1. *Content of the 'Topic Description' document*

1.1. Topic area

Pest vector biology, epidemiology, taxonomy

1.2. Links to the Euphresco Strategic Research Agenda

The topic addresses the following objective(s) of the 2017-2022 Euphresco Strategic Research Agenda *(Please keep only relevant objectives)*.
☒ Objective 2017-R-1.1: to improve knowledge on the biology, epidemiology and ecology of priority invasive and (re)emerging pests
☒ Objective 2017-R-1.2: to support taxonomic research for the unambiguous identification of pests
☒ Objective 2017-R-5.4: to test and validate the use NGS (e.g. whole genome sequencing, metagenomics, deep sequencing, typing by sequencing) for routine diagnostics

1.3. Topic title

Taxonomy and epidemiology of *Pectobacterium* and *Dickeya* spp, in Europe, North America and South Africa

1.4. Description of the problem the research should solve

Pectobacterium and *Dickeya* are important bacteria that can cause soft rot on a wide range of host plants. Besides soft rot they are associated with other plant diseases as well (e.g. blackleg of potato). Although these bacterial species are not regulated within the European Union, some third countries do have specific requirements regarding the absence of these bacteria on plant material.
Symptoms caused by different *Pectobacterium* and *Dickeya* spp. are mostly indistinguishable. Surveys performed in potato in many different countries revealed changing dominant species in time and place. Together with recent changes in the taxonomic position of many *Pectobacterium* and *Dickeya* strains, these factors make it hard to get a good understanding of the epidemiology of these soft rot pathogens. This is further complicated by the lack of specific tests that can accurately identify each individual member of the large and diverse group of *Pectobacterium* and *Dickeya* genera down to their species or subspecies level.
Accurate taxonomic determination is necessary to perform good epidemiological studies and to take the right measures to restrict pathogen spread. This study will focus on the proper determination and characterization of *Pectobacterium* and *Dickeya* strains collected in surveys throughout Europe, North America and South Africa in the last decade. Further, we will aim at developing and/or validating tools for detection and identification of (new) *Pectobacterium* and *Dickeya* species.

1.5. Description of the expected results

Characterization of strains collected in surveys in different countries in and outside Europe from various hosts and from waterways will be performed. This will be done using TaqMan real-time PCR, core genome multi locus sequence typing and phenotypic characterization and will allow us to determine the (genetic) relationship between the collected *Pectobacterium* and *Dickeya* strains.
Further, virulence tests will be performed on sets of strains from different surveys selected based on their phylogenetic relationship. This, in combination with whole genome sequencing, will lead to more detailed information on the epidemiology of these bacteria. From some of the newly described *Pectobacterium* and *Dickeya* species, it is not known if they can cause disease in potato from an infected seed tuber, nor if they can be transmitted by seed tubers. This will be checked in small field tests.

Additionally, identification of *Pectobacterium* and *Dickeya* strains using MALDI-TOF MS is currently ongoing and will be combined with the sequencing information to help in quick and specific identification of the different strains in the future.
Since *Pectobacterium and Dickeya* species appear to use different genetic tools to overcome plant host barriers, sequencing information and data on host specificity will be combined to search for (a set of) genes that are linked to the ability of different strains to infect specific hosts. This will hopefully allow for better prediction of possible hosts for strains that will be isolated in the future.

1.6. Beneficiaries of this research product

National Plant Protection Organization, National Reference Laboratories, *etc*.

1.7. Research funders and research contribution/ distribution

Funding organisation	Research activity and researchers involved
1. Netherlands Food and Consumer Product Safety Authority (NVWA), the Netherlands Martijn Schenk m.schenk1@nvwa.nl	-Project coordination; -Sequence and analyse +/- 50 strains collected in NL in the last 10 years; -Application of MALDI-TOF MS; Contact person: Chiel Pel E.mail address: m.j.c.pel@nvwa.nl
2. Flanders Research Institute for Agriculture, Fisheries and Food (ILVO), Unit Plant Sciences, Belgium Kris de Jonghe kris.dejonghe@ilvo.vlaanderen.be	-Validation of already designed TaqMan real-time PCR and LAMP tests for *P. brasiliense*; -Seed tuber transmission of newly identified species; -Contribution to strain collection and WGS; -Pectate lyase barcodes; Contact person: Johan van Vaerenbergh E.mail address: johan.vanvaerenbergh@ilvo.vlaanderen.be
3. Canadian Food Inspection Agency, Canada Loren Matheson loren.matheson@canada.ca	-Contribution to be detailed; Contact person: Sean Li E.mail address: Sean.li3@canada.ca
4. Danish AgriFish Agency, Denmark Mogens Nicolaisen mn@agro.au.dk	-Collect strains in survey on potato; Contact person: Lars Bødker E.mail address: lab@seges.dk
5. Norwegian Institute of Bioeconomy Research, Norway Hanne Skomedal Hanne.Skomedal@nibio.no	-Contribution to be detailed; Contact person: May Bente Brurberg E.mail address: May.Brurberg@nibio.no Contact person: Juliana Perminow E.mail address: juliana.perminow@nibio.no
6. École Nationale Supérieure Agronomique El Harrach, Algeria	-Contribution to be detailed;

Samia Laala slaala@hotmail.com	Contact person: Samia Laala E.mail address: slaala@hotmail.com
7. Natural Resources Institute Finland, Finland Yeshitila Degefu yeshitila.degefu@luke.fi	-Survey and monitoring of *Dickeya* and *Pectobacterium* species in Finland; -Study the pathogenicity of the newly identified species on potato in Finland; -Characterization of strains of *Dickeya* and *Pectobacterium* species collected in Finland over the last 15 years; -Validation of the TaqMan real-time tests; Contact person: Yeshitila Degefu E.mail address: yeshitila.degefu@luke.fi
8. French Federation of Seed Potato Growers, France Valérie Hélias valerie.helias@fnpppt.fr	-Contribution to be detailed; Contact person: Valerie Helias E.mail address: valerie.helias@fnpppt.fr
9. Agricultural Research Organization, Volcani Center, Israel Iris Yedidia irisy@volcani.agri.gov.il Leah Tsror tsror@volcani.agri.gov.il	-Characterize strain collected in Israel and from import material with TaqMan real-time PCR; -Study effect of field conditions on disease development; Contact person: Leah Tsror E.mail address: tsror@volcani.agri.gov.il Contact person: Iris Yedidia E.mail address: irisy@volcani.agri.gov.il
10. NAK, the Netherlands Miriam Kooman mkooman@nak.nl	-Contribution to be detailed; Contact person: Miriam Kooman E.mail address: mkooman@nak.nl
11. University of Gdansk, Poland Ewa Lojkowska ewa.lojkowska@biotech.ug.edu.pl	-Collection of strain of *Dickeya* and *Pectobacterium*; -Genomic and phenotypic characterization of collected strains; -WGS and analysis of the regulation of the expression of virulence factors; -*Dickeya* and *Pectobacterium* survival in water; -Application of cold plasma for bacteria eradication; Contact person: Ewa Lojkowska E.mail address: ewa.lojkowska@biotech.ug.edu.pl
12. University of Pretoria, South Africa Jacquie van der Waals jacquie.vanderwaals@up.ac.za	-Virulence tests with set of representative strains; Contact person: Jacquie van der Waals E.mail address: jacquie.vanderwaals@up.ac.za

13. James Hutton Institute, United Kingdom Ian Toth ian.toth@hutton.ac.uk	-Contribution to be detailed; Contact persons: Ian Toth E.mail address: ian.toth@hutton.ac.uk Contact persons: Sonia Humphris E.mail address: sonia.humphris@hutton.ac.uk

1.8. Research project partnership outside Euphresco

Euphresco funding ensures a certain level of transnational collaboration among Euphresco member countries. It is possible, if the funding consortium is interested, to contact funding organisations or research groups outside the geographical area covered by Euphresco members. The Euphresco coordinator could advertise the research topic in order to have an enlarged collaboration. If funders are interested in this possibility, please check the case below:

☐ The funding consortium of the topic mentioned in section 1.2 requires that the topic is advertised outside the Euphresco network

Information to define the profile of sought partners could be useful (but not mandatory): country/region (if there are preferences), skills/expertise required, etc.

1.9. Any other relevant information on content

2. *Euphresco management aspects of the project*

1.1. Indication of the topic budget

Funding organisation [a]	Mechanism [b]	Total Budget [c]
1. NVWA (NL)	NC	€20.000 (in kind)
2. ILVO (BE)	NC	€10.000
3. CFIA (CA)	TBC	€ TBC
4. DAFA (DK)	TBC	€ TBC
5. NIBIO (NO)	TBC	€ TBC
6. ENSA (DZ)	TBC	€ TBC
7. LUKE (FI)	NC	€30.000
8. FN3PT (FR)	NC	€20.000 (in kind)
9. ARO (IL)	TBC	€ TBC
10. NAK (NL)	NC	€20.000 (in kind)
11. UG (PL)	NC	€20.000
12. UP (ZA)	TBC	€ TBC
13. JHI (GB)	TBC	€ TBC
total		€

1.2. Expected duration of the project (only for non-competitive topics)

24 months

1.3. Identification of project coordinator

Has the research project coordinator been identified?

☒ Yes
☐ No

1.4. Any other relevant information on topic organisation and management

[a] First member is project coordinator. A minimum of two partners are necessary for each proposal. Add lines as needed.
[b] Please indicate the preferred mechanism (e.g. real pot RP; virtual pot VP; non-competitive NC), or several mechanisms if there is flexibility.
[c] Optional, as this amount can still change in the next phase. In-kind contribution should also be indicated in this column.