1. Content of the 'Topic Description' document

1.1. Topic area

Pest/vector biology, epidemiology, taxonomy.

1.2. Topic title

Xylella fastidiosa and its insect vectors Cicadella.

1.3. Description of the problem the research should solve

Xylella fastidiosa is a bacterial pathogen recently detected in association with olive trees showing rapid decline in Southern Italy. More recently, another strain of *X. fastidiosa* has been detected initially on a few ornamental plants (*Polygala myrtifolia*) in Corsica (France) but now on a greater number of hosts including *Quercus suber* (Cork Oak). Furthermore, several *Coffea* plants originated from Central and South America contaminated by *X. fastidiosa* have been intercepted by official services from European countries (Germany, The Netherlands, France, Switzerland and Italy) (EPPO 2012; Legendre *et al*., 2014; Bergsma *et al*., 2015). Strains of this bacterium are endemic in the Americas and cause economically important diseases including phony peach disease (PPD), plum leaf scald, Pierce's disease (PD) of grapes, citrus variegated chlorosis (CVC), and leaf scorch of almond, coffee, elm, oak, oleander, pear, and sycamore. Moreover, *X. fastidiosa* has been described on grape and almond in Iran (Amanifar *et al.*, 2014) and many other agricultural, ornamental, forest and urban tree species are suspected in different countries to be susceptible to infection expressing leaf scorch and wilting. As of November 2015, 359 host species have been confirmed.

Under natural conditions the bacterium is transmitted by xylem sap-feeding insects belonging to the order Hemiptera, sub-order Auchenorrhyncha. The transmission of *X. fastidiosa* by insects does not require a latent period and the bacteria are persistently transmitted. Vectors (both nymphs and adults) acquire the bacteria by feeding on the xylem fluid of an infected plant and transmit the pathogen to healthy plants immediately after acquisition. Bacteria are restricted to the foregut and do not systemically infect the insect body. Newly emerged adults must feed on an infected plant to become infectious and spread *X. fastidiosa*. Once infected, adult vectors can transmit during their whole lifetime, as bacteria multiply and persist in the vector foregut. Adults are the main factor for *X. fastidiosa* spread.

While the vectors of the disease are relatively well known in South and North Americas, our knowledge needs to be improved in the European countries where the disease has been recently detected. Initially, the meadow spittlebug *Philaenus spumarius* (L.) (Hemiptera: Aphrophoridae) was the only species found in Salento identified as a vector of *X. fastidiosa* (Saponari *et al*., 2014). Subsequently the species *Neophilaenus campestris* (Aphrophoridae) and *Euscelis lineolatus* (Cicadellidae) were also identified as potential vectors (Elbeaino *et al*. 2014). It is interesting to highlight that the *E. lineolatus* is a phloem-feeder insect. Moreover, vectors or potential vectors are considered 'spy insects' because they can reveal the presence of the pathogen before symptoms development (Ben Moussa *et al*., 2015; 2016). However it is important to realise that this is an evolving area where the number of hosts and associated potential vectors (*Cicadellidae, Aphrophoridae, Cercopidae* and possibly *Cicadoidae*) are rising.

A UK review of xylem feeding bugs which could potentially serve as *X. fastidiosa* vectors was conducted by Chris Malumphy (January 2014). He found that there are 16 species found in the UK that feed on the xylem (listed below). The majority breed on herbaceous plants (including hosts of *X. fastidiosa*). However, the adults of several species often feed on a wider host range than the nymphs.

Aphrophora alni is a very common species across the UK, and feeds on a wide range of trees and bushes.

Cicadellidae – 7 species
Euscelis lineolatus (potential vector according to Elbeaino *et al*., 2014)
Cicadella lasiocarpae Ossiannilsson
Cicadella viridis (L.), very common species
Graphocephala fennahi Young
Evacanthus acuminatus (Fabricius)
Evacanthus interruptus (Linnaeus)
Anoterostemma ivanoffi (Lethierry)

Aphrophoridae – 9 species
Aphrophora alni (Fallen)
Aphrophora major Uhler
Aphrophora pectoralis Matsumura
Aphrophora salicina (Goeze)
Neophilaenus campestris (Fallen) (potential vector according to Elbeaino *et al*., 2014)
Neophilaenus exclamationis (Thunberg)
Neophilaenus lineatus (Linnaeus)
Neophilaenus longiceps, very common species

Cercopidae – 1 species
Cercopis vulnerata Rossi

There is a need for the evaluation of methods to reliably sample for vector species in the environment both to aid their study but also to potentially provide a sentinel sampling network. Currently a modified sweep net and sticky traps are utilised in Italy but other methods may provide lower input options for routine monitoring. Associated with the later application is the need to reliably detect *X. fastidiosa* in the vector. This will be considered as part of the Euphresco project 2015-F-146 where they have already evaluated the use of real-time PCR on insect heads and the *Xylella* screen glow kit on whole individual insects which utilizes real-time LAMP assay (Yaseen *et al*., 2015) real-time PCR. The use of dPCR to detect *Xylella* in vector is proposed in Euphresco project 2016-A-215. A non-destructive DNA extraction method for detecting *X. fastidiosa* in insects by real time LAMP has been developed in order to proceed to the identification only of the infected insects after analysis (Yaseen *et al*., 2015).

1.4. Description of the expected results:

- Survey of potential vector species associated with *X. fastidiosa* hosts.
- Evaluation of sampling methods for vector species in the environment.
- Development of real-time assays for known and suspected vector species (including North American species) to provide taxonomic support (especially nymphs) and rapid sample screening.
- Improvement of the real time LAMP detection method of *X. fastidiosa* in potential vectors.
- Validation of the non-destructive DNA extraction methods already developed in potential vectors.
- Improvement of the non-destructive extraction methods to other insect which may harbour the bacterium.
- Potential cultural and chemical control methods related to vector lifecycle.

The activities undertaken in this project will have links to, or build on the following projects:

- Euphresco 2015-B-115: The biology and epidemiology of *Candidatus* Liberibacter solanacearum and potato phytoplasmas and their contribution to risk management in potato and other crops.
- Euphresco 2015-F-146: Harmonized protocol for monitoring and detection of *Xylella fastidiosa* in its host plants and its vectors.
- Euphresco 2016-A-215: Improvement of diagnostics of quarantine pathogens by digital PCR.
- EU H2020 project POnTE.

1.5. Beneficiaries of this research product

- National Plant Protection Organisations.
- EPPO and its members (validated diagnostic protocols; information contributing to EPPO PRAs).
- IPPC and its members
- Farms, Nurseries, Industry and other stakeholders.
- National and EU policy makers.

1.6. Euphresco members with proposal for content contribution/ distribution

Funding organisation	Research activity and researchers involved
1. Science and Advice for Scottish Agriculture, Great Britain David Kenyon David.Kenyon@sasa.gsi.gov.uk	-Survey of potential vector species. -Development of real-time assays. -Detection of *X. Fastidiosa* in vectors -Interest in sampling methods. Contact person: Katherine Lester Katherine.Lester@sasa.gsi.gov.uk
2. Ministry of Agriculture and Forestry Environment and Water Management, Austria Sylvia Bluemel sylvia.bluemel@ages.at	-Evaluation of sampling methods. -Survey of potential vector species. -Detection of XF in vectors. -Method validation. Contact person: Richard Gottsberger richard.gottsberger@ages.at Contact person: Gudrun Strauss gudrun.strauss@ages.at Contact person: Helga Reisenzein helga.reisenzein@ages.at
3. Institute National de la Recherche Agronomique, France Thierry Candresse thierry.candresse@bordeaux.inra.fr	-Contribution to be detailed Contact person: Marie-Agnès Jacques Marie-Agnes.Jacques@angers.inra.fr
4. Federal Ministry of Food and Agriculture, Germany Bettina Beerbaum Bettina.beerbaum@bmel.bund.de Silke Steinmöller Silke.steinmoeller@julius-kuehn.de	- Evaluation of sampling methods. - Survey of potential vector species. - Detection of *Xylella fastidiosa* in Auchenorrhyncha. Contact person: Michael Maixner michael.maixner@julius-kuehn.de

5. Ministry of Agriculture, Hungary George Melika MelikaG@nebih.gov.hu	-Contribution to be detailed
6. CIHEAM-Istituto Agronomico Mediterraneo of Bari, Italy Anna Maria D'Onghia donghia@iamb.it	-Improvement of real time LAMP detection method of *X. fastidiosa* in potential vectors. -Validation of the non-destructive DNA extraction methods already developed in potential vectors. -Improvement of the non-destructive extraction methods for its application to other insect species. Contact person: Thaer Yaseen y.thaer@iamb.it
7. Ministry of Agriculture, Forestry and Food, Slovenia Ms. Erika Orešek Erika.oresek@gov.si	-Exchange of information on screening for known and potential vectors of *Xylella fastidiosa* -Exchange of information on determination of population dynamics of *Philaenus spumarius* on selected locations Contact person: Tanja Dreo tanja.dreo@nib.si
8. Department for Environment, Food and Rural Affairs, United Kingdom Belinda Phillipson (Funder) belinda.phillipson@defra.gsi.gov.uk	-Contribution to be detailed Contact person: John Elphistone john.elphinstone@fera.co.uk
9. Agricultural University of Tirana, Albania Magdalena Cara mcara@ubt.edu.al	-Survey of potential vector species. -Methods validation. Contact person: Prof. Jordan Merkuri email: jordanmerkuri@gmail.com Contact person: Prof. Rexhep Uka Email: rexhepuka@yahoo.com
10. University of the Balearic Islands, Spain Miquel Angel Miranda Chueca ma.miranda@uib.es	-Contribution to be detailed Contact person: Miguel Ángel Miranda Chueca ma.miranda@uib.es

1.7. 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 to advertise the topic outside the Euphresco network*

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

1.8. Any other relevant information on content

Attention should be given to the fact that many projects are on proposition within other European calls so that could have overlaps between them and Euphresco.

2. Euphresco management aspects of the project

2.1. Indication of the topic budget

Member [a]	Mechanism [b]	Total Budget [c]
1. SASA (GB)	NC	€ 44 000
2. AGES (AT)	NC	€ 32 250
3. INRA (FR)	NC	€ 20 000
4. BMEL (DE)	NC	€ 5 000
5. NEBIH (HU)	NC	€ 3 000
6. CIHEAM-IAMB (IT)	NC	€ 10 000
7. MKGP (SI)	NC	€ 6 000
8. Defra (GB)	NC	€ 65 600
9. AUT (AL)	NC	€ 1 000
10. UiB (ES)	NC	€ 2 362.50
Total		€ 189 212.5

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

24 months.

2.3. Any other relevant information on topic organisation and management

SASA are consortium members of Euphresco projects B-115, F-146 and A-215 as well as partners in the EU funded POnTE project.

[a] First member is Research 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.