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

### 1.1. Topic area

Diagnostics, field detection, surveillance

### 1.2. Links to the Euphresco Strategic Research Agenda

The topic addresses the following objective(s) of the 2017-2022 Euphresco Strategic Research Agenda

☒ Objective 2017-R-1.1: to improve knowledge on the biology, epidemiology and ecology of priority invasive and (re)emerging pests

☒ Objective 2017-R-2.2: to expand knowledge on transmission of disease and pathogens for healthy planting material

☒ Objective 2017-R-4.4: to test and validate the use of environmental DNA (eDNA) analysis in inspection and surveillance activities

### 1.3. Topic title

Insights into the biology of tomato brown rugose fruit virus*:* virus survival in soil

### 1.4. Description of the problem the research should solve

Tomato brown rugose fruit virus is an emerging tobamovirus that was first observed in 2014 and 2015 on tomatoes in Israel and Jordan. Since, outbreaks of the virus have been reported from other Middle East countries but also from the EPPO region and North America. The virus causes major concerns for growers of tomato and pepper as it reduces the vigour of the plant, causes yield losses and virus symptoms make the fruits unmarketable. The virus is recommended for regulation (EPPO A2 list) and regulated in the EU (Emergency measures, 2019).

Tobamoviruses can survive outside of the host on inert and biological surfaces as well as in nutrient film solutions and soil for months without losing their virulence (EPPO, 2020; Li *et al*., 2016; Smith *et al*., 2019). The ability to survive in the soil or on plant debries allows microorganisms to maintain a viable inocula between cropping seasons, through crop rotations, or during periods when conditions are unfavorable for infection of the host. Therefore, turing the soil into a potentially long-term resevoir of viable inocula. Studies on the survival of tomato brown rugose fruit virus have been ongoing in Israel (EPPO, 2020), but additional information should be collected considering the type of soil, the environmental conditions, the crop cultivated and the management practices, *etc*.

The goal of the project is to increase knowledge on the survival of tomato brown rugose fruit virus in soil in order to achieve a better management. It is expected that the project makes links with relevant national and international research initiatives such as the Euphresco project 2019-C-326 'Soil-borne plant pathogens survival in soil', the Euphresco project 2019-A-324 'Reliable detection of pathogens in soil' and others.

### 1.5. Description of the expected results

The project will develop new knowledge on the survival of tomato brown rugose fruit virus in soil in different agro-ecological and pedoclimatic conditions. Survival in composting will also be considered. The project will validate tests for the diagnosis of the tobamovirus in soil and compost (including eDNA approaches) and will develop management guidelines. The project will be divided into three main work packages:

i) The detection of ToBRFV from soil/substrates
ii) The survival of TobRFV in plant debris in soil/substrates
iii) Eradication of ToBRFV in plant debris and soil

### 1.6. Beneficiaries of this research product

The project will benefit policy makers (research evidence to support regulation), farmers and nurseries (research evidence to support management).

### 1.7. Research funders and research contribution/ distribution

In the framework of the CIHEAM/Euphresco initiative on the Plant Health research priorities for the Mediterranean region[1], the following organizations have preliminarily expressed an interest to be involved in a research project on tomato brown rugose fruit virus.

| Funding organisation | Research activity and researchers involved |
|---|---|
| 1. Department of Environment, Food and Rural Affairs, United Kingdom<br><br>Jasmine Burr-Hersey<br>Jasmine.Burr-Hersey@defra.gov.uk | -Project management and coordination;<br>-Investigations on survival and eradication in soil/substrates;<br>-Diagnostic validation (LAMP and RT-real-time PCR);<br><br>Contact person: Adrian Fox<br>E.mail address: adrian.fox@fera.co.uk<br><br>Contact person: Anna Skelton<br>E.mail address Anna.skelton@fera.co.uk |
| 2. Department of Agriculture, Water and the Environment, Australia<br><br>Keira Beattie<br>PHSgovernancegroups@agriculture.gov.au | -To test and validate the use of environmental DNA (eDNA) analysis in inspection and surveillance activities;<br>-Knowledge transfer on environmental sampling, eDNA/eRNA extraction from infected soil;<br>-Development of Standard Operating Procedures;<br>-eDNA/eRNA diagnostic validation, if feasible including hands-on training/technical demonstration;<br><br>Contact person: Uday Divi<br>E mail address: uday.divi@awe.gov.au<br><br>Contact person: Alejandro Trujillo-González<br>E mail address:<br>alejandro.trujillogonzalez@canberra.edu.au |
| 3. Austrian Agency for Health and Food Safety, Austria<br><br>Sylvia Bluemel<br>sylvia.bluemel@ages.at | -Diagnostic validation of the detection of ToBRFV in soil/substrates using RT-real-time PCR;<br>-Investigations concerning the survival of ToBRFV in plant debris in soil/substrates;<br><br>Contact person: Sabine Grausgruber-Groeger<br>E mail address: sabine.grausgruber-groeger@ages.at |

[1] https://www.youtube.com/watch?v=WJ04QW4ImYA

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| 4. Multiplex SpA, Chile<br><br>Bernardo Pollak<br>bpollak@multiplex.bio | -Detection and surveillance of ToBRFV from field samples, using high-throughput sequencing (HTS);<br><br>Contact person: Juan Cristobal Jiménez<br>E.mail address: jjimenez@multiplex.bio<br><br>-Diagnosis by Viroscope.io using HTS data and based on the correlation of viral genome assembly coverage with functional activity of the virus (i.e., replicases);<br>-Diagnostic validation of Viroscope for ToBRSF as certain diagnosis. This activity will be performed through the comparison of HTS results to other molecular tests (RT-PCR; RT-real-time PCR);<br><br>Contact person: Veronica Morgante<br>E.mail address:<br>veronica.morgante@multiplex.bio |
| 5. Federal Ministry of Food and Agriculture, Germany<br><br>Beerbaum, Bettina<br>Bettina.Beerbaum@bmel.bund.de<br><br>Sillke Steinmoeller<br>silke.steinmoeller@julius-kuehn.de | -Spiking of soil material and detection by PCR-based tests;<br><br>Contact person: Heiko Ziebell<br>E.mail address: heiko.ziebell@julius-kuehn.de |
| 6. Science and Advice for Scottish Agriculture, United Kingdom<br><br>David Kenyon<br>David.kenyon@sasa.gov.scot | -Contribution to be detailed;<br><br>Contact person: Carolyn Nisbet<br>E.mail address:<br>Carolyn.nisbet@sasa.gov.scot |
| 7. Department of Agriculture, Food and Marine, Ireland<br><br>Destefanis, Maria<br>Maria.Destefanis@agriculture.gov.ie | -Detection from soil/substrates;<br>-Diagnostics (RT-real-time PCR) validation (TPS);<br><br>Contact person: Manuel Lopez Vernaza<br>E-mail address:<br>manuel.lopezvernaza@agriculture.gov.ie<br><br>Contact person: Rebecca Ham<br>Email address:<br>Rebecca.ham@agriculture.gov.ie |
| 8. Ministry of Agriculture, Plant Biosecurity,Plant Protection and Inspection Services, Israel<br><br>Yael Meller Harel<br>YaelM@moag.gov.il | -Detection from soil/substrates;<br>-Diagnostics (RT-real-time PCR) validation (TPS);<br><br>Contact person: Mouhammad Zeidan<br>E-mail address:<br>Mouhammad.zeidan7@gmail.com |

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| | Contact person: Dorit Shargil<br>E mail address: doritsh@moag.gov.il |
| 9. National Research Council, Italy<br><br>Giuseppe Parrella<br>giuseppe.parrella@ipsp.cnr.it | -Detection of ToBRFV from soil/substrates;<br>-Biological test on tobacco;<br>-Test validation (RT-real-time, RT-PCR, LAMP);<br><br>Contact person: Giuseppe Parrella<br>E mail address: giuseppe.parrella@ipsp.cnr.it |
| 10. Ministry of Agriculture, Food and Forestry Policy, Italy<br><br>Pio Federico Roversi<br>piofederico.roversi@crea.gov.it | -Investigations on survival and infectivity of ToBRFV in soil where infected plants had previously grown;<br>-Test validation (LAMP and RT-real-time PCR);<br><br>Contact person: Laura Tomassoli<br>E.mail address: laura.tomassoli@crea.gov.it<br><br>Contact person: Antonio Tiberini<br>E.mail address: Antonio.tiberini@crea.gov.it |
| 11. Naktuinbouw, The Netherlands<br><br>Harrie Koenraadt<br>H.koenraadt@naktuinbouw.nl | -Validation of RT-real-time PCR detection of ToBRFV in seeds, plants and substrate;<br>-Local lesion test to determine infectivity ('survival') of tobamoviruses;<br>-Validation of diagnostic tests ;<br><br>Contact person: Harrie Koenraadt<br>E mail address:H.koenraadt@naktuinbouw.nl<br><br>Contact person: Ruud Barnhoorn<br>E mail address: r.barnhoorn@naktuinbouw.nl |
| 12. Netherlands Food and Consumer Products Safety Authority, the Netherlands<br><br>Martijn Schenk<br>m.schenk1@nvwa.nl | -Experiments and case-studies to gain insight in on-plant contamination by detectable environmental residues of ToBRFV;<br>-Sharing literature on elimination of ToBRFV/related viruses in soil;<br><br>Contact person: Marleen Botermans<br>E.mail address: m.botermans@nvwa.nl<br><br>Contact person: Anne Giesbers<br>E.mail address: a.k.j.giesbers@nvwa.nl |
| 13. Ministry of Primary Industries, New Zealand<br><br>Aurelie Castinel<br>Aurelie.Castinel@mpi.govt.nz | -Observer ;<br><br>Contact person: Jeremy Thompson<br>E mail address:<br>Jeremy.Thompson@mpi.govt.nz |
| 14. Ministry of Agriculture, Palestine<br><br>Ahmad Fattum | -Sample collection (soil and plant debris) and testing through molecular tests (RT-PCR);<br>-Virus survival in soil; |

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| ahmadfattum@yahoo.com | Contact person: Samer Jarar<br>E.mail address: samer.jarrar@moa.pna.ps<br>samerjarrar72@gmail.com<br><br>Contact person: Rola Sameer<br>E.mail address: rola.mahmoud@moa.pna.ps<br>rola_s_m@yahoo.com<br><br>Contact person: Salamah Shabib<br>E.mail address: salamshbib@gmail.com<br><br>Contact person: Mazen Salman<br>E.mail address: m.salman@ptuk.edu.ps |
| 15. All Russia Plant Quarantine Department, Russia<br><br>Yury Shneyder<br>yury.shneyder@mail.ru | -Testing the possibility of virus persistence in different substrates or soil;<br>-Validation of diagnostic tests;<br><br>Contact Person: Elena Karimova<br>E mail address: Elenavkar@mail.ru |
| 16. Ministry of Agriculture, Forestry and Food, Slovenia<br><br>Erika Oresek<br>erika.oresek@gov.si | -Study of the survival of ToBRFV in soil (sowing seeds and seedlings in soil in which infected plants had previously grown);<br><br>Contact person: Natasa Mehle<br>E.mail address: natasa.mehle@nib.si<br><br>Contact person: Ana Vučurović<br>E.mail address: Ana.Vucurovic@nib.si<br><br>-Virus detection and survival in soil and compost;<br><br>Contact person: Irena Mavric Plesko<br>E.mail address: irena.mavricplesko@kis.si |
| 17. International Seed Federation, Switzerland<br><br>Rose Souza Richards<br>R.SouzaRichards@worldseed.org | -Review of documents (e.g. drafts project plans, protocols, publication paper etc., as needed);<br>-Participation in the selection of molecular tests;<br><br>Contact person: Rose Souza Richards<br>E.mail address:<br>R.SouzaRichards@worldseed.org |
| 18. Ministry of Food, Agriculture and Forestry, Turkey<br><br>Suat Kaymak<br>suatkaymak43@hotmail.com<br>suat.kaymak@tarimorman.gov.tr | -Detection of ToBRFV from soil/substrates;<br>-Survival of TobRFV in plant debris in soil/substrates;<br>- Diagnostic validation (RT-real-time PCR);<br><br>Contact person: Pelin Keleş Öztürk<br>E.mail address:<br>pelin.kelesozturk@tarimorman.gov.tr |

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| | Contact person: Şefika Yavuz<br>E.mail address:<br>sefika.yavuz@tarimorman.gov.tr<br><br>-Investigations on survival and eradication in soil/substrates;<br>-Diagnostic validation (LAMP and RT-real-time PCR)<br><br>Contact person: Serpil Erilmez<br>E.mail address:<br>serpil.erilmez@tarimorman.gov.tr |

**1.8. Research project partnership outside Euphresco**

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

**1.9. Any other relevant information on content**

None.

## 2. *Euphresco management aspects of the project*

### 2.1. Indication of the topic budget

| Funding organisation | Mechanism | Total Budget |
|---|---|---|
| 1. Defra (GB) | NC | € |
| 2. DAWE (AU) | NC | € |
| 3. AGES (AT) | NC | € |
| 4. Multiplex (CL) | NC | € |
| 5. BMEL (DE) | NC | € |
| 6. SASA (GB) | NC | € |
| 7. DAFM (IE) | NC | € |
| 8. MOAG (IL) | NC | € |
| 9. CNR (IT) | NC | € |
| 10. MIPAAF (IT) | NC | € |
| 11. Naktuinbouw (NL) | NC | € |
| 12. NVWA (NL) | NC | € |
| 13. MPI (NZ) | NC | € |
| 14. MoA (PS) | NC | € |
| 15. VNIIKR (RU) | NC | € |
| 16. MAFF (SI) | NC | € |
| 17. IST (Int) | NC | € |
| 18. TARIMORMAN (TR) | NC | € |
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### 2.2. Expected duration of the project (only for non-competitive topics)

36 months

### 2.3. Identification of project coordinator

Has the research project coordinator been identified?

☒ Yes
☐ No

### 2.4. Any other relevant information on topic organisation and management

Whilst Adrian Fox, Fera, will coordinate the project, the complexity of the project and number of partners involved will require work package leads to be identified.