

Focus on...Euphresco: European Phytosanitary Research Coordination network

Giovani Baldissera

Co-ordinator of the Euphresco network at the European and Mediterranean Plant Protection Organization



If the countries of the Mediterranean basin face similar problems in relation to agriculture and their ecosystem, these issues are still handled nationally while transnational cooperation will accelerate the development of solutions to protect the environment and support the economy³.

This fragmentation is not limited to the Mediterranean basin, but is a character of the whole of Europe and is based on historical heritage. One solution to improve co-operation is the development of a European Research Area (ERA), an area where ideas, knowledge and people could circulate freely. A lot of work needs to be done to establish this ERA, but some progress has been made since the concept was endorsed at the Lisbon European Council (2000).

Euphresco ERA-NET

ERA-NET schemes have been developed to ease the opening of national and regional research programmes, to strengthen their coordination, and to support joint activities as joint calls for transnational research projects. Among the various ERA-NETs funded so far by the EU Framework Programmes, EUPHRESCO European Phytosanitary Research Coordination ERA-NET (2006-2014) aimed at underpinning European plant health policy and its implementation, sustaining European plant health science capability, optimising the use of limited resources and producing optimal research outputs. In a transition period for the economy (reduced availability of funds), for the phytosanitary field (lack of staff, development of new technologies that have to be mastered) and for the environment (number and complexity of plant pest problems increases every year), EUPHRESCO ERA-NET was seen as an opportunity to 'perform more with less'.

As a network of European (public or non-profit) organisations funding and/or managing national phytosanitary research programmes, Euphresco members have funded a number of research projects of interest for the Mediterranean basin.



More information available at:
www.euphresco.net

Introduction

The five Mediterranean-climate regions of the world (southern and south-western Australia, central Chile, coastal California, Western Cape of South Africa and the Mediterranean basin) occupy less than 5% of Earth's surface yet harbour almost 20% of the total vascular plants¹. The Mediterranean basin in particular is home to 25 000 plant species, of which 13 000 are endemic (i.e. they are found nowhere else on Earth) and it was identified by Myers and collaborators as a biodiversity hotspot experiencing exception loss of habitat². The threats associated with climate change and the increase in global trade open new pathways for the introduction of invasive alien species and the need to tackle plant pests is more important than ever.

¹ Cowling R.M., Rundel P.W., Lamont B.B., Kalin Arroyo M., Arianoutsou M. Plant diversity in Mediterranean-climate regions. *Trends Ecol Evol.* 11(9): 362-6 (1996).

² Myers N., Mittermeier R.A., Mittermeier C.G., da Fonseca G.A., Kent J. Biodiversity hotspots for conservation priorities. *Nature* 403(6772): 853-8 (2000).

³ *Mediterra 2008. The Future of Agriculture and Food in Mediterranean Countries / International Centre for Advanced Mediterranean Agronomic Studies.* – Paris: Presses de Sciences Po, 2008.

Tableau 1*
List of Research projects launched by Euphresco

Country	Organisation
Austria	Ministry of Agriculture and Forestry, Environment and Water Management
Belgium	Federal Public Service Health, Food Chain Safety and Environment
	Institute for Agricultural and Fisheries Research
	Walloon Agricultural Research Center
Bulgaria	Bulgarian Food Safety Agency
Denmark	Ministry of Food, Agriculture and Fisheries, Danish AgriFish Agency, Department of Plants
Estonia	Ministry of Agriculture
Finland	Ministry of Agriculture and Forestry
France	French Agency for Food, Environmental and Occupational Health & Safety
	Ministry of agriculture, agro-food and forestry, General directorate for food
	National Institute for Agricultural Research
Germany	Federal Ministry of Food and Agriculture
Greece	Benaki Phytopathological Institute
Hungary	Ministry of Agriculture
Ireland	Department of Agriculture, Food and the Marine
Italy	Agricultural Research Council
	Ministry of agricultural food and forestry policies
Latvia	Ministry of Agriculture
Lithuania	Ministry of Agriculture of the Republic of Lithuania
Netherlands	Ministry of Economic Affairs, Department of Agroknowledge
Portugal	National Institute for Agricultural and Veterinarian Research
Russian Federation	All-Russian Plant Quarantine Centre
Slovenia	Ministry of Agriculture, Forestry and Food
Spain	National Institute for Agricultural Research and Food Technology
Sweden	Swedish Board of Agriculture
Switzerland	Federal Office for Agriculture
United Kingdom	Department for Environment, Food and Rural Affairs
	Forestry Commission
	Science and Advice for Scottish Agriculture

* The full list of research projects funded so far can be found on the Euphresco website:
<http://www.euphresco.net/projects/portfolio>

The procedure through which research topics are selected for funding has been running for a number of years and it is now consolidated. Each member of Euphresco can propose topic suggestions as national priorities that can be supported by other Euphresco members. If a topic reaches the minimum level of transnational interest (two funders from two different countries) it can be proposed to become an official Euphresco topic. The detailed topic description and the funding mechanism (non-competitive or competitive) for each topic are agreed by the funders behind each topic, and the funders are also involved in the selection of the proposals.

Research organisations in countries represented within Euphresco are eligible for funding. For those countries not yet in the network it is still possible to participate in research projects funded through Euphresco provided that the research activity they propose is in line with the topic objectives set-up by Euphresco funders and that they fund their own research.

Examples of the approximately fifty research projects funded include:

- The project 'Validation of diagnostic methods for the detection and identification of whitefly-transmitted viruses of regulatory or quarantine concern to the EU' (2008-2009) was funded through Euphresco. *Bemisia tabaci* is vector of 111 plant infecting viruses causing severe losses to the horticultural industries in the Mediterranean basin. The emergence of the polyphagous B biotype of *B. tabaci* has given whitefly-transmitted viruses a mode to infect new plant species. The project focussed on real-time and conventional PCR methods for the diagnosis of the following viruses: *Tomato infectious chlorosis virus* (TICV), *Tomato chlorosis virus* (ToCV), *Cucumber vein yellowing virus* (CVYV) and *Cucurbit yellow stunting disorder virus* (CYSDV). Trials were organised among the different laboratories involved in the project to blind-test samples of healthy and infected plant material. The project produced test validation data for the detection and identification of the above viruses which will benefit to National Plant Health Service laboratories and promoted the use of TaqMan real-time PCR as an efficient method for the diagnosis of the viruses.
- During the same period (2008-2009) the project 'Development and validation of innovative diagnostic tools for the detection of fire blight *Erwinia amylovora*' validated methods for strain level genotyping and source tracking of *Erwinia amylovora*, a quarantine bacterium in Europe which is responsible for a devastating disease of apple and pears. The EU-28 is a leading producer of fresh pome fruits and the pest represents then a serious threat to European economy. The development and validation of these methods allows distinction of *Erwinia amylovora* strains from different geographical regions in order to identify inoculum sources. Several genomic markers were identified and evaluated for their potential use in strain genotyping, including genomic rearrangements, Variable Number Tandem Repeat (VNTRs) and plasmid content. VNTRs and plasmid content were determined to have the highest potential for application in pathogen source tracking. High-throughput PCR tests based on the VNTR system and plasmid typing tests were developed and validated for source tracking. Newly available tests such as new PCR assay and real time PCR were reviewed with respect to their performance criteria. The final results of test performance study showed that Isolation, conventional PCR assays according

Llop 1999⁴, Taylor 2001⁵, Stöger 2006⁶ and Obradovic 2007⁷ and real time PCR assay according Pirc 2009⁸ with the tested DNA extraction protocols can be recommended for the analysis of asymptomatic and symptomatic plant material.

- More recently (2014-ongoing) the project 'IPM strategies against *Drosophila suzukii*' was funded to develop integrated control strategies to reduce the huge economic impact of this pest that since the first European record (Spain 2008) has spread through most of the Mediterranean and continues its colonisation towards north and east. Contrary to most of drosophilid flies that oviposit on overripe fruits, *D. suzukii* is able to lay eggs in fresh ripening fruits causing physical damage to the host fruits, that become soft and rot rapidly. Secondary pathogens infections via the oviposition wound can further increase the damage. Furthermore, a high variety of wild fruits are also hosts of the spotted-wing drosophila, thus acting as reservoirs from which the fly can infest cultivated fruits⁹. The current methodologies employed for the control of *D. suzukii* are mainly based on the use of insecticides; however, the range of insecticides is being progressively restricted. In this context, the development of Integrated Pest Management (IPM) solutions for the control of *D. suzukii* is of great importance to reduce the huge economic impact that this fly can potentially exert on European agriculture (damage produced by this pest species can be up to 80% crop loss). The project will improve the knowledge of the biology of the pest species and of the ecological factors that determine the abundance, dispersal and survivorship of field populations. Also, alternative plant protection products which are environmentally safer and with a different mode of action (entomopathogenic microorganisms and the insect growth regulators) to those employed currently will be evaluated. Easy to handle monitoring and trapping devices will be developed.

⁴ Llop, P., Caruso, P., Cubero, J., Morente, C., and López, M.M. A simple extraction procedure for efficient routine detection of pathogenic bacteria in plant material by polymerase chain reaction. *Journal of Microbiological Methods* 37: 23-31 (1999).

⁵ Taylor, R.K., Guilford, P.J., Clark, R.G., Hale, C.N. and Forster, R.L.S. Detection of *Erwinia amylovora* in plant material using novel polymerase chain reaction (PCR) primers. *New Zealand Journal of Crop and Horticultural Science* 29: 35-43 (2001).

⁶ Stöger, A., Schaffer J., Ruppitsch W. A Rapid and Sensitive Method for Direct Detection of *Erwinia amylovora* in Symptomatic and Asymptomatic Plant Tissues by Polymerase Chain Reaction. *J. Phytopathology* 154, 469-473 (2006).

⁷ Obradovic D., Balaz J., Kevresan S. Detection of *Erwinia amylovora* by Novel Chromosomal Polymerase Chain Reaction Primers. *Microbiology* 76 (6), 748-756 (2007).

⁸ Pirc, M., M. Ravnkar, J. Tomlinson, T. Dreo. Improved fireblight diagnostics using quantitative real time PCR detection of *Erwinia amylovora* chromosomal DNA. *Plant Pathology*, 58:872-881 (2009).

⁹ Cini A, Ioriatti C & Anfora G. A review of the invasion of *Drosophila suzukii* in Europe and a draft research agenda for integrated pest management. *Bulletin of Insectology* 65(1):149-160 (2012).

Euphresco durable and self-sustainable network

Since April 2014 Euphresco (www.euphresco.net) is a self-funded phytosanitary network in Europe supported by its members and accountable to them. Recently the network has been recognised by the Working Party of Chief Officers of Plant Health Services (COPHS) as a competent forum to identify phytosanitary research priorities and contacts with the European Commission (DG Research and Innovation) are established to discuss a long-term strategy for research coordination in the field of plant health. If the legal framework in which Euphresco operates has changed, the remit remains the same: to support activities towards transnational research coordination and funding.

Euphresco coordination and secretariat is hosted within the European and Mediterranean Plant Protection Organization (EPPO), an international organisation of 50 member countries which includes within its remit the facilitation of co-operation in research on plant pests. The privileged position of Euphresco coordination being hosted within EPPO has many advantages, among which an increased visibility of the network and preferential relationships with the national plant protection organisations in the EPPO region (which includes several countries of the Mediterranean basin).

Euphresco members set-up the objective to fund a number of research topics every year and they are currently working on the identification of the topics to fund in 2015. The bacteria *Xylella fastidiosa* and 'Candidatus Liberibacter solanacearum', and the nematode *Meloidogyne* spp. are among the priorities identified by Euphresco members as requiring urgent actions.

In mid-October 2013 the National Plant Protection Organisation of Italy reported the first detection of *Xylella fastidiosa* in the Puglia region. A task force has been created in Italy to stop the spread of this new olive tree disease, which represent a very serious threat for the Mediterranean basin and for the larger EPPO region. Euphresco members will be funding a research project aiming at developing rapid and reliable methods for the identification of the bacterium from symptomatic and asymptomatic material. Better understanding of the pest's biology (vectors, host plants) could also help those designing control strategies and elaborating management strategies.

Since its addition to the EPPO Alert List in 2009 *Candidatus L. solanacearum* has been detected in several European countries in carrot crops (and to a lesser extent in celery). *Solanaceous* crops such as potatoes and tomatoes are the main plant hosts of the bacterium which is transmitted through psyllid *Bactericera cockerelli* vectors. Even if there does not seem to be a pathway for transmission from carrots to other plants, it is essential to ensure surveillance in order to prevent and limit the economic impact the pest could have on Mediterranean agriculture. In 2015 Euphresco members are funding a research project to identify transmission pathways, to elucidate the host plant-vectors interactions and to develop control strategies.

Because of its climatic conditions the Mediterranean basin is susceptible to the establishment of both sub-tropical and tropical invasive pests. As an example, the area of distribution of tropical *Meloidogyne* species is evolving towards the European region because of climate change. The nematodes are able to infect about 2000 plant species and are among the most economically damaging plant parasitic nematodes on horticultural and field crops. In 2015 Euphresco members will fund a topic aimed at mapping the distribution of tropical *Meloidogyne* species and at analysing pathways of introduction.

The Mediterranean countries currently represented within Euphresco are Spain, France, Italy, Slovenia, and Greece. As the network is looking for enlargement outside Europe, the possibility to involve organisations in North-Africa and the Middle East is very welcome; having more members advocating joint research to work on regional plant health problems will focus the attention of a wider audience on the Mediterranean plant health and could catalyse the development of solutions to safeguard the agriculture, the environment, and protect the economy.

Bibliography / More information

- Cowling R.M., Rundel P.W., Lamont B.B., Kalin Arroyo M., Arianoutsou M. Plant diversity in Mediterranean-climate regions. *Trends Ecol Evol.* 11(9): 362-6 (1996)
- EPP0. Plant Health Endangered - State of Emergency (Madeira, 2004-09): https://www.eppo.int/STANDARDS/position_papers/madeira.htm
- Myers N., Mittermeier R.A., Mittermeier C.G., da Fonseca G.A., Kent J. Biodiversity hotspots for conservation priorities. *Nature* 403(6772): 853-8 (2000)
- Mediterra 2008. The Future of Agriculture and Food in Mediterranean Countries / International Centre for Advanced Mediterranean Agronomic Studies. - Paris: Presses de Sciences Po, 2008.

New Medit

Based in Italy, this journal is produced under the direction of the CIHEAM-Bari. Agro-food economy, rural systems and environmental issues are the main topics addressed.

Established in 1990, *New Medit* is a quarterly publication. This peer-reviewed journal is evaluated in the "Journal Citation Reports (JCR) Science Edition". The articles are referenced in the "Web of Science Core Collection".

Its peer recognition makes it even more attractive for researchers and scientists in the Mediterranean and elsewhere. Since 2014, the editorial board of *New Medit* has opted for the free access policy by making all articles available online.

Economics, agriculture, and environment are the key words of the subjects dealt with in the review.



You can find all the articles published in the review since 1990 on the official website

newmedit.iamb.it