Fruit Flyer

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FF-IPM in close cooperation with stakeholders

Horizon 2020
European Union Funding
for Research & Innovation

FF•IPM

Fruit Flies In-silico
Prevention & Management
FF•IPM

This is the sixth Newsletter Publication of the EU-funded research project FF-IPM, with the aim to protect fruit production and trade from threats posed by fruit flies.

The newsletter is published quarterly, highlighting the actions, news, progress related to the issue at hand.

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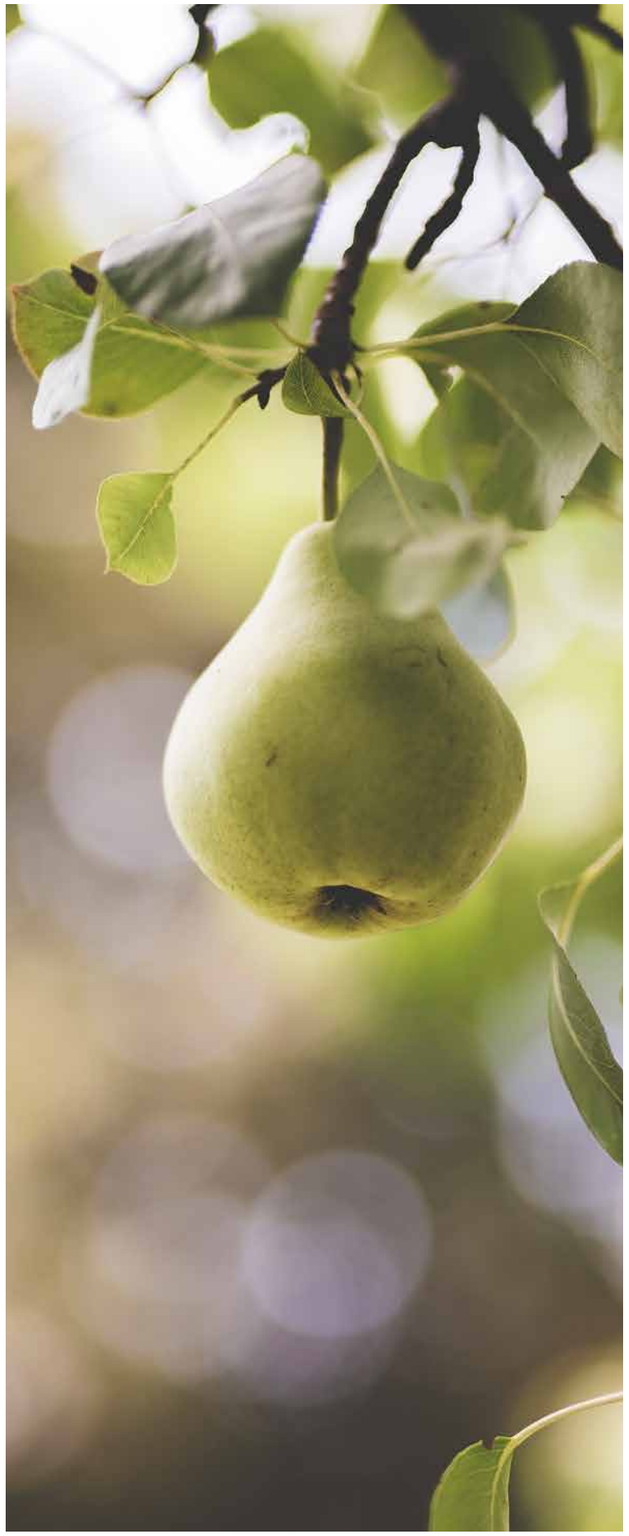

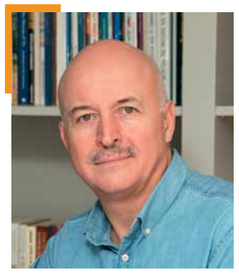

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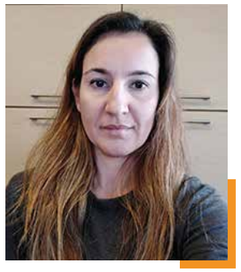


Georgia Pahlitzanakis

FF-IPM Stakeholder Engagement Coordinator

This 6th issue of the FF-IPM newsletter incorporates material from the stakeholders for the stakeholders. As we currently finished the 3rd project year, FF-IPM research has progressed from the experimentation phase to the results phase, and we are very proud that research effort has translated into products and services. As such, we have started presenting our first research outputs, namely the decision support system, climatic maps, prediction models, E-traps and the Kobo fly application, ID Keys and the E-nose (portable electronic nose) to interested stakeholders. In this issue, you can see the result of these discussions which ranged from conversations with farm owners to national plant protection agency staff to industry representatives and research organization staff and university faculty.

Apart from these targeted stakeholder actions, the newsletter includes many contributions with articles of interest from our network of industry experts highlighting the multi-actor dimension of the FF-IPM project. Miriam Silberstein from MOP Zafon contributed an article on the AW-IPM of medfly in Israel, while Vincente Dalmau from the Plant Health and Phytosanitary Protection Service of the Ministry of Agriculture, Fisheries and Food of Alicante-Valencia wrote about methods to control the Mediterranean fruit fly in the Valencian Community. Dimitris Papachristos from partner BPI in his article presents research on surveying fruit flies and Evgenia Makridou from the Hellenic Ministry of Rural Development and Food of the Regional Centre of Quality & Phytosanitary Control of Thessaloniki writes about the challenges faced in phytosanitary inspection. Lastly, Anita Benko Beloglavec, administrative plant health consultant from the Food Safety, Veterinary Sector and Plant Health Division Republic of Slovenia, provides an interesting viewpoint about supporting trade of fruit and vegetables in the CEFTA region.

Our first research outputs, namely the decision support system, climatic maps, prediction models, E-traps and the Kobo fly application, ID Keys and the E-nose (portable electronic nose) have been presented to interested stakeholders

The second part of the interview of Dr. Polychronis Rempoulakis (Entomology Leader at NSW DPI), who gives insights on national action plans for fruit flies in Australia, also continues from the previous issue. Finally, the FF-IPM platform, a powerful tool developed by our project to link services and products developed by our project or other researchers and innovators across the EU to a multitude of end-users, is presented.

This is a very productive time for the FF-IPM project and stakeholder engagement actions represent the cornerstone of facilitating end-users to take up project results.

We hope that you enjoy the material presented in the stakeholder issue of our newsletter and keep tuned in to learn more about our developing research outputs!

Stakeholder's Consultation Workshop

University of Thessaly, Volos | March 24, 2022

Local Organizer: Dr. Nikolaos Papadopoulos (UTH) | Workshop Agenda: From 10:00 to 17:30

FF-IPM PARTICIPANTS

David Nestel (ARO) | Darren Kriticos (Cervantes) | Anna Szyniszewska (CORVUS) | Karol Kozyra (CORVUS) | Helene Delatte (CIRAD) | Vasilis Rodovitis (UTH) | Christos Genitseftsis (UTH)

STAKEHOLDER PARTICIPANTS

21 participants were separated into four (4) sessions. The main structure of each session was the same and the stakeholder participants were divided regarding their interest and field of concentration.

AIM OF THE WORKSHOP

Presentation of the FF-IPM's products, discussion on their needs and how the FF-IPM products can cover them.

1ST SESSION 10:00-11:00 *(phone call)*
Makis Pardalis from K & N Efthimiadis

2ND SESSION 11:00-12:00 *(skype call)*
Amalia Tabaki from Neuropublic

3RD SESSION 12:00-14:00 *(skype call & in person)*

- Antonios Ifoulis from Regional Center for Plant Protection - Quality & Phytosanitary Control in Thessaloniki
- Dimitris Stavridis from Directorate of Rural Economics and Veterinary Medicine - Department of Quality and Plant Health Control in Larisa
- Giannis Rodovitis from GRINN company and UTH
- General managers from FRUEAT-Moudiris

4TH SESSION 16:30-17:30 *(skype call)*
Technical consultants from NOVAGREEN S.A

KEY TAKEWAYS FROM SESSIONS

1ST SESSION - K & N Efthimiadis

- M. Pardalis presented the fields of activity of the company and mentioned that they are trying to initiate a digital platform for a variety of services dealing with fertilization, weather forecasts, irrigation directions and pest and disease alerts, to provide to the farmers and the agronomists a tool which leads to better resource management. The company would like weekly forecasts. Also, there is a need for calibration for pest and disease modeling, due to the fact, that existing models are not effective in all places.
- Participants highlighted the need of being in contact with farmers to convince them to use the platform for making better resource management decisions with less inputs. Also, smart traps and prediction models for pests and diseases could be adapted in the platform.
- Stakeholders highlighted the need of a dual-purpose targeted system which can assure through early detection that an area is free of pests (for the client) and that there are not invasive species. Main pest concerns are C. capitata, B. olea and R. cerasi (emerging risk).
- The biggest problem (for the RPPOs) is the timing of spraying directions to growers. A weekly forecast would be most valuable.
- Having an effective and economical strategy for alerting growers to apply pesticide would be attractive.
- The requirements for providing better direction to growers on timing of sprays was discussed at length and should be taken into account in future FF-IPM work.

2ND SESSION - Neuropublic

- There is an interest in learning more about e-traps, the decision support system for Ceratitis capitata and for the FF-IPM platform. Also, having access to the platform and data regarding Greece is crucial.
- In six months, a dynamic model for predictions on population density will be available.
- Access to the platform and a detailed description of the e-trap will be provided.

3RD SESSION - RPPO's and packing houses

- FF-IPM products will help the farmers to deal with insect issues especially regarding exports.

4TH SESSION - NOVAGREEN S.A

- Stakeholders presented the field of activity of the company and the challenges that they face regarding the early detection of a pest and the appropriate time for interventions. They mentioned that the products of the FF-IPM project will be helpful in pest management.
- Stakeholders indicated the potential for adoption of automated monitoring and forecasting.
- After extensive discussion regarding methods, benefits and cost NOVAGREEN indicated a high interest and probability of using e-traps and as such FF-IPM will set up an e-trap at trial level for the company.

Stakeholder meeting to approve FF-IPM scenarios

D6.3 Scenarios for OFF- and ON-season medfly management

Three separate meetings took place at the experimental pilot sites in Lechonia, Magnesia, Greece, each one with each of the three owners.

The FF-IPM experts presented the FF-IPM management strategy that is based on the PESTonFARM model and the approaches regarding the next two years of experimentation of the FF-IPM project. After analyzing the data that were already collected regarding crop phenology, medfly population trends and socioeconomics, they presented the strategy that is planned to be implemented in the organic farms which deploy mass trapping and other biological methods.

PARTICIPANTS

18/5/2022	18/5/2022	19/5/2022
Kostantinos Ioannou	*Kostantinos Kyriazis*	*Apostolos Chanias*
Nikos Papadopoulos	*Nikos Papadopoulos*	*Nikos Papadopoulos*
Kostas Zarpas	*Kostas Zarpas*	*Kostas Zarpas*
Vassilis Rodovitis	*Vassilis Rodovitis*	*Vassilis Rodovitis*
Parhs Prekas	*Parhs Prekas*	

The farmers replied to several questions regarding:

- technical support of the FF-IPM experts during these last two growing seasons,
- possibility of reduced insecticide applications after the technical support/recommendations of the FF-IPM experts which was based on studying medfly phenology patterns
- availability of each grower to invest his own resources on the mass trapping method and to apply the PESTonFARM model after the end of the FF-IPM program
- the usability of the detailed data collection related to socioeconomics, fruit fly phenology and targeted phytosanitary or other applications.

During the meeting with the owner of the conventional farm, the general discussion was targeted around the Mediterranean fruit fly in the region of the Pilot site. Apart from medfly, the discussion included the limitation of EU policy regarding the reduced pesticides in crops in general. The farmer expressed his concerns about the future of conventional farming, especially about the limited active ingredients of pesticides currently in use and the absence of other well-known and well- established strategies or methods that can provide similar effectiveness in crop protection. The owner expressed his interest to adopt the system and even to purchase some of the materials by himself. He stated several times that his is impressed of the thorough characterization that we have conducted in his farm. He said this characterization is an important tool that helped him understand more regarding the ecological dynamics of his farm.

The owners of the biological farms expressed their interest regarding new strategies such as mass trapping and especially the targeted mass trapping method, which is going to be applied at their farms, following the outputs of D6.3 scenarios. Also, they proposed that more data be collected about medfly soil predators by screening variable landscapes.

Overall, the farmers were extremely positive about the PESTonFARM model and the mass trapping method. They were pleased about the technical consulting that FF-IPM experts provided these last two years. Thus, they did not express any concerns regarding the applications that are going to be applied on their farms. Moreover, all the farmers agreed that they could cover with their own expenses the numerous traps that are required in mass trapping, and they were positively inclined to apply the results of the model after the finalization of the program. They argued that the detailed data collection is of utmost importance. They argued also that the detailed collection of data regarding host phenology, medfly population dynamics and inputs- outputs efforts, provide them with a powerful tool which can prove and guarantee the product quality.

Furthermore, they can use the data and the models to be more targeted and specific in their applications and staff effort. Lastly, the farmers proposed that a series of technical workshops could be organized in the farms for other stakeholders and farmers of the area, for all these stakeholders to be informed and for information to be disseminated about the PESTonFARM and FF-IPM approaches, since these kinds of strategies can be applied in an area-wide scale.

Stakeholder meetings in Central Macedonia, Greece

01/06/2022 | Naousa Greece

At the start of the meeting, Prof. Lang informed that his research work is focused on tree fruit horticulture and physiology, orchard microclimate modification technologies and sweet cherry genetic improvement and bacterial canker research. He mentioned that warm climates in the States have a problem with fruit flies (California, Florida, South Carolina, Georgia and New Jersey). He pointed out that there is a very large Monitoring Network of neighbouring regions (Ontario, NY, Pennsylvania and Michigan) which could be contacted to discuss FF-IPM project developments, common challenges and the future of pest prevention especially dealing with new and emerging fruit flies.

Afterwards, Prof. Papadopoulos presented our FF-IPM progress including the tools and products developed and a discussion regarding the main fruit crops affected in the States by fruit flies followed. These include the sour cherry, apples, peaches, wine grapes and blueberries. Prof. Lang urged us to come in contact with colleagues who work at the MSU entomology department for the continuation of networking activities.

STAKEHOLDER

Gregory Lang
Professor, Department of Horticulture, Michigan State University (Michigan, USA)

STAKEHOLDER

Julien Ruesch
Experimentation Engineer at the Interprofessional Technical Center for Fruits and Vegetables – CTIFL (Bellegarde, France)

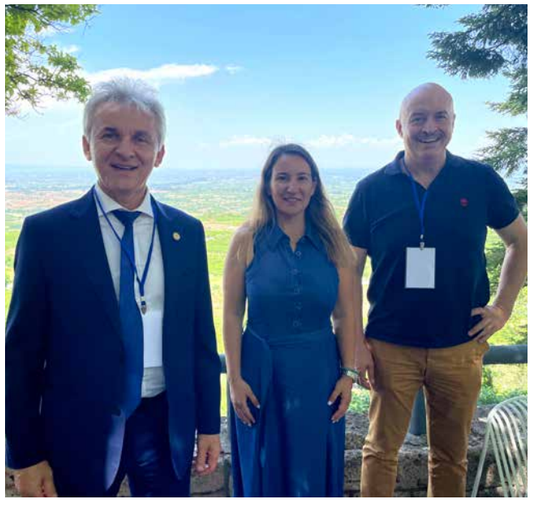
As an introduction, Mr. Julien Ruesch who is an Experimentation Engineer at the Research & Innovation Unit of CTIFL briefly presented CTIFL. He told us that CTIFL is a research and development organization serving the professions of the fruit and vegetable sector, from production to distribution. The CTIFL oversees the control and certification of fruit propagating materials and is located in the heart of the main French fruit and vegetable production areas. The four CTIFL units constitute, in partnership or in association with the regional experimentation stations, an experimentation network unique in Europe. CTIFL is partly financed by stakeholders and partly by the government.

Following this overview of CTIFL, Prof. Papadopoulos presented our work in FF-IPM including the tools and products developed. Mr. Ruesch mentioned that his areas of expertise are not directly connected to phytosanitary issues, but the FF-IPM team will come in contact with colleagues of relevant speciality for the continuation of networking activities.

STAKEHOLDER

Dr. Florin Stanica
Professor, University of Agronomic Sciences and Veterinary Medicine, Faculty of Horticulture (Bucharest, Romania)

In way of an introduction, Prof. Stanica who is a professor at the University of Agricultural Sciences and Veterinary Medicine of Bucharest informed us about his areas of scientific interest and his work on agricultural plant science,



horticulture and food science. He stated on peach production in Romania, where there has been a notable reduction in peach production. He mentioned the national rural development program and the fruit tree program which focuses on blueberries, walnuts, hazelnuts, almonds, sea buckthorn and sweet cherries.

Afterwards, Prof. Papadopoulos presented our work in FF-IPM including the tools and products developed and our interest in interacting with similar research programs.

Prof. Stanica mentioned the university research greenhouse, the integrated fruit growing program established since 1995 and how his university sponsors a Master's degree in integrated technologies in horticulture and organic fruit production.

The meeting finished by Prof. Stanica extending an invitation to our team to come visit UASVM Bucharest to discuss possible networking opportunities with other research projects linked with plant protection initiatives.

STAKEHOLDER

Ioannis Avramidis
Marketing Manager Specialty at Syngenta (Thessaloniki, Greece)

At the start of the meeting, Mr. Avramidis gave us a brief introduction of his work at Syngenta which includes him being responsible for Marketing activities and crop management of all crop protection products for specialty Crops (Top Fruits, Grapes, Olives) for Greece, Cyprus, Albania/ Kossovo and Israel. He discussed the various crop protection products that are handled by Syngenta including for example Karate (broad spectrum insecticide for various insects and fruit flies), AFFIRM Opti (insect control especially lepidoptera), mass trapping techniques (Karate trap c, karate trap b), Trapview electronic trap (for cydia pomonella) etc. He mentioned that Syngenta is interested in pest prevention of fruit flies and drosophila suzuki with mass trapping techniques as well as digital traps systems to be able to reduce the number of insecticide applications to the crops. Especially, in Southern Greece and Crete and in the orchids of Argolida, Korintho and Lakonia fruit flies are a major problem.

Afterwards, Prof. Papadopoulos presented our work in FF-IPM including the tools and products developed. He asked what Mr. Avramidis considers to be the most important issues in effective pest prevention. Mr. Avramidis mentioned (1) the reliability of prediction, (2) marketability/availability of the product and (3) who is using it. Crop management using prediction models is something that holds a lot of merit since new solutions must be found to reduce pesticide use. Furthermore, a pest-on-farm system which can accurately predict the invasion which in turn can give spraying/trapping parameters and cost would be potentially an output that Syngenta could potentially invest resources in developing.

Stakeholder meetings to discuss medfly problem

Two separate meetings took place in Naoussa and Kouloura, Imathias, the main peach producing area of Central Macedonia Greece, with the technical experts of the fruit producing company, FRUEAT – Moudiris and the Agricultural Cooperative of Kouloura respectively.

2/6/2022 | Naousa, Greece

FRUEAT- Moudiris

PARTICIPANTS

Athanasios Moudiris
Pantelis Skouloudis
Vassilis Rodovitis
Ioannis Rodovitis
Nikos Papadopoulos

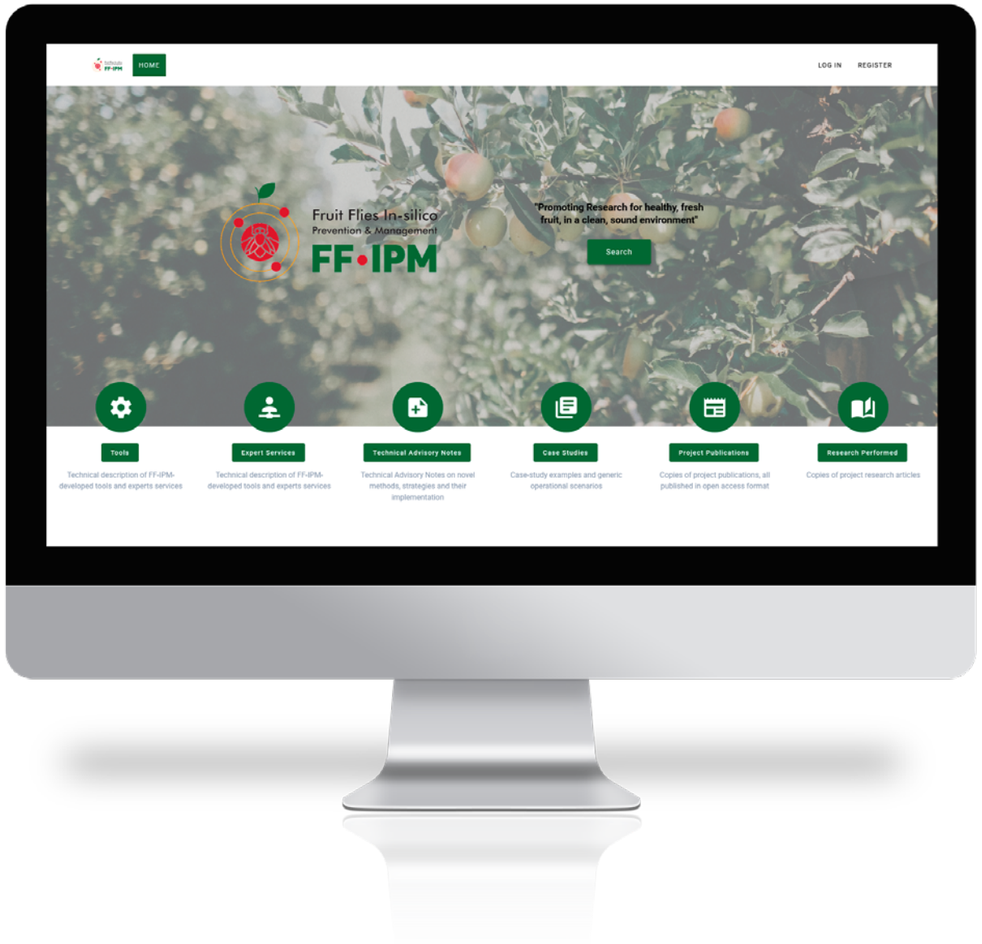
2/6/2022 | Kouloura, Imathias

Kouloura Agricultural Cooperative

Konstantinos Vogiatzopoulos
Efthimia Nestoropoulou
Vassilis Rodovitis
Ioannis Rodovitis
Nikos Papadopoulos

The FF-IPM experts presented the FF-IPM management strategy, the new tools (e-traps and e- nose) and new methodologies that improved during the FF-IPM project and some results regarding the medfly phenology in this specific area.

During the meeting, the technical experts of the companies expressed their interest regarding the new electronic traps. Also, they discussed about the optimum management practices that they can apply to protect their crops from medfly and such Teprhitids. In addition, the panel expressed its concerns about the protocols of imports and exports of several countries worldwide which have set strict regulations to avoid the entrance of invasive species such as the medfly. Finally, several problems regarding other species such as *Halyomorpha halys* were discussed and the FF-IPM experts tried to give solutions to detect and manage them.



The FF-IPM Platform

The FF-IPM Platform is a dynamic web-based foundation for dissemination of technologies, know-how, innovative tools, and expert services, to empower stakeholders across all sectors along the fruit production and processing chain (platform.fruitflies-ipm.eu).

The purpose of this platform is to link services and products developed either by FF-IPM, or other researchers and innovators across the EU and beyond, thus providing technical support to the end-users.

It acts as an easy-to-use, intuitive showcase of the expert services and tools available, allowing visitors to quickly find a tool or service that suits their needs.

The FF IPM Platform consists of six areas (Fig. 1), each describing a specific type of document:

1 Tools
Technical description of FF-IPM-developed tools

2 Expert Services
Technical description of FF-IPM-developed tools services

3 Technical Advisory Notes
Technical advisory notes on novel methods, strategies and their implementation

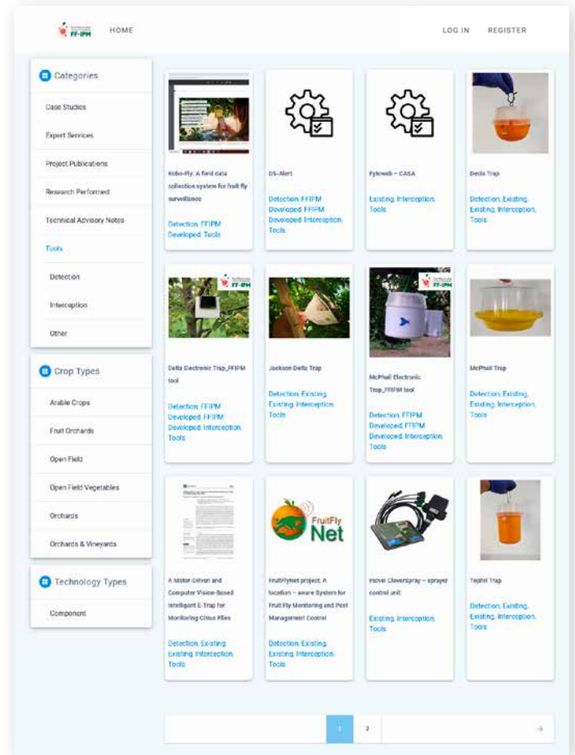
4 Case Studies
Case-study examples and generic operational scenarios

5 Project Publications
Copies of project publications, all published in open access format

6 Research Performed
Copies of project research articles

The Platform archives project accomplishments to ensure open access and public availability without requiring user login and provides visitors with a powerful search bar that enables querying based on keywords, which can represent either general information (Company, Author, Title etc.) or more specific parameters like Geographical Area. Results are listed in either alphabetical or publication date order and can further be filtered by the user. Each entry contains a summary, a few basic keywords related to the results, a related picture, and a downloadable link. Users can also leave comments/reviews under the different publications.

Storage information and documents generated during the project and stored on the Intranet of the Management Platform will be protected for at least a year after the project completion, and longer according to subsequent decisions taken by the Executive Board (EB).



National Action plans for fruit flies in Australia

Interview by
Ana Larcher Carvalho and Ulli Schiefer

Dr. Polychronis Rempoulakis

PART 2. FRUIT FLIES IN AUSTRALIA

Regarding fruit flies, could you give us an overview about their importance in terms of insect pests in Australia and impacts in terms of economic, environment and health?

Fruit flies are among the most important insect pests for a variety of agricultural products (oranges, persimmons, summer fruits, cherries etc.) affecting heavily a horticultural industry that worth's more than 15 $$ B/Yr. Fruit flies have negative effects to the industry production and market access, both domestically and for our export partner countries internationally.

In the East of Australia, the most notorious and damaging is the Queensland fruit fly (Bactrocera tryoni), while in the West Australia is Medfly (Ceratitis capitata). Notable is the fact that those fruit fly pests of the East do not occur in the West and vice versa, and also that some states are totally free from both, so when they detect them, eradication campaigns must take place.

With the rapid decline in the use of pesticides and the loss of a broad range of conventional chemicals, the control of those pests is becoming now more difficult, and the methodologies more complex, involving more trapping, sanitation and crop hygiene, public awareness campaigns from the state governments and local councils, and eradication with the use of many methods (including SIT).

It is estimated that the total damage from fruit flies exceeds 300 M$ / yr. Even more important is the risk for market access loss. Because Australia being in the South hemisphere has a competitive advantage for off season supply of fruits-vegetables offshore that command high prices, is able to produce and export off season fruits and vegetables to the North hemisphere.

The quality of our products is recognised by our trading partners globally, and we strive to maintain those high standards, even under the compound threats of new biosecurity incursions and climate change.

Could you tell us about new developments in fruit fly control strategies? In particular, in relation to SIT, could you tell us about its use in Australia?

SIT has been proposed as an environmentally friendly methodology to control fruit flies in Australia since the early 60's, following the success of the screw worm fly eradication campaign in USA. Since then, a significant amount of investment in R&D has been made, and also several operational attempts, with various level of success. My organisation NSW DPI has been actively involved in the SIT application since 1996 with the establishment of a mass rearing facility to produce sterile Q-flies for release in a fruit fly free area in the border of NSW, Victoria and South Australia. Similarly, in West Australia, a Medfly SIT facility has been in operations for the last decades.

An SIT marked fruit fly as seen under UV light microscopy, fluorescent dye visible in the head capsule (Photo credits P. Rempoulakis)

As for recent advances, for the last 7 years we have worked extensively in the field of Sterile Insect Technique against Q-fly, in a large consortium with many partners from Australia and New Zealand, trying to upgrade the method to global standards, with the development of new insect rearing methods, diets, and sterilization processes. We investigated on the quality aspect of insects for release, with detailed studies on the effects of post factory handling and transportation, pre-release rearing methods, and marking and identification methodologies.

Novelties such as the use of stable isotopes for reliable identification of sterile vs wild flies are notable examples where quality research has been translated in operational procedures that improve the method. This large program culminated with pilot air releases in selected locations in Victoria and NSW for 3 consecutive seasons, this project is to be concluded this year.

What key lessons would you highlight from your experience with fruit fly control in Australia that can be learned for fruit fly control in Europe and internationally?

Fruit fly control (and prevention) is an activity that involves many shareholders, namely governmental organisations (licencing of chemical, biosecurity and management research), research organisations (universities, CSIRO, State organisation, independent research providers), the producers, city councils and also back yard growers and the general public. It is a complex landscape, where every player must be aware of the needs and limitations of the other partners and address those in a constructive manner.

During the last years, we observe an increase in pest pressure due to many factors (new cultivations that create suitable habitats, climate change, increased commerce that enable pests to move further and faster), and we need to be able to adapt and respond rapidly.

During the last years we witness an increased potential for invasiveness from several fruit fly species, and alarming incidents of ecological displacement

What will be the major challenges ahead for fruit fly management in the world?

Fruit flies are among the most destructive pests of fruits and vegetables worldwide. During the last years we witness an increased potential for invasiveness from several fruit fly species, and alarming incidents of ecological displacement, where a newly introduced fruit fly pest manages not only to establish, but also to drive native populations outside of their traditional boundaries into new climatic areas. Another threat is the development of insecticide resistance that reduces the available chemical control methods. The combination of all the above factors is posing a great threat in the productivity, food safety, and market access for many countries.

The current crises (Covid, food security, etc.) require a profound rethink of policies and programmes. What could be some of the impacts in pest and fruit fly management?

It is true that during the last years we have faced an unprecedented amount of pressure from various factors (climate change, new incursions, COVID restrictions), and we see the results in the global scene already. Several threats appearing in different parts of the world, but as a general statement, I would say that the need of accurate pest management and international collaborations is now larger than ever. We have the benefit of living in a world where information can be shared and implemented rapidly, and we need to take the full advantage of it. Novel molecular and bioinformatics methods, modelling for accurate predictions, precision agriculture and many other tools are progressing rapidly, and with good collaboration in international level we can stay ahead of the advances of fruit flies.

Entomology Group Photo, NSW DPI Biosecurity Research and Diagnostics 2019 Workshop, Belgeny Historic Farms, NSW, From Left: Dr. David Gopurenko (Molecular Entomology), Mr. Terry Osborne (Technical Officer), Dr. Grant Herron (Insecticide resistance), Dr. Mark Stevens (IPM), Dr. Polychronis Rempoulakis (Group Leader), Dr. Adrian Nicholas (Horticulture Entomology), Ms. Fah Eagleton (Technical Assistant), Dr. Solomon Balagawi (Fruit fly and Market Access Entomology), Mr. Damian Aitken (Technical Officer), Dr. Risha Gupta (Technical Officer), Mr. Glenn Warren (Technical Officer), Dr. Duong Nguyen (Insecticide Resistance), Dr. Aisuo Wang (Technical Officer). (Photo Credits, P. Rempoulakis)

Supporting trade of fruit and vegetables in CEFTA

CEFTA is a regional free trade agreement, which aims to eliminate tariff and non-tariff barriers to trade among its signatories (Albania, Bosnia and Herzegovina, Moldova, Montenegro, North Macedonia, Serbia and Kosovo). One of the main supporters of efficient implementation of the CEFTA requirements in the field of harmonization of procedures for border crossing of fruit and vegetables at regional level is the project Open Regional Fund for Foreign Trade. It is commissioned by the German Federal Ministry for Economic Cooperation and Development and the European Union, and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

Anita Benko Beloglavec

Plant health consultant

The thematic focus is on implementation of mutual recognition programmes: the registered operators and border documents that certify compliance with legal requirements, as well as supporting a regional approach for joint risk management. Based on the program simplified export procedures and used of risk based approach at export and reduction of border formalities by use of risk-based inspection methods (i.e. reduced frequency) and the mutual recognition of certificates issued by each CEFTA Party for fruit and vegetables will be adopted. The electronic exchange of phytosanitary certificates and information on non-compliances will be enabled.

In order to achieve the above-mentioned goals in the plant health sector, the list of regulated fruit and vegetables, respective quarantine pests and registration of exporters or producers, as well as the control system for the certification of fruit and vegetables should be harmonised. CEFTA Parties decided to harmonise their legislation with the new EU plant health regime. A CEFTA Priority Pest List has been prepared on the basis of the EU Priority Pest List and includes among 16 others also 4 fruit flies: *Bactrocera dorsalis, Bactrocera zonata, Rhagoletis pomonella* and *Anastrepha ludens*.

Based on the guidelines, prepared in the project, CEFTA Parties adopted a statistically sound and risk-based pest survey approach in line with the recommendations and guidelines provided by the various international standards and European and Food Safety Authority guidelines. Results from the detection survey will assure the official pest status in each CEFTA Party and build trust on the control.

The targeted population in a detection survey has been defined based on a production area of hosts of most economic importance in the CEFTA region, the suitability of the environments to the pest's establishment, the ability of the pest to spread naturally or through human assistance, and the identification of risk factors associated with an increased probability of presence. For the identification of risk areas, it was first necessary to identify the activities that could contribute to the introduction or spread of fruit flies; these are: import, trade or storage of possible infested host fruits (especially from areas of their presence) and discharge of fruits waste. These activities have been connected to specific locations (entry points, packing stations, processing industries, fresh markets, waste collection centers). Around these locations, risk areas were defined, depending on the spread capacity of the target pest and the availability of host plants. The smallest epidemiological unit of host plants has been defined as one orchard of at least 0.5 ha. Their number for survey in a CEFTA Party has been calculated based on the international standard ISPM 31 (Methodologies for sampling of consignments). During the survey fruits are examined for the possible presence of symptoms. Trapping with yellow sticky traps is ongoing for 2022. Trapping with pest specific pheromone traps is envisaged to start next year.

Contingency plans are in progress for priority pests in order to ensure a rapid and effective response to an outbreak of specific pests that have a high potential for introduction, and for which an eradication plan is necessary, before the pest is found in an area.

Challenges in Phytosanitary Inspection

Evgenia Makridou

Hellenic Ministry of Rural Development and Food

Regional Centre of Quality & Phytosanitary Control of Thessaloniki

Being in phytosanitary inspection for about nine years I have realized how familiar people are with everything about food quality and safety and how little information they have come across concerning phytosanitary reality. In fact the thought that pathogens that affect plants in other countries can find their way to our own country through someone carrying fresh lemons from Argentina in one's luggage and in a near future become destructive for plantations in our country, might sound at first like fiction! And maybe it is a real challenge to convince people all around the world that many times our way of "hiding" fresh fruits in our suitcase or carrying any kind of plant hidden in our cars from another country and planting it in the garden, can end up to insects, viruses, bacteria or nematodes moving in to our country and starting affecting our cultivations!!

Believe it or not, for most of us ordinary people, the question that easily comes in our mind sounds like "Ok, if I buy some plants from another country without asking if I am allowed to, what can really happen?" What is even more interesting though, is that apart from individuals, there are groups of professionals like nurseries, that think in this very same way, ending up to buying plants for planting without checking pathogens properly and as a result risking to unleash in their area, pathogens that are new and many times invasive and after a while very difficult to eradicate.

I think the real challenge is to provide information and to try and have as many parts of this chain as possible to cooperate. To try and give every part involved, the opportunity to BE RESPONSIBLE for one's actions, regarding the impact they have in the country's phytosanitary situation. Knowledge, scientific progress, pathogen monitoring and the spread out of the phytosanitary

The real challenge is to provide information and to try and have as many parts of this chain as possible to cooperate

legislation are a good way to start with.

Responsibility, which is a challenge itself, starts with the question "AM I ALLOWED TO according to the European Union phytosanitary legislation to import?"

And it is the same question for a passenger having a cruise, for a nursery/farmer wanting to buy stock plants, for a trader arranging to buy 30 containers of fresh lemons from South Africa and for a research institute that is trying to "import" a pathogenic organism, just to work with it. "Am I allowed to?"

The answer to this question might be a direct no but most of the times the answer is "I AM ALLOWED BUT THE WAY IS". That means I have to ask the other country for a special way of providing evidence that the seed/plant/fresh fruit that I buy is not carrying pathogens that are unknown to one's country and according to the research community, it is better left this way.

Being responsible for the phytosanitary situation is a real challenge and most of the times it is the difficult way to work. But I think that it is too many of us nowadays who understand that it is a challenge to protect our plantations and moreover every country's flora and being on the same side can really work!

AW-IPM of Medfly in Israel 2010 - 2022

Miriam Silberstein

MOP Zafon, Kiryat-Shmona, Israel

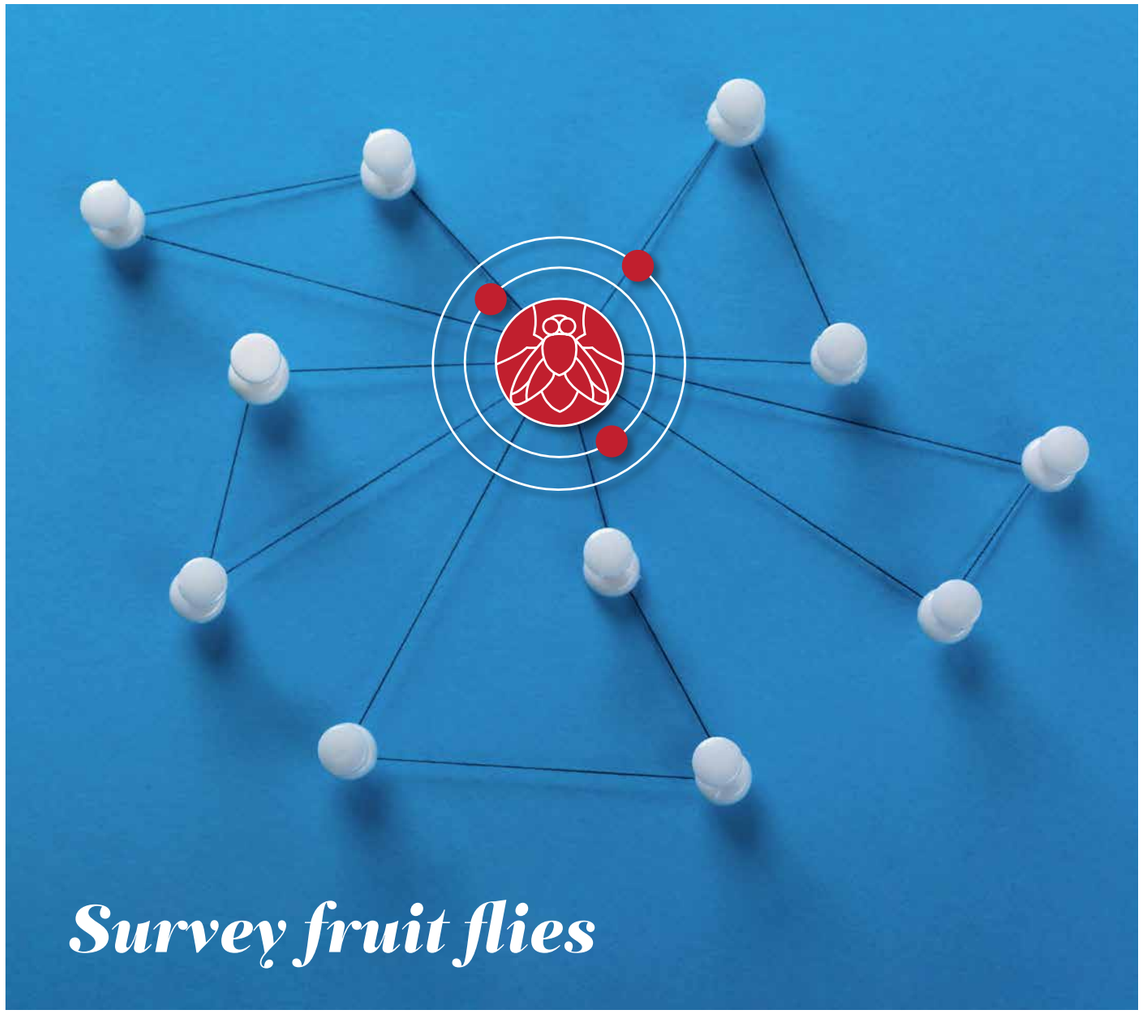
Israel has switched to a regional IPM of Medfly (*Ceratitis capitata*) in deciduous orchards, covering more than 70% of the country's orchards (9000 ha) in the three main growing areas, and led by the ministry of agriculture and regional organizations. The projects include more than 1,000 farmers. These regional-projects are based on mass trapping with minor GF-120 spraying when necessary, demanding a high level of bottom-up collaboration between growers, who practically contribute substantially by providing labor in mass trapping placement, sanitation, ground spraying etc.

Management strategy is based on a spatial approach of the entire region in terms of crops, other existing plant protection issues and the social nature of the villages, providing a specific realtime and localy-tailored advice when Medfly problems arise.

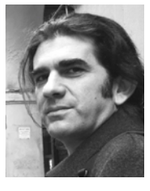
The impact was examined using indices of fruit infestation and damage, reduction in the number of spraying-rounds, conversion from use of Organo-Phosphates to low toxicity materials (using EIQ index), and monitoring of pesticide residues in the fruits.

Large scale regional IPM in collaboration with many growers made it possible to study the hotspot phenomenon, understand the impact of surrounding natural vegetation on Medfly population and behavior and the beneficial impact of full sanitation on reducing fly populations.

Regional management allowed also upgrading of pest scouts' work and formulation of common and effective IPM scouting standards; it also contributed to strength the environmental-agricultural interface (agroecology), and promoted a regional and holistic standard of agricultural culture among growers.



Survey fruit flies



Dr Dimitrios Papachristos

Entomologist-Researcher

Department of Entomology and Agricultural Zoology

Benaki Phytopathological Institute

The species belonging to Tephritidae family, commonly known as true fruit flies, are considered an important insect group that attacks a wide variety of commercial and wild fruits causing substantial economic losses to agricultural crops. cultivated commercial and wild fruits and vegetables. They occur in all biogeographic regions except for extreme desert and polar areas, where the climatic conditions are unsuitable for their development and their hosts are scarce or absent. Although many fruit flies are important pests worldwide, in Europe only three species of high importance are widespread i.e. the Mediterranean fruit fly (*Ceratitis capitata*), the olive fruit fly (*Bactrocera oleae*), and the European cherry fruit fly (*Rhagoletis cerasi*).

Many fruit fly species have highly invasive potential. The most economically important fruit flies, with considerable success in invading new regions, which pose an imminent threat to European Union (EU) horticulture, belong to the genera: *Ceratitis, Anastrepha, Bactrocera, Dacus*, and *Rhagoletis*. The potential risk of their introduction and establishment to the EU is facilitated by increasing international trade, human mobility, and climate change. Indicative to the high risk of arrival of non-European fruit flies to EU is the high number of annual interceptions of consignments with fruit and vegetables imported from non-EU countries. In fact, non-European fruit flies are the most commonly intercepted group of pests intercepted each year in fruit and vegetables in Europe.

Moreover, the recent interceptions of *Bactrocera dorsalis* in Italy and France in traps placed in urban areas and orchards located near places importing fruits are also indicative of the high propagule pressure on invasion success.

Non-European fruit flies are listed as Union quarantine pests of the European Union (Regulation (EU) 2016/2031 of the European Parliament of the Council, Annex II of Commission Implementing Regulation (EU) 2019/20725) and are thus subject to regulations to prevent their introduction and spread into or within the member states of the EU. The import of fruits and plants for planting of several hosts of non- European fruit flies, is currently either prohibited or subject to special requirements (Commission Implementing Regulation (EU) 2019/2072, Commission Implementing Regulation (EU) 2018/20197). Special import requirements are also in place for the import of growing medium (Commission Implementing Regulation (EU) 2019/2072). Four of the non- European Tephritidae species (*B. dorsalis, B. zonata, R. pomonella* and *A. ludens*) also listed as priority pests

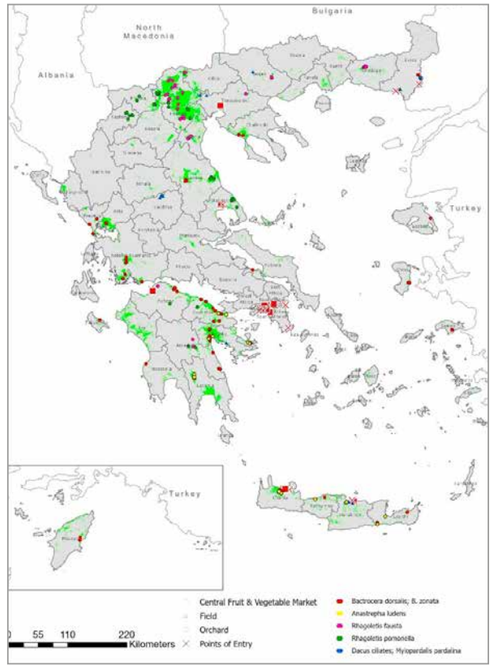
The last years there is an increasing effort in Europe to combat quarantine plant pests, the development of a systematic, robust, and harmonised surveillance system among Member States is in progress

under Commission Delegated Regulation (EU) 2019/17026 implying the obligation for annual pest surveys.

The National Plant Protection Organizations (NPPO) of EU Member States carry out annual survey programmes for quarantine pests including many non-European fruit flies. Notwithstanding that the last years there is an increasing effort in Europe to combat quarantine plant pests, the development of a systematic, robust, and harmonised surveillance system among Member States is in progress. In that direction, European Food Safety Authority (EFSA) have prepared Pest survey cards and guideline documents, using a statistically sound and risk-based pest survey approach to current international standards, in order to assist EU Member States to plan annual survey activities of quarantine pests.

In the framework of Greece's annual survey programme, a trap network for

early detection of some of the most important non-EU fruit flies, has been developed. The network primarily targets on *B. dorsalis, B. zonata, R. pomonella, R. fausta, A. ludens, Myiopardalis pardalina*, and *D. ciliatus* but also provides data for many others fruit flies. The network includes the placement of more than two hundred fruit flies' traps in orchards and fields of most economically important hosts cultivated in Greece such as citrus, stone fruits, pome fruits, cucurbits, and others. Fruit flies' traps are also placed in central fruit and vegetable markets as well as the points of entry (airports, ports, and across ground crossings). For the trap network, different kinds of traps (triangular, McPhail-type, Jackson, and yellow sticky traps) are used baited by the appropriate attractant (methyl eugenol, two or three-component synthetic food attractants (ammonium acetate and putrescine or ammonium acetate, trimethylamine and putrescine), ammonium carbonate and as ammonium acetate).



Greek trap network for non-EU fruit flies (green color indicates the distribution of most important fruit hosts)

Area-Wide Integrated Pest Management Programme with an SIT component

Control the Mediterranean fruit fly in the Valencian Community

Mass rearing facility for sterile males of *Ceratitis capitata* in Caudete de las Fuentes (Valencia-Spain)

Vicente Dalmau Sorli

Plant Health and Phytosanitary Protection Service

Ministry of Agriculture, Fisheries and Food, Alicante-Valencia, Spain

The Mediterranean fruit fly *Ceratitis capitata*, Wied. is an endemic pest in the Spanish fruit-growing areas of the Mediterranean coast. In the Valencian Community it represents a serious problem, especially in citrus cultivation, as this is the main crop, with more than 160,000 ha. This pest also causes serious damage to numerous species of fruit trees which are among the main hosts, such as peach, cherry, apricot, persimmon, fig, pomegranate, etc., which currently represent a not inconsiderable cultivation area of more than 37,000 ha in the region.

The Valencian Community is the Spanish region with the largest citrus-growing area and the main citrus exporter in the world. *C. capitata* is considered a quarantine pest in some importing countries and, consequently, the presence of eggs or larvae in the fruit can lead to the rejection of consignments sent to these countries and cause severe restrictions on our exports. Therefore, the economic losses that this pest can cause are considerable.

In view of the importance of the citrus sector in the Valencian Community, the Department of Agriculture of the regional ministry, with the support of the Ministry of Agriculture of Spain, has been promoting an Area-Wide Integrated Pest Management (AW-IPM) Programme for the control of *C. capitata* for more than 50 years. The pest control strategy has evolved in recent decades towards the application of control methods that are respectful of the environment, natural enemies and human health, so that whereas in the year 2000 the programme included only ground and aerial phytosanitary treatments with insecticides; nowadays ,this type of action has been considerably reduced and has been replaced by biological and biotechnical control techniques applied in a coordinated and effective way according to the levels of the pest, which are known thanks to the installation of a monitoring network.

Since 2007, the Sterile Insect Technique (SIT) is the main method used to control the Mediterranean fruit fly in the Valencian Community. For this purpose, in 2006 a mass rearing facility was built in Caudete de las Fuentes (Valencia) for the production of sterile males, with a production capacity of 500 million sterile males per week, which places it in third place worldwide in terms of production capacity. This facility produces per year more than 10,000 million sterile males that are released in the Valencia region. This project is a pioneer and the most important in Europe in terms of the application of SIT to combat pests.

On the other hand, other complementary actions that are included each year in the *C. capitata* control Programme are the following:

- Installation of a monitoring network
- Establishment of strategic areas for biotechnical control: mass trapping
- Collective treatments: aerial application of biological insecticides (Spinosad) using drones, at specific places and times.
- Ground-based mass treatments in specific plots and at specific times.
- Control of the multiplication of C. capitata by installing traps in isolated fruit trees.

The proper integrated management of C. capitata in the Valencia Region has contributed very positively to maintaining a clear positive trend in the income obtained by this region from the export of fruit to third countries, which has almost doubled in the last 25 years.

On the other hand, it should be noted that with the almost 100% reduction of pesticide application by aerial means, the promotion and use of biological insecticides and the application of environmentally friendly control techniques such as the Sterile Insect Technique, environmental benefits have been reached and contribute to the achievement of various objectives included in the 2030 Agenda for Sustainable Development of the United Nations, aimed at achieving greater economic, social and environmental sustainability. Examples include reduced greenhouse gas emissions, reduced exposure of workers, operators and areas surrounding the crops to environments harmful to health, reduced residues on fruits, etc.

All in all, we can say that the implementation of the integrated control programme based on the Sterile Insect Technique to control the Mediterranean fruit fly in the Valencian Community has clearly brought very positive benefits to the region, both from an economic, social and environmental point of view.

Ceratitis capitata sterile male

The 26th International Congress of Entomology returned to Europe, for the first time in 25 years and took place in Helsinki, Finland from 17 July until 22 July 2022 with the intention to attract world-leaders able to identify cutting-edge topics and to assemble the best-available established researchers, and excellent younger researchers, to present their work.

FF-IPM team had the honor to sponsor one of the sessions with title «Fruit fly invasion a global phenomenon of major importance» covering a wide spectrum of subjects reflecting on this global phenomenon with huge agricultural threat aiming to protect the European horticulture and trade from the current and imminent treats.

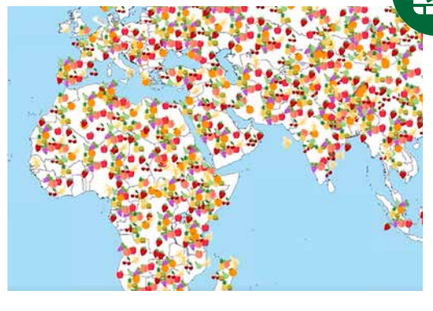
11th International Symposium on Fruit Flies of Economic Importance

From the 13th to the 18th of November 2022 Sydney will host scientists, researchers, and those involved in plant protection agencies and phytosanitary operational programs, to share knowledge, technologies and experiences regarding fruit flies. FFIPM project will be presented while an abstract with title "**A holistic approach to address invasive fruit flies (Diptera: Tephritidae) in Europe: the FF-IPM project"** has been submitted.

FF-IPM project at a glance

Our first promotional video is under production!

In this video, generic information related to the project's purpose and objective is presented in an friendly way, for everyone to watch. The project partners will be able to present the video to customers, fellow researchers and stakeholders during meetings and conferences.



New publication

CHILL COMA RECOVERY OF CERATITIS CAPITATA ADULTS ACROSS THE NORTHERN HEMISPHERE

JOURNAL NAME: **Scientific Reports**

AUTHORS: **Cleopatra A. Moraiti, Eleni Verykouki & Nikos T. Papadopoulos**

The Mediterranean fruit fly, *Ceratitis capitata* (Diptera: Tephritidae), is an invasive pest, that is currently expanding its geographic distribution from the Mediterranean coasts to more temperate areas of Europe.

Given that low temperature is a primary determinant of insect species' range boundaries especially in the Northern Hemisphere with pronounced seasonality, we used chill coma recovery time for assessing latitudinal clines in basal chill tolerance of *C. capitata* adults. We selected six populations obtained from areas with broad climatic variability based on the main bioclimatic variables of temperature and precipitation, spanning a latitudinal range of about 19° from Middle East to Central Europe. Adults were exposed to 0 °C for 4 h, and time to regain the typical standing position of a fly at 25 °C were recorded.

The post-stress survival after a period of 8 days was also recorded. Results revealed that adults from Israel and Austria were less chill tolerant than those from Greece, resulting in curvilinear trends with latitude. Analysis of macroclimatic conditions revealed combined effects of latitude (as a proxy of photoperiod) and macroclimatic conditions on chill coma recovery time.

Nonetheless, there was not a deleterious effect on post-recovery survival, except for flies obtained from the northern most point (Vienna, Austria). Overall, it seems that evolutionary patterns of basal chill coma recovery time of *C. capitata* adults are driven mainly by local climatic variability.

scientific reports

Read the article HERE

Upcoming webinars

→ visit the webinars page for updates

STAY TUNED

The series of FF-IPM webinars will be continued with the three following webinars:

- "Exploiting functional biodiversity to manage the populations of fruit flies" by Dr. Darren Kriticos.
- "Effect of ground management on survival of Ceratitis capitata" by Prof. Josep A. Jaques.
- "Interception of fruit fly infested fruits in cargo shipment" by Dr. Panos Mylonas.

Fruit Flies In-silico
Prevention & Management
FF•IPM

Horizon 2020
European Union Funding
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