outbreak of *C. sepedonicus*. It is important that capabilities in detection, diagnosis, and risk management are available.

5. Response

Official action to be taken following the suspicion of an interception of *C. sepedonicus*

5.1. If *C. sepedonicus* is suspected by the Plant Health and Seeds Inspectorate (PHSI) to be present in a consignment moving in trade, the PHSI must hold the consignment until a diagnosis is made. Any opened containers should be resealed. Other consignments that are at risk of cross-contamination should also be held prior to a risk assessment on whether cross-contamination has or could have potentially occurred. Samples should be sent by the PHSI to the Plant Clinic, Fera Science Ltd., York Biotech Campus, Sand Hutton, York, YO41 1LZ (+44 (0) 300 100 0323; email: plantclinic@fera.co.uk) in a sealed bag or container, within at least two other layers of containment, which are not liable to be crushed during transit.

5.2. All other material that has come in contact with the suspected tubers, such as equipment, vehicles, machinery and storage facilities, should also be designated as infested until testing has been completed.

Official action to be taken following the confirmation of an interception of *C. sepedonicus*

5.3. When infection with *C. sepedonicus* is confirmed, the PHSI should advise the client of the action that needs to be taken by way of an official plant health notice.

5.4. The consignment should be destroyed by either incineration, deep burial or one of the other methods described in point 5.51. If it is not possible to organise destruction via one of these methods, a suitable alternative should be discussed with the Defra Risk and Horizon Scanning team.

5.5. Infested materials, such as equipment, vehicles, machinery and storage facilities should be cleansed and disinfected as in point 5.52.

5.6. An UKPHINS (UK Plant Health Interception Notification System) notification should be made upon confirmation of an interception of *C. sepedonicus*. UKPHINS is the IT system for recording findings and non-compliance in order to maintain records and to notify other National Plant Protection Organisations (NPPOs) of plant health issues.

5.7. In the event that all or part of the consignment has not been held and has been distributed to other premises prior to diagnosis, trace forward and trace back inspections should take place upon suspicion or confirmation of *C. sepedonicus*. Details of recent past and future consignments from the same grower/supplier should also be obtained and a decision on action taken on a case-by-case basis.

5.8. A factsheet to raise awareness of *C. sepedonicus* and its symptoms should be distributed to potato growers, packers/processors and importers and displayed at public locations, nearby to the infested site and other areas at risk. The pest alert and factsheet should be distributed to residential addresses nearby to the outbreak site, if it is deemed likely that hosts of *C. sepedonicus* could be growing in residential gardens. Confidential information about the location of the infestation will not be released.

Official action to be taken following the suspicion of a *C. sepedonicus* outbreak

5.9. Suspicion of *C. sepedonicus* is likely to occur following a positive immunofluorescent microscopy (IF) result or real-time TaqMan PCR result. Fera Science Ltd. will inform Defra of any suspicious test results. A second molecular test e.g. TaqMan real-time PCR or Pastrik conventional PCR assay is required to provide confirmation of the initial test results. A further eggplant bioassay is required to obtain an isolate and perform subsequent pathogenicity testing for official confirmation purposes.

5.10. Suspected outbreaks will be assessed on a case-by-case basis. An Outbreak Triage Group (OTG), chaired by the Chief Plant Health Officer (CPHO) or their deputy and including specialists from APHA, Defra and other organisations, should be set up to assess the risk and decide on a suitable response. Where appropriate, the OTG will also decide who will be the control authority (the lead organisation responsible for the eradication or containment of the pest), who will then nominate an Incident Controller. For an outbreak of *C. sepedonicus* in potatoes, APHA will likely be the control authority. An Incident Management Team (IMT) meeting, chaired by the Incident Controller, will subsequently convene to produce an Incident Action Plan (IAP) to outline the operational plan. See the Defra Generic Contingency Plan for Plant Health in England for full details.

5.11. The OTG will determine an alert status, which will consider the specific nature of the outbreak. The alert levels, in order of increasing severity, are white, black, amber and red (more detail on these levels can be found in table 2 of the Defra Generic Contingency Plan for Plant Health in England). Under most scenarios, an outbreak of *C. sepedonicus* in a potato field is likely to be given an amber alert status. An amber alert status refers to a serious plant pest/disease with potential for relatively slow but extensive geographical spread leading to host death and/or major economic, environmental or social impacts. However, this could be downgraded to a black alert status (limited geographic spread) depending on the extent of spread.

Restrictions on the movement of material, equipment and machinery to and from the place of production

5.12. *Clavibacter sepedonicus* is associated with potato plants and tubers, so infested or potentially infested potato plants or tubers should be restricted from leaving the infected site (e.g. farm), except when they are being sent for disposal. Potato plants and tubers may also be moved under exceptional circumstances under notice in consultation with the Defra Risk and Horizon Scanning team, provided there is no identifiable risk of *C. sepedonicus* spreading.

5.13. *Clavibacter sepedonicus* can adhere to inorganic surfaces, so the movement of material, equipment, vehicles and machinery should also be restricted to prevent the movement of the bacterium from infected to non-infected areas. However, if movement is necessary, the material, equipment, vehicles and machinery should be thoroughly cleansed and disinfected at the designated outbreak site to eliminate the bacterium as in point 5.52.

5.14. Movement of personnel into the affected field or production site poses a risk of spread, as *C. sepedonicus* can be transferred on clothing, footwear and possessions. Personnel should therefore be briefed on the importance of good hygiene practice to reduce the risk of spread, and movement into the affected field or production site should be minimised as best as possible.

Precautionary measures (grower)

5.15. To prevent the mechanical transfer of *C. sepedonicus*, hygiene best practice should be followed as below:

- Training staff to identify symptoms of *C. sepedonicus*.
- Using disposable garments (including overshoes), which will be destroyed after working on an infected field or production site, or which should only be used in the infected area. If disposable overshoes are not practical, footwear should be cleaned and disinfected before leaving the infected area,
- Using disposable gloves that can be destroyed following work on a particular crop, between different areas within a crop, or between plants, or only used in the infected area.
- Avoid using the same equipment and machinery for seed and ware potatoes when growing, packing or processing, particularly from different growers, as there is a higher risk of cross-contamination.
- Avoid cutting tubers, as this increases the risk of spreading *C. sepedonicus* through potato stocks.
- Take care when handling potatoes, as any damage can act as openings for the bacterium.
- The fewer people entering a particular field or infected area, the less chance of spread of *C. sepedonicus*. Only trained staff should be able to access restricted areas, and there should be a sign in/sign out sheet to record movements.
- Wherever possible during work shifts, uninfected areas should be worked in first before finishing in areas that could potentially be infected. There should be no movement between infected crops and those assumed to be uninfected.
- Maintain up-to-date records of cleansing and disinfection, and the location of potato stocks.

5.16. Volunteer host plants may act as reservoirs for *C. sepedonicus* if they originate from an infected crop. Controlling these plants reduces the chance of the crop becoming infected and reduces survival and persistence in the event of an outbreak. Volunteer plants can be controlled mechanically (e.g. by hoeing, roguing, flame weeding) and chemically (e.g. using herbicides). Any disposal required should be as in point 5.51.

Preliminary trace forward / trace backward

5.17. Information obtained regarding the origins of suspected infected consignments should be used to locate other related and therefore potentially infected consignments. The relevant NPPO should be contacted and delivery notes requested upon confirmation of *C. sepedonicus*. Information should also be obtained on the destination to which suspect consignments have been sent. This process is particularly important for propagation or seed potato stocks.

5.18. In addition to tracing investigations relating to consignments, trace forward/back investigations linked to equipment, vehicles and machinery used in the infected field or production site should be carried out.

Confirming a new outbreak

How to survey to determine whether there is an outbreak

5.19. Information to be gathered by the PHSI on suspicion of an outbreak of *C. sepedonicus*, in accordance with ISPM 6; guidelines for surveillance (https://www.ippc.int/en/publications/615/), includes:

- The origin of the host plants and associated pathways.
- Details of other premises or destinations where the host plants/products have been sent, where *C. sepedonicus* may be present.
- The layout of the premises and surrounding area (in relation to potential demarcated areas), including a map of the fields/cropping/buildings, at risk growers, and details of neighbouring crops, especially any commercial or non-commercial hosts in fields, allotments, gardens or glasshouses.
- Details of the host variety, growth stage and any other relevant information.
- Details of all potato stocks on site, particularly identifying any potatoes which are clonally related to a known infected stock or a stock grown on infected premises.
- Area and level of infection, including a description of symptoms (photos should be taken).
- The locations where *C. sepedonicus* has been detected, including grid references.
- The date and time the sample was taken, how it was identified and by whom.
- Current treatments/controls in place e.g. chemical treatments.
- Details of the movement of people, equipment, machinery etc. to and from the infected area, and the associated premises.
- Cultural, biosecurity and working practices.
- The name, address, email and telephone number of the person who found the pest and/or its symptoms, and the business owner/person responsible for the infected premise and crops/consignments.

5.20. This information should be included on the plant pest investigation template (see the Defra *Generic Contingency Plan for Plant Health in England*).

5.21. Further to information gathering, samples of other potentially infected plants should be taken to confirm the extent of the infection e.g. in associated fields. This initial survey will be used to determine if it is an isolated finding or an established outbreak.

5.22. Finance for the surveys will depend on the individual circumstances of the outbreak, and will be subject to discussion, usually between Defra policy and the PHSI.

Sampling

5.23. Potato tuber coring kits can be obtained from the bacteriology laboratory in Fera Science Ltd.

5.24. Buffer provided in the kits should be refrigerated prior to use and ice packs should be frozen prior to sending the samples to the laboratory.

5.25. Ensure that samples arrive at the laboratory the day after sampling, ideally by 9am. Inform the laboratory of the number and expected date of arrival of the samples before 5pm the day prior to arrival at the latest.

5.26. To prevent cross-contamination, use a new pair of disposable gloves, a new sterile corer, a new sterile collection tube and a fresh tube of sterile buffer for each sample.

5.27. Do not package any other sample types with latent core or tuber samples for *C. sepedonicus* screening, as these samples will not pass through the plant clinic.

5.28. Instructions for taking cores from potato tubers:

- Wear disposable gloves.
- Select samples of 200 tubers randomly from the entire lot to be sampled.
- Attach a sterile stainless-steel corer to the empty 50 ml screw cap tube.
- Remove as much soil as possible from the heel end of each tuber (e.g. using a new disposable cloth, glove or paper towel for each sample) and locate the point of attachment with the stolon.
- Remove cores from the point of attachment of each tuber in the sample and collect in the tube (each core must contain vascular tissue from the point of attachment). When 200 cores have been collected, their volume should be between the 30 and 40 ml graduation marks.
- Unscrew the corer and replace it in the original transport pot for return with the sample.
- Add buffer to cover the cores, shake and top up to the 45 ml mark leaving an air space at the top of the tube. Discard any unused buffer.
- Replace cap and seal tightly.
- Include sample information as needed on the sample tube label, including the sample ID number, date of coring and the inspector name.
- Maintain the samples refrigerated or in a cooled box until packaging for sending to the laboratory.
- Always place the cored sample against the ice-pack in the transport package, also include the used corer in the package, and return overnight to the laboratory using the correct label.

- If several core samples are sent together in an outer bag or box, ensure that the 'Potato cores' label will be visible and easily identifiable upon arrival at the laboratory.
- Collect cored tubers from each sample and store separately in labelled secure bags for further reference until results are known.

5.29. If the tubers are too difficult to sample in the field, the tubers can be sent to the lab for processing (using the tuber label). As previously, Fera Science Ltd. should be informed prior to arrival at the laboratory. Cores and tubers are sent to different parts of the laboratory.

5.30. A higher sampling density may be required during trace-back during outbreaks to give greater confidence in detecting an infection of *C. sepedonicus*. In practice, 20 x 200 tubers (4,000 tubers in total) are sampled from each suspicious lot. See ISPM 31 for details (https://www.ippc.int/en/publications/588/).

Diagnostic procedures

5.31. Identification of *C. sepedonicus* is carried out in line with the EPPO Diagnostic Protocol PM7/59 (2) (EPPO, 2022).

5.32. At Fera Science Ltd., initial detection tests include immunofluorescence microscopy (using a monoclonal antibody) and real-time (TaqMan) PCR. Positive results from these provide these tests provide the first indication that the sample is positive for *C. sepedonicus* and at this point official action can be taken based on suspicion (see 5.1-5.2 for interceptions and 5.9-5.11 for an outbreak).

5.33. A second molecular assay (targeted at a different part of the genome if molecular testing was carried out as the initial screening test) such as TaqMan real-time PCR or Pastrik conventional PCR is required to provide confirmation of *C. sepedonicus* presence and justification for official action taken based on confirmation (5.3-5.8 for an interception and 5.37 onwards for an outbreak).

5.34. A further step would be to carry out an eggplant bioassay to obtain an isolate of *C. sepedonicus* and perform subsequent pathogenicity testing, to allow the UK plant health service to state that *C. sepedonicus* has been detected and identified according to the EPPO protocol, and provides the official confirmation required to notify other countries. The bioassay takes 2-4 weeks depending on the inoculum load and subsequent symptom development. Identification of *C. sepedonicus* colonies isolated from the bioassay is carried out using TaqMan and Pastrik conventional PCR. Confirmation of Koch's postulates is carried out by eggplant pathogenicity test which could take another 2-4 weeks. Observation of symptoms and re-isolation of typical colonies from the symptomatic material allow confirmation of pathogenicity.

5.35. The variety of the potatoes can be confirmed by DNA fingerprinting analysis at SASA, should there be suspicion of misidentification or mixing of varieties.

Criteria for determining an outbreak

5.36. If *C. sepedonicus* is detected at a location other than at a port or confined to a particular consignment with no risk of spread, then an outbreak should be declared. For example, if it is identified in a potato field, then this would be classified as an outbreak. However, if it is restricted to recently imported potatoes within a cold store then this would be classified as an interception. If only symptoms are found, then the outbreak should be treated as suspected until it is confirmed by testing.

Official Action to be taken following the confirmation of an outbreak

5.37. The scale of the outbreak will determine the size and nature of the IMT and action.

Communication

5.38. The IMT will assess the risks and communicate details to the IPPC and EPPO, in accordance with ISPM 17: pest reporting (https://www.ippc.int/en/publications/606/), as well as to Defra Ministers, senior officials, devolved governments, and other government departments and agencies (e.g., the Environment Agency) on a regular basis as appropriate; and to stakeholders.

5.39. If there is a risk of contamination of potatoes coming from or moving into another country, the country should be informed of the relevant details by the country in which *C. sepedonicus* was found.

5.40. A generic communications plan is available for use across all plant health outbreaks. This will be owned by APHA and FC communications teams and is intended to provide consistency across outbreaks. This plan can be tailored to the outbreak, using pest and outbreak specific information. It includes a list of key stakeholders and templates for:

- Core Narratives
- Press releases
- Reactive lines
- Frequently Asked Questions

Surveillance and demarcated zones

5.41. In line with section 3 of EPPO Standard PM 9/2 (3) (EPPO, 2023), designate as **infested** the tubers or plants, consignment and/or lot, the waste (e.g. soil, processing waste) from the infested lot, and the machinery, vehicle, vessel, store, or units thereof, and any other objects including packaging material, from which the

sample was taken, and, where appropriate, the place(s) of production and field(s) from which the tubers or plants were grown.

5.42. In line with section 3 of EPPO Standard PM 9/2 (3) (EPPO, 2023), designate the extent of **probable infestation** as the following:

- Tubers or plants grown at a place of production designated as infested.
- Places of production with some production link to the tubers or plants designated as infested, including those sharing production equipment and facilities directly or through a common contractor.
- Tubers or plants produced in the place(s) of production referred to in the previous bullet point, or present in such place(s) of production during the period when the tubers or plants designated as infested were present on the place of production referred to in the first bullet point.
- Premises handling potatoes from the places of production referred to in the previous bullet points.
- Any machinery, vehicle, vessel, store, or units thereof, and any other objects including packaging material, that may have come into contact with the tubers or plants designated as infested.
- Any tubers or plants stored in, or in contact with, any of the structures or objects listed in the previous bullet point, prior to the cleansing and disinfection of such structures and objects.
- Those tubers or plants with a sister or parental clonal relationship to the tubers or plants designated to be infested and for which, although they may have tested negative for the organism, it appears that infestation is probable through a clonal link. Variety testing may be undertaken to verify the identity of the infested and clonally related tubers or plants.
- Places of production of the tubers or plants referred to in the previous bullet point.

5.43. In line with section 3 of EPPO Standard PM 9/2 (3) (EPPO, 2023), a demarcated area should be established based on the designation of infestation (point 5.41), the designation of probable infestation (point 5.42), and the possible spread of the organism based on the proximity of other places of production growing potatoes or other host plants, and the common production and use of seed potato stocks.

5.44. Initial maps of outbreak sites should be produced by officials.

5.45. In line with section 3 of EPPO Standard PM 9/2 (3) (EPPO, 2023), testing must be carried out on potato stocks which are clonally related to those involved in the infestation to determine the probable primary source of infection, and testing must be carried out to determine the extent of probable infestation, preferably in order of degree of risk. This will include places of production that are in proximity to infested and probably infested premises.

5.46. The demarcated area should be adjusted in response to further findings.

Pest management procedures

5.47. If there are potato plants still being grown in fields designated as infested or probably infested, the plants should either be cut or left in the field and ploughed into the soil or treated with an approved plant protection product (PPP) such as a herbicide/desiccant. Plant material and tubers should not be removed to minimise the risk of spreading *C. sepedonicus*. All the equipment and machinery used to cut the crop or to plough it into the soil must be cleansed and disinfected as in point 5.52.

5.48. Any other tubers or plants designated as infested or probably infested must not be planted and must either be destroyed or disposed of using one of the options outlined in point 5.51.

5.49. Any machinery, vehicle, vessel, store, or units thereof, and any other objects including packaging material, designated as infested or probably infested must either be destroyed as in point 5.51 or cleansed and disinfected as in point 5.52.

Disposal plan

Infected plant material

5.50. The primary means of destruction of potato plants in a field is through a PPP (herbicide application. The Defra Risk and Horizon Scanning team will advise on the most appropriate treatments.

- Prior to any PPP being used, the risk posed by the PPP to people and the environment will be assessed.
- Any applications should be made following the advice on the product label and be in accordance with HSE guidance. In some cases there may be a requirement to carry out a Local Environment Risk Assessment for Pesticides (LERAP) depending on the product used and the situation of the finding.
- Growers will be placed under notice to apply the recommended pesticides and make the applications using their own or contractor's equipment. Records of applications will be kept, including details of the amount of product and water used.

Infected tubers/soil/plant debris

5.51. Disposal and/or destruction should be under the approval and supervision of the PHSI. If the material has to be moved off the premises, it should be contained within at least one sealed layer, and two layers if possible, and should not be split open prior to being buried or incinerated. The vehicle used for transport must be cleaned and disinfected after use. The following disposal methods are approved for *C. sepedonicus*-infested material:

- **Deep burial** (minimum 2 m with immediate backfill), which can be done at an approved landfill site, or on the site or nearby farm, but only in agreement with the local Environment Agency, who is satisfied that there will be no risk of contaminating ground water.
- **Incineration**, which must comply with appropriate waste management regulations, Environment Agency in England, Scottish Environment Protection Agency and Natural Resources Wales.
- **Use as animal feed** following steaming / boiling for at least 30 minutes.
- **Approved commercial composting** using a validated process (PAS 100) with regular mixing, at least 50% moisture content, pH 7 and a two-week sanitation period with peak temperatures of 55°C (or 1 week with peak temperatures of 65°C). If temperature requirements cannot be met, then additional heating to 70°C for 4 hours either before or after composting would be required. In addition, the resulting compost should not be used on arable land. It can be returned to non-agricultural land as well as to e.g. orchards, Christmas tree production sites or short rotational plantations (e.g. fast-growing trees for biomass production) which are not and will not be used for arable crop production; or in permanent wooded area, grassland or pastures.
- **Approved mesophilic anaerobic digestion** using a validated process (PAS 110) at temperatures of ≥ 37°C for 6 or more days. Because *C. sepedonicus* can survive for more than 24 h at these temperatures, continuous processes should not be used. Instead, it should be a batch process to ensure all of the material is treated for at least 6 days. Pasteurisation, either before or after digestion, at 70°C for at least 1 hour is recommended to ensure complete kill of the bacteria. In addition, the digested material should not be used on arable land.
- **Direct and immediate delivery for industrial processing** to a site which operates officially approved waste disposal facilities and which has a system of disinfection of storage areas and departing vehicles.
- Treatment of liquid washing or drainage effluent will be decided on a case by case basis but will likely include an **approved treatment to remove all solids, followed by a treatment to kill the bacteria, such as heat or UV treatment.** EPPO Standard PM 9/2 (3) (EPPO, 2023) recommends that liquid waste should be heated to a minimum of 60°C throughout the entire volume consistently, for at least 1 hour prior to disposal.

5.52. All objects designated as ‘infested’ or ‘probably infested’, such as equipment, vehicles, machinery, boxes and storage facilities, should be thoroughly cleansed and disinfected to eliminate the risk of spread of *C. sepedonicus*. This should be carried out at the outbreak site or a site nearby in agreement with a Plant Health and Seeds Inspector. Any waste material generated should be disposed of as in 5.51. Boxes could also be left in the open air for several months to expose the bacterium to the weather, but the boxes must not be used for storage of seed potatoes.

Measures in subsequent seasons

Infested fields or units of protected cropping

5.53. Measures for infested fields must follow either I or II:

I. For the next three years from the start of the next growing season, growers must eliminate volunteer potato plants and other naturally found host plants (see point 5.51 for guidance on destruction). In addition, no potato tubers, plants or true seeds, or other naturally found host plants of the organism or crops for which there is an identified risk of the organism spreading, shall be planted.

- Following this period and if the field has been found free from volunteer potato plants and other naturally found host plants during official inspections for at least two consecutive years prior to planting, potatoes (officially certified seed potatoes) may be grown for ware production, but the harvested tubers must be tested for *C. sepedonicus*.
- Following the growing of potatoes for ware production and an appropriate rotation cycle, either ware or seed potatoes may be grown and an official survey carried out. The official survey will include visual inspection of plants and tubers, and sampling of tubers for testing (as in points 5.23-5.35). In the case of seed potatoes, there should be at least a 2-year period before potatoes are grown.

II. For the next four years from the start of the next growing season, growers must eliminate volunteer potato plants and other naturally found host plants of the organism (see point 5.51 for guidance on destruction). In addition, the field must be maintained either in bare fallow, used for cereals or under permanent pasture with frequent close cutting or intensive grazing, or as grass for seed production. With regard to leaving the field in bare fallow, if the site is at particularly high risk of diffuse pollution running into water courses alternatives will be considered to adhere to The Reduction and Prevention of Agricultural Diffuse Pollution (England) Regulations 2018.

- Following this period and if the field has been found free from volunteer potato plants and other naturally found host plants during official inspections for at least two consecutive years prior to planting, either ware or seed potatoes (officially certified seed potatoes) may be grown, but harvested tubers must be tested for *C. sepedonicus*.

In other fields on infested premises

5.54. In the first year following confirmation of *C. sepedonicus*, on the condition that the volunteer potato plants and other naturally found host plants of *C. sepedonicus* have been eliminated, officially certified seed potatoes may be planted for ware production only. The PHSI should inspect the growing crop and any volunteer

plants should be tested for infection. Harvested tubers must be inspected and tested for *C. sepedonicus*.

5.55. In the second and third year, following confirmation of *C. sepedonicus*, officially certified seed potatoes may be grown for seed production as well as ware production. Measures must be taken to eliminate any volunteer potato plants and other naturally found host plants of *C. sepedonicus*, and harvested tubers must be tested for the bacterium. Alternatively, in the second and third year, potatoes grown under official control and tested for *C. sepedonicus* may be planted instead of certified seed potatoes. In the third year, potatoes grown under official control from certified seed potatoes may also be planted instead of certified seed potatoes.

5.56. Following the designation of premises as infested and in each of the subsequent growing years, up to and including the first permissible potato cropping season on the fields designated as infested, growers must cleanse and disinfect all potato machinery, equipment and storage facilities on the premises.

5.57. In a unit of production where the complete replacement of the growing medium is possible, no tubers, plants or true seed must be planted unless the production unit has been subjected to measures to eliminate *C. sepedonicus* and to remove all host plant material, which includes a complete change in growing medium and cleansing and disinfection of the production unit and all equipment, and has been granted approval for potato production by the PHSI. Potato production must be from officially certified seed potatoes, or mini-tubers or micro plants from tested sources.

Other areas of the demarcated area

For three years, or as long as the infested production sites are subject to the above requirements:

5.58. Any premises growing, storing or handling potatoes (including those of contractors) will be supervised and controlled under notice.

5.59. All machinery, equipment and storage facilities involved with potato production must be cleansed and disinfected, as in point 5.52.

5.60. Growers must plant only officially certified seed potatoes, or seed potatoes once-grown under official control, for all potato production. Seed potato crops grown in places of production designated as probably infested must be tested at harvest.

5.61. Ware potatoes and seed potatoes must be handled separately on all premises within the demarcated area, or there must be a system of cleansing and disinfection in place between the handling of ware and seed potato stocks.

5.62. An annual official survey will be carried out. The official survey will include visual inspection of plants and tubers, and sampling of tubers for testing (as in points 5.23-5.35).

5.63. A programme should be established to replace all seed potato stocks over an appropriate period of time.

6. Criteria for declaring eradication / change of policy

6.1. *Clavibacter sepedonicus* can be declared eradicated (by the Chief Plant Health Officer) in potato after:

- at least 5 years if the infested field(s) is left in bare fallow or permanent pasture for 4 years. There must be 2 consecutive years within this 4-year period without volunteer potato plants or naturally found host plants prior to planting of ware or seed potatoes.

- at least 6 years if the infested field(s) is not left in bare fallow or permanent pasture. There must be at least 2 consecutive years within a 3-year period without volunteer potato plants or naturally found host plants prior to planting of ware potatoes in the first potato cropping season and following a rotation of ideally two years (and must be two years for seed) prior to planting of ware or seed potatoes in the second potato cropping season.

7. Evaluation and review of the contingency plan

7.1. This pest specific contingency plan should be reviewed regularly to consider changes in legislation, control procedures, pesticides, sampling and diagnosis methods, and any other relevant amendments.

7.2. Lessons should be identified during and after any outbreak, including what went well and what did not. These should be included in any review of the contingency plan leading to continuous improvement of the plan and response to outbreaks.

8. Appendix A

Data sheet for *C. sepedonicus*

Identity

PREFERRED SCIENTIFIC NAME	AUTHOR (taxonomic authority)
Clavibacter sepedonicus	(Spieckermann & Kotthoff 1914) Nouioui *et al.* 2018

CLASS: Actinobacteria
ORDER: Micrococcales
FAMILY: Microbacteriaceae

SYNONYMS

Aplanobacter sepedonicum (Spieckermann and Kotthoff 1914) Smith 1920
Bacterium sepedonicum Spieckermann and Kotthoff 1914
Clavibacter michiganense sepedonicum
Clavibacter michiganense subsp. *sepedonicum*
Clavibacter michiganensis sepedonicum
Clavibacter michiganensis subsp. sepedonicus
Clavibacter sepedonicus nom. Illegit
Corynebacterium michiganense pv. *sepedonicum* (Spieckermann & Kotthoff) Dye & Kemp 1977
Corynebacterium michiganense subsp. *sepedonicum* (Spieckermann and Kotthoff 1914) Carlson and Vidaver 1982
Corynebacterium sepedonicum (Spieckermann and Kotthoff 1914) Skaptason and Burkholder 1942
Mycobacterium sepedonicum (Spieckermann and Kotthoff 1914) Krasil'nikov 1949
Phytomonas sepedonica (Spieckermann and Kotthoff 1914) Magrou 1937
Pseudobacterium sepedonicum (Spieckermann and Kotthoff 1914) Krasil'nikov 1949

COMMON NAMES

Bacterial ring rot of potato (English)
Bactériose annulaire de la pomme de terre (French)
Bacteriosis anular de la papa (Spanish)
Bacteriosis anular de la patata (Spanish)
Bakterielle ringfäule: Kartoffel (German)
Bakterienringfäule: Kartoffel (German)
Flétrissement bactérien de la pomme de terre (French)
кольцевая гниль картофеля (Russian)
Ljust ringröta (Swedish)

Marciume anulare della patata (Italian)
Podredumbre anular de la papa (Spanish)
Podredumbre anular de la patata (Spanish)
Podridão-anelar-bacteriana-da-batata (Portuguese)
Pourriture annulaire de la pomme de terre (French)
Ringbakteriose: Kartoffel (German)
Ringrot (Dutch)
Ring rot of potato (English)
Vascular wilt of potato (English)

Notes on taxonomy and nomenclature

Clavibacter sepedonicus is a short, non-motile, Gram-positive rod shaped bacterium (Hayward and Waterston, 1964), and is currently placed within the *Clavibacter* genus. The *Clavibacter* genus originally contained 6 species, including *Clavibacter michiganensis*, *C. iranicum*, *C. rathayi*, *C. toxicus*, *C. tritici* and *C. xyli*, but *C. iranicum*, *C. rathayi*, *C. toxicus* and *C. tritici*, and *C. xyli*, were subsequently moved into the genera *Rathayibacter* and *Leifsonia*, respectively, leaving *C. michiganensis* as the only species in the genus *Clavibacter* (Zgurskaya *et al.*, 1993; Suzuki *et al.*, 1999; Evtushenko *et al.*, 2000).

Clavibacter michiganensis was subdivided into nine subspecies based on their biology and host range (Li *et al.*, 2018):

- *Clavibacter michiganensis* subsp. *insidiosus* (causes wilting and stunting in alfalfa)
- *Clavibacter michiganensis* subsp. *michiganensis* (causes bacterial canker of tomato)
- *Clavibacter michiganensis* subsp. *nebraskensis* (causes wilt and blight of maize)
- *Clavibacter michiganensis* subsp. *sepedonicus* (potato ring rot)
- *Clavibacter michiganensis* subsp. *tesselarius* (freckles and leaf spots in wheat)
- *Clavibacter michiganensis* subsp. *phaseoli* (causes bacterial bean leaf yellowing)
- *Clavibacter michiganensis* subsp. *capsici* (causes bacterial canker in pepper)
- *Clavibacter michiganensis* subsp. *californiensis* (isolated from tomato and pepper seed from California)
- *Clavibacter michiganensis* subsp. *chilensis* (isolated from tomato and pepper seed from Chile)

There are other strains of the genus *Clavibacter* that have been isolated as epiphytes and endophytes on asymptomatic plant species, but these are generally classified as *Clavibacter* sp.

Based on genome classification of the phylum *Actinobacteria*, Nouioui *et al*. (2018) proposed raising the subspecies *capsici*, *nebraskensis* and *sepedonicus* to species, and the names *Clavibacter capsici*, *Clavibacter nebraskensis* and *Clavibacter sepedonicus* were formerly accepted (Oren and Garritty, 2018).

Re-classification of *Clavibacter michiganensis* subspecies on the basis of whole-genome sequence analyses, Li *et al*. (2018) also proposed that subspecies *capsici, nebraskensis, insidiosus, sepedonicus* and *tessellarius* be raised to species. Further descriptions of *Clavibacter insidiosus* and *Clavibacter tessellarius* were provided by Li *et al.* (2019).

Tian *et al.* (2021) proposed a novel *Clavibacter* species, *C. zhangzhiyongii* isolated from barley seeds, causing leaf brown spot and decline.

Most recently, based on complete genome *in silico* analyses, Arizala *et al.* (2022) proposed raising the subspecies *californiensis* to species level and merging subspecies *chilensis* and *phaseoli* and re-classifying as *Clavibacter phaseoli.*

This would bring to the current position of the genus *Clavibacter* currently divided into nine species (*Clavibacter michiganensis, Clavibacter nebraskensis, Clavibacter capsici, Clavibacter sepedonicus, Clavibacter tessellarius, Clavibacter insidiosus, Clavibacter zhangzhiyongii, Clavibacter californiensis* and *Clavibacter phaseoli.*

Biology and ecology

Life cycle

The most likely route of introduction of the bacterium is the planting of infected seed tubers (CABI, 2023; EPPO, 2025). Once planted, the bacterium builds up rapidly and moves into the stems and petioles via the vascular tissue (CABI, 2023; EPPO, 2025). The bacterial load generally increases throughout the growing season and can move into the developing tubers through the stolons within 8 weeks (EPPO, 2025). Over the winter, the bacterium survives within plant debris, and volunteer plants, but does not survive well in the soil (CABI, 2023). The bacterium can remain infective within potato stems for 63 months (Nelson, 1984). Infection does not necessarily result in symptom development and latent infections are possible for up to three generations of the potato crop (Franc, 1999). Potato ring rot disease eventually develops when the bacterial load reaches a threshold population, which is influenced by environmental conditions and differential host response in different potato cultivars (Inglis *et al.*, 2013).

Clavibacter sepedonicus prefers cooler temperatures, optimally between 21 and 23°C, and this is reflected in its northerly distribution (CABI, 2023; see Figure 8). The bacterium prefers cold dry conditions, with moist conditions and repeated cycles of wetting and drying decreasing the ability of the bacterium to survive (Inglis *et al.*, 2013).

Modes of transmission

1. **Seed tuber transmission** is the primary route (as described above).
2. Transfer of the bacterium from infected to healthy tubers via **direct** contact during handling. Wounds are necessary to infect, but less than 300 bacteria are required to infect a seed piece (Nelson, 1982). The operation of cutting, grading and handling seed tubers is therefore an ideal means of spreading the bacterium within potato lots (Elphinstone, 2010). Transmission between plants in the field is thought to be low (Elphinstone, 2010).

3. Transfer of the bacterium via **indirect contact on machinery, equipment** etc. The bacterium produces extracellular polysaccharides that protect the bacteria and allows it to adhere and survive for long periods on inorganic surfaces (Inglis *et al.*, 2013). It can survive for at least a month, and much longer if it dries rapidly and conditions continue to be cold and dry (Defra, 2018). It has been recorded surviving in a desiccated state on equipment and in dust in stores for several years (APHA, 2016). Infection can therefore occur during routine cutting, planting, harvesting and grading operations, if the machinery becomes contaminated (Inglis *et al.*, 2013).
4. Infection of healthy plants **via infected volunteer plants**. As mentioned, the bacterium can persist over winter in infected volunteer plants, which can be a source of inoculum for subsequent crops.
5. **Infested potato waste**.
6. **Transmission in water**. The bacterium can survive for 35-52 days in sterile water and less time in unsterile water, but there are no known aquatic hosts which allow the bacterium to build up its population in natural water systems (Elphinstone, 2010). Infection of healthy tubers has been demonstrated, however, following washing in contaminated water (Defra, 2018).
7. **Insect transmission**. *Leptinotarsa decemlineata* (Colorado beetle), *Myzus persicae* (potato peach aphid), and potato flea beetles have been shown to transfer the bacteria between potato plants experimentally (Stevenson *et al.*, 2001), but this is unlikely to be a significant pathway in the field.

Hosts/crops affected

Clavibacter sepedonicus only causes disease symptoms under natural conditions in potato (*Solanum tuberosum*), with the exception of a finding in tomato (*Solanum lycopersicum*) from a substrate crop in the Flanders region of Belgium, but this was limited to a row of 10 plants and additional inspection resulted in no further findings (CABI, 2023; Van Vaerenbergh *et al.*, 2016). *Clavibacter sepedonicus* has also been isolated under natural conditions from sugar beet seed and roots, but no symptoms were observed (Bugbee and Gudmestad, 1988). Reports from the USA of infection and seed transmission in sugar beet have not been reproducible under European conditions or with commonly grown sugar beet varieties (Elphinstone, 2010). In addition to tomato and eggplant, infections can be artificially introduced into several wild *Solanum* species following stem or root inoculations (Knorr, 1948; Zizz and Harrison, 1991; van der Wolf *et al*., 2005; CABI, 2023). Similarly, artificial infections were introduced into stinging nettle (*Urtica dioica*) following root and stem inoculations, leading to symptoms of wilting, chlorosis or leaf necrosis (van der Wolf *et al*., 2005).

Plant stage affected

Flowering, fruiting, vegetative and post-harvest stages are all affected.

Plant parts affected

Tubers, leaves, roots, seedlings, stems and accompanying soil are all affected.

Symptoms/signs - description

Whole plant

Symptoms are variable, but generally start to appear towards the end of the season as wilting of the lower leaves which progresses upwards until the whole plant is wilted (CABI, 2023; EPPO, 2025; Figure 7). Leaves also roll inwards and upwards and show areas of discolouration, such as chlorosis between the veins (EPPO, 2025; Inglis, 2013; Figure 7). As the disease progresses, leaves can become brown and necrotic, and the whole plant can die prematurely (EPPO, 2025). In certain cultivars, rosette symptoms with short internodes can also develop, but in the absence of wilting (CABI, 2023).

Tubers

Symptoms initially develop as glassy, creamy-yellow to dark patches in the vascular tissue at the stolon end (Elphinstone, 2010; EPPO, 2025; Figure 2). The rotting extends around the vascular ring and eventually moves into the cortex of the tuber, where hollowing can develop (Elphinstone, 2010; Figures 3, 4 and 5). When the tuber is cut and squeezed, bacterial ooze can be expelled (Elphinstone, 2010; Figure 3). External symptoms are also evident in advanced infections as reddish-brown blotches and cracking (EPPO, 2025). The latter can leave tubers susceptible to infection by secondary rot microorganisms and lead to the mummification of the tuber (Elphinstone, 2010; Figure 6).

Similarities to other species/diseases/plant damages

Plant symptoms of *C. sepedonicus* may be confused with those of potato blight (*Phytophthora infestans*), wilt (*Verticillium albo-atrum*), stem canker (*Rhizoctonia solani/Thanatephorus cucumeris*) and drought (EPPO, 2025). While early tuber symptoms are similar to brown rot (*Ralstonia solanacearum*) (EPPO, 2025).

Detection and inspection methods

Detection of *C. sepedonicus* can be difficult due to the bacterium having a latent period, expressing symptoms late in the season after natural senescence, and due to its similarity to other wilting/rotting diseases and conditions (CABI, 2023). Inspection of plants in the field is therefore usually not advised. Instead, tuber sampling and laboratory testing is required, with a range of techniques used, including immunofluorescence microscopy (monoclonal antibody), real-time TaqMan PCR and conventional PCR, and host testing in line with Commission Implementing Regulation (EU) 2022/1194 (EU, 2022) and EPPO Standard PM 7/59 (EPPO, 2022).

Figure 2. Early tuber symptoms. Vascular tissue has a glassy, watersoaked appearance. © Fera Science Ltd.

Figure 3. Bacterial ooze emerging from the vascular ring of an infected tuber. © Fera Science Ltd.

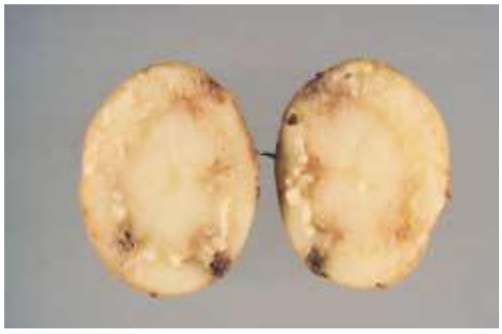

Figure 4. Cheese-like rot of the vascular ring. © Fera Science Ltd.

Figure 5. Later stage of infection, showing extensive tuber rot and breakdown with internal hollowing. © Fera Science Ltd.

Figure 6. Severe infection, shown as cracking and mummification of the tuber. © Fera Science Ltd.

Figure 7. Wilting and yellowing of an infected potato leaf. © Fera Science Ltd.

Distribution

History of introduction/spread

The disease was first described in 1905 in Germany (Appel, 1906), but it is unclear where the disease first originated. *Clavibacter sepedonicus* is generally considered to be associated with cooler climates and has been reported from large areas of North America (Canada and the USA), China, Russia and northern Europe (Elphinstone, 2010). The disease has spread within Europe, with a number of outbreaks recorded in recent years, including in Crete (Greece) (EPPO, 2025; Goumas *et al.*, 2001).

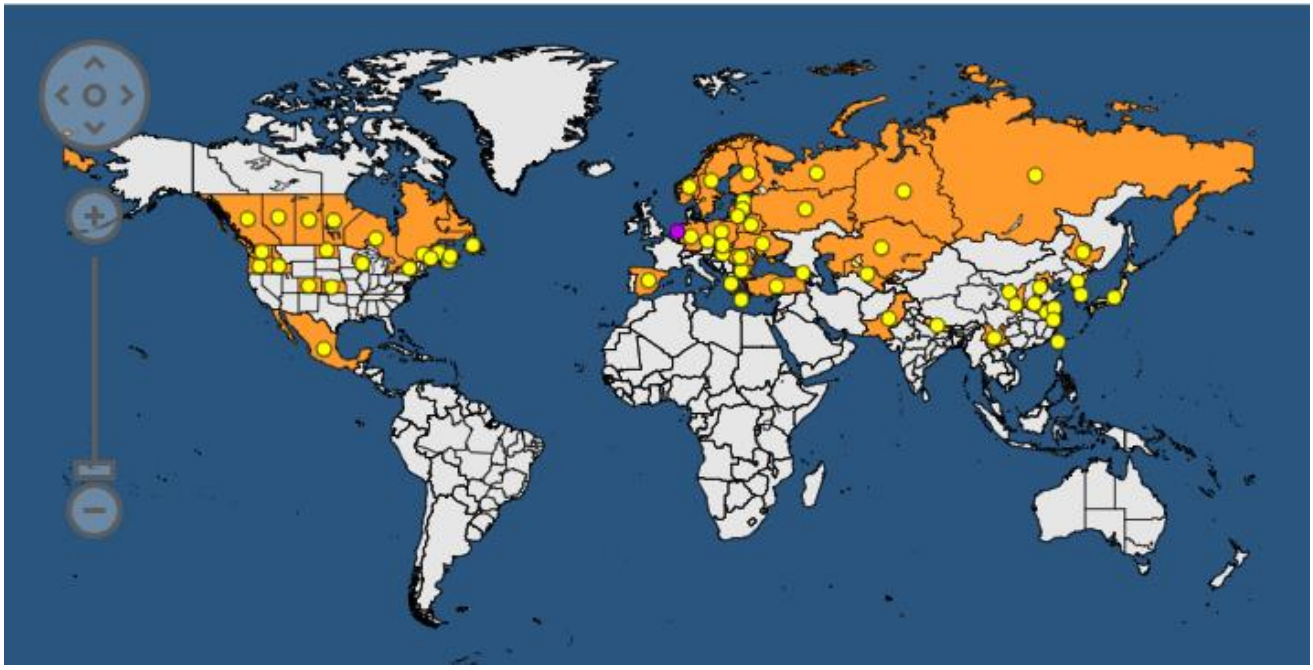

Figure 8. Global distribution of *Clavibacter sepedonicus*. (EPPO, 2025).

Phytosanitary status

Clavibacter sepedonicus is a GB Quarantine Pest. It is also on the EPPO A2 list and is therefore recommended for regulation by EPPO member countries. A full table of country and regional categorisations is provided below:

Table 1. Global categorisations of *Clavibacter sepedonicus* (adapted from EPPO, 2025).

COUNTRY / REGION	List	Year of addition
AFRICA		
Egypt	A1 list	2018
Morocco	Quarantine pest	2018
Tunisia	Quarantine pest	2012
AMERICA		
Argentina	A1 list	2019
Brazil	A1 list	2018
Canada	A2 list	2019
Chile	A1 list	2019
Mexico	Quarantine pest	2018
Paraguay	A1 list	1992
Uruguay	A1 list	1992
ASIA		
Bahrain	A2 list	2003
China	Quarantine pest	2021
Israel	Quarantine pest	2009
Jordan	Quarantine pest	2013
EUROPE		
Azerbaijan	A1 list	2007
Georgia	A1 list	2018
Moldova	Quarantine pest	2017
Norway	Quarantine pest	2012
Russia	Regulated non-quarantine pest	2014
Switzerland	A1 list	2019
Türkiye	A2 list	2016
Ukraine	Regulated non-quarantine pest	2019
United Kingdom	A1 list	2020
OCEANIA		
New Zealand	Quarantine pest	2000
RPPO / EU		
APPPC	A2 list	1988
CAN	A1 list	1992
COSAVE	A1 list	2018
EPPO	A2 list	1975
EU	A2 Quarantine pest (Annex II B)	2019
IAPSC	A1 list	1989

Means of movement into the UK

Solanaceous plants and tubers for planting are prohibited from all third countries other than EU Member States, Liechtenstein and Switzerland (The Plant Health (Phytosanitary Conditions) (Amendment) (EU Exit) Regulations 2020). Seed potatoes entering from the EU must have been produced in the EU or Switzerland from advanced breeding selections, free from GB quarantine pests. Ware potatoes are prohibited from third countries other than Algeria, Bosnia and Herzegovina, Egypt, EU Member States, Israel, Libya, Liechtenstein, Morocco, Serbia, Syria, Switzerland, Tunisia and Türkiye. Given that *C. sepedonicus* is present across most of Europe, there is potential for the disease to enter via potato plants for planting, seed and ware potatoes from European countries. In 2017 and 2018, the UK had interceptions of *C. sepedonicus* on ware potatoes (var. Innovator) from Poland, where the bacterium is present at high levels in localized areas.

Control

There are currently no forms of biological or chemical control for *C. sepedonicus*, and there are no varieties that are resistant to the disease (EPPO, 2025). Some American varieties have been classed as tolerant, but these are not now widely used and are not encouraged because they may act as symptomless carriers of the disease (CABI, 2023; EPPO, 2025).

The main form of control is exclusion. *Clavibacter sepedonicus* free stock can be established via micro propagation under aseptic conditions and laboratory testing (CABI, 2023). When obtaining disease free material, use of certification schemes, sourcing of material from reputable suppliers, laboratory testing, and good record keeping, are recommended (EPPO, 2025). Monitoring of crops and tubers for symptoms is also advised.

Appropriate sanitation procedures are also important for minimising introduction and spread of the disease, and these include advice to:

- Avoid sharing machinery, equipment, containers and vehicles where possible to avoid the spread of the disease by contact. Likewise, avoid the use of picker type planting machinery.
- Clean and disinfect machinery, equipment, containers, vehicles and storage facilities regularly. Appropriate disinfectants include quaternary ammonium compounds and chlorine (bleach) (EPPO, 2025).
- Careful handling of potatoes to avoid any damage, as wounds can act as an entry point for the disease (Elphinstone, 2010). Similarly, whole rather than cut seed tubers should be used (CABI, 2023).
- Avoid planting on infected land/implement a crop rotation (CABI, 2023).
- Avoid using the same machinery for grading/processing of different tuber lots to prevent cross-contamination (Elphinstone, 2010).

- Remove volunteer plants, which can act as reservoirs for the disease (Elphinstone, 2010).
- Dispose of waste appropriately, using deep burial, incineration or other approved methods (Inglis *et al.*, 2013).
- Disinfect and change wash water between different tuber lots, as contaminated wash water has been shown to transmit the disease (Elphinstone, 2010).
- Plant seed tubers from different sources separately where possible to avoid any cross-contamination (Inglis *et al.*, 2013).

Phytosanitary measures

See section 4.

Impact

Crop losses of 50 and 47% have been reported from the USA and Russia respectively (Easton, 1979; Muller and Ficke, 1974). Crop losses of 30% have also been recorded from France (Lansade, 1950), but generally infection and loss is lower in the EPPO region because seed tubers are usually not cut and picker type style planters are not used, minimising spread of the disease (EPPO, 2025). In addition to direct yield losses, economic losses are also incurred through cleaning, disinfection, waste disposal and the purchasing of new seed material, as well as the loss of certification status (CABI, 2023).

A cost benefit analysis conducted by Defra in 2000 showed that the benefit: cost ratio of excluding *Clavibacter sepedonicus* from England was 29.8: 1 over a 30 year period (Elphinstone, 2010).

9. References

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