

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-2.2: to expand knowledge on transmission of disease and pathogens for healthy planting material
- Objective 2017-R-5.1: to understand the biological significance of a positive molecular diagnosis
- Objective 2017-R-6.1: to test and validate methods for in situ detection and identification of pests

1.3. Topic title

Validation of molecular diagnostic methods for the detection and identification of tomato mottle mosaic virus (ToMMV)

1.4. Description of the problem the research should solve

In recent decades, diseases caused by emerging viruses have become increasingly important in terms of their economic impact. Currently, the most economically important emerging virus is the tobamovirus tomato brown rugose fruit virus (ToBRFV), which poses a threat to tomato production and to a lesser extent to pepper production. These crops can also be infected by another tobamovirus, tomato mottle mosaic virus (ToMMV), which was first described in Mexico in 2013 (Li *et al.*, 2013) and is since then reported in several other countries¹. Symptoms caused by ToMMV can be severe, but vary depending on factors such as host cultivar and environmental conditions. There is evidence to suggest that *Capsicum* cultivars carrying L1 and L3 resistance genes are resistant to ToMMV, and that the tomato Tm-2² gene is effective against ToMMV. The biological characteristics of tobamoviruses allow them to spread rapidly and give them a high epidemic potential, which can consequently have a significant impact on agriculture.

One critical step in successfully controlling tobamoviruses and preventing further spread is accurate and timely detection of the virus. Molecular tests for the detection and identification of ToBRFV have recently been validated under the EU VALITEST project and the Euphresco 2019-A-327 project. There is also a great need for harmonized and validated protocols for ToMMV. There are several published RT-PCR and real time RT-PCR tests for the detection and identification of ToMMV. In this Euphresco project, it is proposed to organize a Test Performance Study (TPS) to compare the performance of different ToMMV-specific molecular tests. The results of the proposed TPS will provide information on how these tests perform in different laboratories, i.e. on different equipment, with different reagents and with different operators. They will also allow a better assessment of the accuracy and reproducibility of the tests. Tests that may be considered for inclusion in the TPS (note that other new promising tests published or commercially available before the launch of TPS may also be considered) are:

- RT-real-time PCR by Tiberini *et al.*, 2022
- RT-real-time PCR by Fowkes *et al.*, 2022
- RT-real-time PCR of ISHI-Veg (Hiddink *et al.*, 2019 and Woudt, unpublished)

¹ See EPPO Global Database <https://gd.eppo.int/taxon/TOMMV0/distribution>

- RT-PCR by Sui *et al.*, 2017
- RT-PCR by Levitzky *et al.*, 2019 followed by Sanger sequencing of PCR products

1.5. Description of the expected results

The objective of the proposed project is to compare and validate molecular tests that can be used for the detection and identification of ToMMV. The results will support the development of a diagnostic protocol.

1.6. Beneficiaries of this research product

The beneficiaries of this protocol are the tomato and pepper growers, the national plant protection organizations and policy makers.

1.7. Research funders and research contribution/ distribution

Funding organisation	Research activity and researchers involved
1. Ministry of Agriculture Forestry and Food, Slovenia Erika Orešek erika.oresek@gov.si	-Project coordination; -Preparation of RNA samples for TPS; -Coordination of selection of molecular tests included in the TPS; -Organisation of the TPS; -Evaluation of molecular tests based on results from TPS; Contact person: Nataša Mehle E.mail address: natasa.mehle@nib.si Contact person: Ana Vučurović E.mail address: Ana.vucurovic@nib.si
2. Department of Agriculture, Water and the Environment, Australia Keira Beattie PHSgovernancegroups@agriculture.gov.au	-Participation in the TPS; -Participation in selection of molecular tests (the department has validated some ToMMV PCR test protocols); Contact person: Neil Grant E.mail address: Neil.Grant@agriculture.gov.au Contact person: Wes Webster E.mail address: Wes.Webster@agriculture.gov.au
3. Federal Ministry for Agriculture, Regions and Tourism, Austria Sylvia Bluemel sylvia.bluemel@ages.at	-Participation in the TPS; -Provision of material for the TPS (if material of other viruses than ToMMV is needed); Contact person: Sabine Grausgruber-Groeger E.mail address: sabine.grausgruber-groeger@ages.at



<p>4. Variety and seed study and control group, France</p> <p>Valerie Grimault valerie.grimault@geves.fr</p>	<p>-Participation in the TPS; -Participation in selection of molecular tests for the TPS; -Review of documents;</p> <p>Contact Person: Thomas Baldwin E.mail address: Thomas.baldwin@geves.fr</p>
<p>5. Federal Ministry of Food and Agriculture, Germany</p> <p>Bettina Beerbaum Bettina.Beerbaum@bmel.bund.de</p> <p>Silke Steinmüller silke.steinmoeller@julius-kuehn.de</p>	<p>-Participation in TPS; -Assistance with initial identification of tests; - Provision of material for the TPS;</p> <p>Contact person: Heiko Ziebell E.mail address: heiko.ziebell@julius-kuehn.de</p>
<p>6. Department for Environment Food and Rural Affairs, United Kingdom</p> <p>Jasmine Burr-Hersey Jasmine.Burr-Hersey@defra.gov.uk</p>	<p>-Participation in TPS; -Assistance with initial identification of tests;</p> <p>Contact person: Adrian Fox E.mail address: Adrian.fox@fera.co.uk</p> <p>Contact person: Aimee Fowkes E.mail address: Aimee.fowkes@fera.co.uk</p>
<p>7. Ministry of Agriculture, Plant Biosecurity, Plant Protection and Inspection Services, Israel</p> <p>Yael Meller Harel YaelM@moag.gov.il</p>	<p>-Participation in the TPS;</p> <p>Contact person: Ahmed Abu-Ras E.mail address: Ahmada@moag.gov.il</p> <p>Contact person: Mouhammad Zeidan E.mail address: Zeidanm@moag.gov.il</p> <p>Contact person: Tomer Gershon E.mail address: tomerg@moag.gov.il</p>
<p>8. Department of Agriculture Food and the Marine, Ireland</p> <p>Maria Laura Destefanis Maria.Destefanis@agriculture.gov.ie</p>	<p>-Participation in the selection of molecular tests included in the TPS; -Participation in the TPS;</p> <p>Contact person: Rebecca Ham E.mail address: Rebecca.Ham@agriculture.gov.ie;</p> <p>Contact person: Manuel Lopez Vernaza E.mail address: Manuel.LopezVernaza@agriculture.gov.ie</p>
<p>9. Council for agronomic research and economic analysis, Italy</p> <p>Pio Federico Roversi piofederico.roversi@crea.gov.it</p>	<p>-Participation in the TPS; -Participation in the evaluation of molecular tests included in the TPS; -Participation in the evaluation of molecular tests based on results from TPS;</p>



	<p>Contact person: Antonio Tiberini E.mail address: antonio.tiberini@crea.gov.it</p> <p>Contact person: Ariana Manglli E.mail address: ariana.manglli@crea.gov.it</p>
<p>10. National Research Council, Italy</p> <p>Giuseppe Parrella giuseppe.parrella@ipspp.cnr.it</p>	<p>-Participation in the TPS;</p> <p>Contact person: Giuseppe Parrella E.mail address: giuseppe.parrella@ipspp.cnr.it</p>
<p>11. Naktuinbouw, the Netherlands</p> <p>Harrie Koenraadt h.koenraadt@naktuinbouw.nl</p>	<p>-Provision of ToMMV contaminated seeds for TPS; -Provision of ToMMV protocol; -Participation in the TPS;</p> <p>Contact person: Harrie Koenraadt E.mail address: h.koenraadt@naktuinbouw.nl</p> <p>Contact person: Ruud Barnhoorn E.mail address: r.barnhoorn@naktuinbouw.nl</p>
<p>12. Netherlands Food and Consumer Products Safety Authority, Netherlands</p> <p>Martijn Schenk M.Schenk1@nvwa.nl</p>	<p>-Participation in the TPS;</p> <p>Contact person: Anne Giesbers E.mail address: a.k.j.giesbers@nvwa.nl</p>
<p>13. Ministry for Primary Industries, New Zealand</p> <p>Aur�lie Castinel Aurelie.Castinel@mpi.govt.nz;</p>	<p>-Participation in the TPS; -Review of documents (e.g. drafts project plans, protocols, publication paper etc., as needed);</p> <p>Contact person: Catia Delmiglio E.mail address: catia.delmiglio@mpi.govt.nz</p> <p>Contact person: Jeremy Thompson E.mail address: Jeremy.Thompson@mpi.govt.nz</p>
<p>14. All Russian Plant Quarantine Center, Russian Federation</p> <p>Yuri Shneyder yury.shneyder@mail.ru</p>	<p>-Participation in TPS;</p> <p>Contact person: Elena Karimova E.mail address: elenavkar@mail.ru</p>
<p>15. Bioreba AG, Switzerland</p> <p>Marco Kaiser kaiser@bioreba.ch</p>	<p>-Contribution to be detailed;</p> <p>Contact person: E.mail address:</p>
<p>16. International Seed Federation, Switzerland</p> <p>Rose Souza Richards R.SouzaRichards@worldseed.org</p>	<p>-Review of documents (e.g. drafts project plans, protocols, publication paper etc., as needed); -Participation in selection of molecular tests;</p>

	<p>-Provision of ToMMV protocol (to be confirmed); -Provision of material for the TPS (by reaching out to the ISHI seed companies);</p> <p>Contact Person: Rose Souza Richards E.mail address: R.SouzaRichards@worldseed.org</p>
<p>17. US Department of Agriculture, Animal and Plant Health Inspection Service, United States of America</p> <p>Heike Meissner heike.e.meissner@usda.gov</p>	<p>-Participation in the TPS; -Review of documents (e.g. drafts project plans, protocols, publication paper etc., as needed);</p> <p>Contact person: Yazmin Rivera E.mail address: yazmin.rivera@usda.gov</p>

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

Australian commercial seed testing laboratories are expected to collaborate (details to be provided at a later stage).

2. Euphresco management aspects of the project

2.1. Indication of the topic budget

Funding organisation	Mechanism	Total Budget
1. MAFF (SI)	NC	€
2. DAWE (AU)	NC	€
3. AGES (AT)	NC	€
4. GEVES (FR)	NC	€
5. BMEL (DE)	NC	€
6. Defra (GB)	?	€
7. MOAG (IL)	NC	€
8. DAFM (IE)	NC	€
9. CREA (IT)	NC	€
10. CNR (IT)	?	€
11. Naktuinbouw (NL)	?	€
12. NVWA (NL)	NC	€
13. MPI (NZ)	NC	€
14. VNIKR (RU)	NC	€
15. Bioreba (CH)	NC	€
16. ISF (CH)	?	€
17. APHIS USDA (US)	NC	€

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

24 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

None.