



NEWSLETTER

N° 2 - March 2023

Periodical information bulletin for the Prometeo project co-financed by the European Union in the framework of the ENI Cross-Border Cooperation (CBC) Programme Italy-Tunisia 2014-2020

The ENI CBC Programme Italy-Tunisia 2014-2020 is a bilateral cross-border cooperation programme, co-financed by the European Union under the European Neighbourhood Instrument (ENI). With a budget of EUR 33.3 million, the programme, which joint management has been assigned to the Sicilian Region's Programming Office, aims to promote fair, equitable and sustainable economic, social and territorial development in order to foster cross-border integration and enhance the territories and resources of the two participating countries. <https://www.italietunisie.eu/>

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Saving tree crops from pests

In the Monthly Bulletin of TESIM (Technical Support to the Implementation and Management of ENI CBC programmes), the technical assistance project providing support and guidance to the 15 ENI CBC programmes, ample space was devoted to our Prometeo Project, with an interview with Coordinator Prof. Santa Olga Cacciola. Below are the main parts of the interview.

Olives, citrus and almonds are of major agricultural importance in the Mediterranean,

yet not exempt from the effects of climate change and emerging parasites. These threats are affecting Italian and Tunisian fields, demanding innovative technology for the creation of sustainable practices to prevent and protect tree crops. Thus, the collaboration between the two countries becomes essential to find common solutions. Funded by the ENI CBC Programme Italy-Tunisia, the PROMETEO project promotes research and exchange of good practices for the valorisation and

preservation of olive, citrus and almond tree crops. We have interviewed PROMETEO's coordinator Santa Olga Cacciola, Professor of Plant Pathology at University of Catania – the lead partner of the project – to get some insights from this cross-border cooperation.

PROMETEO is a project where trees are the protagonists, so let's start from... the roots! How was the PROMETEO project born, why did you choose this name?

This is quite interesting. The title comes from an acronym, but it was also chosen because it is evocative of the Greek mythology. Prometeo is the son of the Titan Iapetus and the nymph Clymene, gifted with a lively intelligence and particularly fond of humans. Indeed, Prometeo is considered a benefactor of mankind: he provided mortals with technology, knowledge and even fire, after stealing it from Zeus. Similarly, the PROMETEO project aims to disseminate knowledge and results of applied research for the Mediterranean tree crops, among all operators of the sector, with particular attention to the food safety of the olive, citrus and almond products.

Could you tell us more about the objectives of the project in the long-term?

We want to create a cross-border network between Italy and Tunisia, two countries that might have some differences but share the same types of crops. Through the creation of this network, we hope to address



the threat of exotic diseases and insect pests. This is also particularly important to prevent the effects of climate change: our project comes at a time when crops are facing a crisis and are the subject of important decisions regarding their reconversion, modernization and intensification.

The project has been running for some time already: have you achieved some of these results?

Yes! The first thing we did was investing time and energy to establish the basis for fruitful scientific collaboration between Italian (mainly Sicilian) and Tunisian institutions. We developed strategies to bring together different partners and to create a team. The following step has been the design of common protocols for the diagnosis of the main emerging, re-emerging and quarantine diseases of the cultures that are object of the project – and also insect pests.

Recently, the University of Catania has been equipped

with a new secondary ion mass spectrometer: could you explain to non-experts what it is, its use and how important is for the project?

The secondary ion mass spectrometer (TOF-SIMS) is based on the principle of emission of secondary ions that enable the characterization of different biological structures. In few words, we should imagine sending these secondary ions, which hit the material and come back, reflected, creating a mass spectrum. This mass spectrum is a sort of 'map' of the position of the ions, allowing to understand the structure of the biological sample. The map can be used for the biocontrol of pathogens and insect pests. In a nutshell, this highly sophisticated tool will make possible to introduce strong innovation in biological control of emerging plant diseases and insect pests of the three crops that are the focus of our project.

Two laboratories will be installed, one on each side of

the border. They are a concrete example of the contribution of the project to innovation in the area. Could you additionally describe the cross-border impact of the project?

Well, the cross-border network represents a technological platform for the interaction of all the actors to share ideas, knowledge and experience and, moreover, to transfer the technological innovation. We rely on the innovative approach of the open scientific method, involving high-profile international experts. They work together with the partners of the project to propose, study, develop new protocols that then will be validated, of course, in the laboratories and experimental fields on both cross-border sides. Developed and validated protocols, then become the subject of further meetings that partners will have with policy makers to outline guidelines useful to guide agricultural policies, support the phytosanitary service and increase the production, competitiveness and sustainability of this sector and improve the quality standards of the food safety of these products in both countries.

Communication is one of the key pillars of the project, with a strategy oriented towards the project's results dissemination, among which the publication of scientific research papers. This could potentially extend the impact of the project beyond the target areas...

Our communication strategy is inspired by the recommendations of the European

Commission and the objective is to put in place communication activities that can help project partners to develop appropriate capitalisation actions. For example, we are organising a capitalisation event, in collaboration with another project within the ITTU Programme - CLUSTER SERVAGRI- where we'll present together our results, especially in contrasting the climate change. Activities like this are aiming at the dissemination of results and transfer of knowledge that is useful not only to the scientific community but also to decision makers.

have also recently launched our newsletter, that can be found on a dedicated section of the website, with the aim not only to share news about the project, but also to gather news from the world that are relevant to the focus of our project.



Where can people find more about PROMETEO?

Besides building our network of professionals, we want to involve as much as possible young people. Thus, beside our website, we want to be present on the main social media platforms: Facebook, Twitter, YouTube and Instagram. We

The Prometeo project meeting room

At the municipality of Palazzolo Acreide, work continues on the completion of the room dedicated to the Prometeo Project

Work at the municipality of Palazzolo to complete the hall that will be dedicated to the activities of the Prometeo Project continues unabated. Technicians and operators are at work on the completion and equipping of the hall, which is fit to host the next thematic Prometeo meeting, scheduled to take place in Palazzolo Acreide from 11th to 13th May 2023.

Some photos show the before and after, and certify the progress of the work.



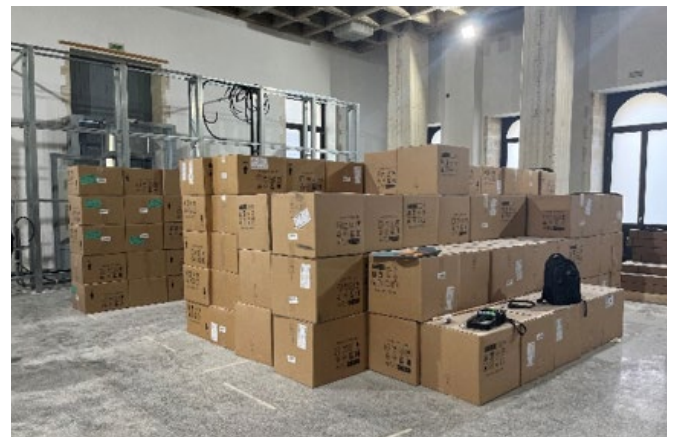
Photos November 2022



Photos November 2022



Photos November 2022



Photos March 2023



Photos March 2023



Photos March 2023

Phytophthora diseases of citrus: gommosis, root and fruit rots

The citrus sector occupies an important place in Tunisia at the national level and especially in Cap Bon. In terms of production, this sub-sector supplies the domestic market with fresh fruit for up to six months a year.

Among the pathogens causing devastating diseases to crops worldwide, oomycetes figure prominently. They were among the first pests to attract the attention of many researchers because of the number of plants infected and the extent of the damage caused. They have caused famine and starvation in many countries. One of the causes of the seriousness of the diseases caused by oomycetes observed is that they very often result from the combined actions of several species on the same plant. This is the presence of a parasitic complex. Indeed, 11 *Phytophthora* species have been identified as pathogens of citrus.

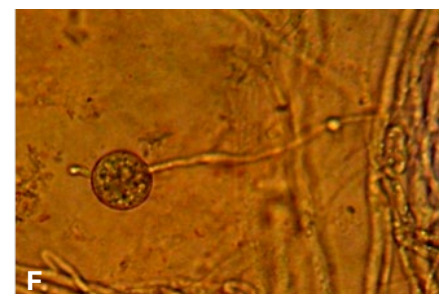
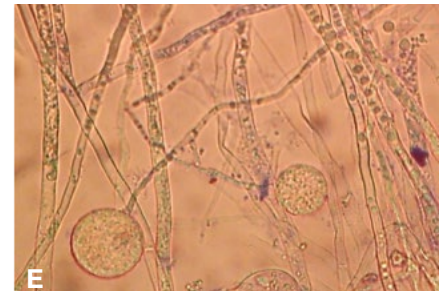
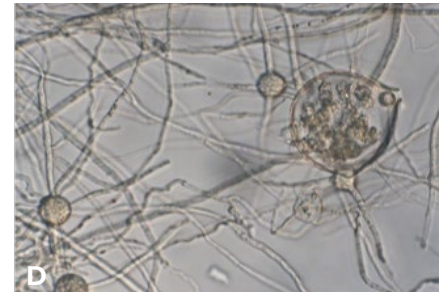
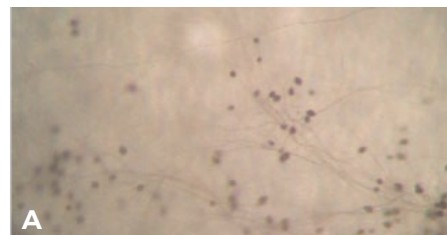
Phytophthora species can attack all parts of a plant, from the roots to the leaves and the stems, causing significant damage and resulting in three types of disease: gum disease, root rot and fruit rot.

Monitoring of *Phytophthora* diseases in citrus orchards in Tunisia

Surveys and investigations carried out in the different citrus producing regions have enabled us to determine the geographical distribution of these diseases and their relative importance.

Indeed, all the orchards visited, in the different bioclimates of Tunisia (humid and sub-humid) present symptoms of infestation by species of the *Phytophthora* genus with a variable rate of infestation from one region to another. The results of the monitoring of infections by this genus of pseudo-fungi have shown that the most important infestations are those caused by *P. citrophthora*, *P. nicotianae* (*P. parasitica*) and *P. palmivora*. These diseases infest all citrus varieties and especially the clementine varieties MA3 and Hernandina which are very susceptible to trunk and branch gummosis.

Different forms of sporangia and asexual and sexual structures of *Phytophthora nicotianae* var *parasitica* (Gr. x 40) (Own picture)



A: Formation of the different structures in the soil solution observed under binocular (x50); B: Subspherical papillate sporangium; C: Spherical bipapillate sporangium; D: Papilla detachment and release of zoospores from sporangia as well as the presence of coraloid mycelia; E: Chlamydospore in terminal position; F: Germination of chlamydospore; G: Oogonia and antheridia in amphigyne position; H: Aplerotic oospore; I: Morphological aspect of the mycelial colony developed on PDA after 5 days of incubation at 24°C

Observed damage

The identification of infested sites was used to describe the characteristic symptoms of the diseases.

- At the root level: rotting of the root system and absence of rootlets (small feeder roots) with an unpleasant pungent smell. In this case, the disease develops in an apoplectic manner. Possible confusion with other diseases such as dry root rot and

tristeza. The diagnosis is confirmed by in vitro culture on PDA and PARBH media.

- At the base of the trunk and on carpenter branches: gum exudation at the entry point of the pathogen on both sides of the graft bead or on the branches. The boundary of the diseased tissue is usually marked by a more or less deep crevice. When the outer bark is lifted, the bast is heavily necrotic. The bark may be affected on one side only, but it may also be completely encircled. In the latter case, the circulation of sap is stopped, leading to the tree's decline. If the attack is partial, the branch next to the lesions on the trunk dies quickly. The desiccation progresses in a downward direction while regaining one or more branches of the tree.
- On the fruit: discoloration of the skin, usually around the flower scars, followed by brown spots as the fruit matures. Infested fruits fall rapidly. Infestation in this case is by splash on the lowest fruits. Some infested

fruit may show no signs of brown rot at harvest and symptoms appear during storage.

Biology of Phytophthora spp.

Phytophthora spp. is present everywhere in citrus-growing areas, but will express itself when environmental conditions are favourable. The storage forms are chlamydospores and oospores which contain the primary inoculum. Germination



of these spores is induced by high and sustained soil moisture (rainy period, excessive irrigation, poor drainage, etc.) combined with high temperatures (30-32°C). Chlamydo-spores and oo-spores germinate and produce sporangia. These are attracted by root exudates (amino acids, sugars, phenolic compounds) to the young roots and in the presence of water the sporangia release zoospores. From there, the zoospores germinate and an intercellular mycelial hyphae forms. Similarly, zoospores on the soil surface can be shed on the trunk, branches or fruits. Species of the genus *Phytophthora* can penetrate directly into non-lignified tissues and require a pathway such as a wound, floral scar, or bark crack in the case of lignified tissues.

Dissemination of means of controlling these diseases

To control *Phytophthora* diseases, the Citrus Technical Centre (CTA) organises awareness and information days for farmers and field technicians in order to present these diseases: description of symptoms, causes and protection techniques recommended by research.

Prophylactic control: we always advise maintaining sanitary conditions unfavourable to these diseases. First of all, make sure that the soil is well drained. The soil should drain easily. Regularly weed the rows. Control irrigation: avoid over-irrigating, try to lengthen the intervals between two irrigations as much as possible and use drip irrigation. Indeed, zoospores can only ensure contamination in the presence

of water. *Phytophthora* attacks on roots and trunks are more frequent in clay soils than in sandy soils. If the soil is heavy, we advise planting on a back slope. *Phytophthora* spp. is also unable to infect intact bark, whether the variety is resistant or susceptible. However, direct penetration can occur on young stems that have not yet formed a continuous corky base. The plants should be planted with the grafting point about 30 cm above the ground. An effective prophylactic measure for brown rot is the pruning of low fruiting branches (below 60 cm from the ground). These branches are easily affected by primary inoculum projections and serve as a relay for contaminations from the top of the foliage. Their elimination reduces the capacity of the brown rot to spread.

Chemical treatment: in at-risk areas, both to treat existing lesions and to act preventively, systemic fungicide applications with Fosetyl-Aluminium at a rate of 50 g/hl can be carried out two to three times a year. It is important to note that curative treatments are only effective if the disease is detected early. Protection must be reinforced during rainy periods. Concerning brown rot, preventive treatments are necessary in orchards with losses in previous years. Foliar applications of copper fungicides or Fosetyl-Al are effective. Their application should be considered from the beginning of growth to veraison.

Winter treatment is highly recommended with metallic copper at a concentration of 50% associated with mineral oil to get rid of all kinds of infestation: fungi, insects, bac-

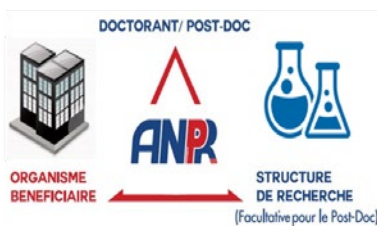
teria. The copper treatment allows to fight against the spores present in the tree, on the branches and the trunk. As a result, it will reduce the intensity of disease attacks and the healing of post-harvest wounds.

Test execution: trials were carried out to monitor the effectiveness of the active substances on the market against *Phytophthora* (fosetyl-al) and to validate new formulations for registration in order to increase the range of fungicides on the market and to avoid repetition of the same active substance so as not to create the phenomenon of resistance in the existing strains in citrus orchards. The results of the follow-ups detected the continuity of the effectiveness of Aliette (fosetyl-Aluminium) in stimulating the defence mechanism of citrus trees to defend themselves against *Phytophthora* attacks and we confirmed the effectiveness of two other formulations compared to Aliette, one containing the active substance phosphonate and the other fosetyl-Al associated with tribasic copper sulphate.

Agence Nationale de la Promotion de la Recherche Scientifique (ANPR)

Partner 5 (Tunisia) PROMETEO Project

The National Agency for the Promotion of Scientific Research (ANPR) is a national body. It has the status of a Public Establishment of a scientific and technological nature with administrative and financial autonomy and placed under the supervision of the Ministry of Higher Education and Scientific Research (MESRS).



Our Mission:

Having as main mission to execute the strategy of the MESRS in terms of research valorisation and technology transfer, ANPR is in charge of the following missions:

- Follow-up of the offices of valorization and technology transfer
- Assistance to public research structures in the fields of Intellectual Property (IP), VRR and technology transfer
- Contribution to the implementation of national research programmes
- Dissemination of programmes and mechanisms related to VRR, technology transfer and promotion of innovation culture
- Contribution to the exploitation of the results of the scientific and technological watch
- Financial management of national and international research projects,
- Design and implementation of funding mechanisms for collaborative research
- Accompaniment and individual coaching of project leaders for the creation of their spin-offs / start-ups

Our main services:

1- Project set-up and management:

ANPR has developed a diversified expertise in the different phases of project set-up and management, through the following activities:

- Partnership coordination,
- Management of stakeholders' commitment,
- Monitoring and control of project implementation,
- Management and control of costs, risks and deadlines,
- Implementation of quality assurance and quality control,
- Communications management,
- Procurement management and contracting,
- Provision of a physical infrastructure dedicated to project management.

ANPR has more than 100 projects to its credit today and the PROMETEO project is considered as one of the flagship projects.

2 - The MOBIDOC scheme:

Mobility scheme (MOBI) for doctoral and post-doctoral students (DOC) in order to carry out applied research in the socio-economic environment that perfectly meets the needs of these partners.

The objectives of this scheme are:

- to strengthen interactions between research and the socio-economic world
- to put RDI at the service of Tunisian socio-economic organisations and societal challenges
- to improve the employability of young researchers and innovative entrepreneurship.

3- Technology Transfer Offices - BuTT

The BuTTs act as an interface between universities and research



centres and the surrounding socio-economic world.

The services provided by the BuTT are:

- Information, Monitoring & Communication
- Marketing of skills and research results
- Protection of Intellectual Property (IP) assets
- Contractualisation
- Technology Transfer & Valorisation
- Setting up and accompanying partnership projects

4- Financial management:

Since its creation, ANPR has developed a business of administrative and financial management of national and international projects.



Comune di Palazzolo Acreide

Partner 6 (Italy) Prometeo project

Our interview with Dr. Salvatore Gallo, Mayor of the Municipality of Palazzolo, partner in the Prometeo Project and venue of the next thematic meeting scheduled for May 2023.



Comune di Palazzolo Acreide
Città Patrimonio dell' Umanità,
tra i borghi più belli d'Italia

The municipality of Palazzolo Acreide is at the forefront of the Prometeo project. How did the Municipality of Palazzolo's interest in this type of project come about?

The Municipality of Palazzolo is at the forefront of the Prometeo project because it found it extremely interesting to participate in an international project of such scientific scope, conducted in collaboration with the Universities of Catania and Tunis and some important local and international operators, which represents an important step for the maintenance and protection of tree crops in the area.

Today, we are witnessing the constant development of new diseases, partly attributable to climate change and the inappropriate use of certain pharmaceutical products, that attack our typical Mediterranean crops, and scientific research represents one of the main ways to restore the natural balance and to arrive at suitable solutions for the protection and preservation of our crops.

Palazzolo Acreide is rich in history and art, with an ancient agricultural tradition and a recent development in the tourism sector; what role does the protection of Prometeo' tree crops (citrus, almond and olive) play in the strategies and policies for protecting the

territory of the municipality of Palazzolo?

Palazzolo is rooted in agricultural tradition as it was created and rebuilt by farmers, who, after the destruction of the 1693 earthquake, contributed together with artisans to the reconstruction of the town through the use of funds from agriculture.

Palazzolo is located 700 metres above sea level, immersed in an intact, healthy and uncontaminated environment and, thanks to its microclimate typical of the mountainous hinterland, it has been possible since ancient times to cultivate vegetables, olives, citrus fruits (in the Anapo valley) and various types of fruit that have made Palazzolo independent in terms of food supplies and whose proceeds have contributed over time to the town's flourishing development. Although recent periods have witnessed a regression in agricultural cultivation in the area, experience teaches us that historical courses and recurrences will allow a return to fully exploit the ancient agricultural traditions and to valorise the typical products of the territory of the various municipalities of the Hyblean mountains, among which the peaches of Cassaro the vines of Buscemi stand out. The objective of a sound and valid land protection policy should be to rediscover these typical local crops that have partially disappeared today but that could instead represent niche productions for the valorisation of the Iblei area and act as a flywheel for the development of the economy of the

entire territory.

What are the main results achieved so far, both at a general project level and specifically for the municipality of Palazzolo?

The results achieved so far are of great interest and, even though the population has not been directly involved in the preliminary results of the project so far, great interest and attention is perceived on the part of the farming communities towards the scientific results of the project, for which there are great expectations and optimistic hopes of protecting and safeguarding local production.

The Prometeo project envisages an important partnership with Sicilian SMEs and universities and with operators, organisations and universities in Tunisia; how does the city of Palazzolo relate to this international dimension?

When one speaks of partner-



ship, one always thinks of a direct involvement of the local business community and population, and the city of Palazzolo is extremely attentive and open to this cultural exchange. The Prometeo project rewards the city of Palazzolo Acreide in that it identifies it as the site chosen for high-level scientific studies that will certainly leave cultural imprints and training paths that will draw important guidelines for those working in the field and for those in the agricultural sector.

Palazzolo will host the next thematic meeting of the Prometeo project in mid-May; how is the city preparing for this important international event?

Palazzolo is ready and prepared for this major international meeting, and the event represents a great showcase for Palazzolo and, let me tell you, a great hope; Sicily and Tunisia represent two very similar peoples, and the commonality of principles and Mediterranean ways of interpreting life and the mutual civic respect between the populations will allow them to converge towards a scientific project of great expectations that will contribute decisively to the cultural development of our territory.

What final imprint will the Prometeo project leave on the city of Palazzolo upon its completion? Will there be a continuation of collaboration and partnership activities beyond the end of the Prometeo project?

The Prometeo project, with a whole series of studies, meetings and conventions that see the city of Palazzolo at the centre of the initiative, will leave, and indeed I would say is already leaving, a significant imprint on the city, both from the point of view of the recovery of its historical heritage and in terms of research, development and technology transfer opportunities. An agreement has al-

ready been initiated between the Municipality of Palazzolo and the University of Catania (Department of Agriculture, Food and Environment - Di3A and Department of Chemical Sciences - DSC) for the implementation of scientific, cultural and educational projects and for the enhancement of the territory's cultural heritage.

Through this agreement, a collaboration between the University of Catania and the Municipality of Palazzolo Acreide will be realised for the implementation of internships and training courses, for the promotion of scientific, technical and technological culture, for the organisation of conferences, seminars, workshops and debates on training and scientific activities of common interest and for the identification and preparation of projects for the participation in EU development programmes. In this way, Palazzolo will become a sort of branch office of the University of Catania and the meeting room set up for the Prometeo project will be used on a permanent basis as a scientific and research laboratory, as a cultural container and for the exchange of ideas and information, leaving a permanent and indelible mark on the development of the entire province of Syracuse. This will also represent a great opportunity for the future of the area's farms and for the many young people who still want to enter the world of agriculture.





Pikobodies: A new hope for made-to-order plant disease resistance

By The Sainsbury Laboratory - 03/03/2023

Plants lack an adaptive immune system, so Giorgos Kourelis and Clémence Marchal in the Kamoun lab had the ambitious idea to piggyback mammalian adaptive immunity and produce made-to-order plant immune receptors called Pikobodies.

Plants have highly effective immune systems which allow them to thrive in our environment today. However, these systems lack the adaptability we need for reliable sources of food.

Devastating wheat disease outbreaks in Africa and Asia have highlighted the need for rapid responsiveness in global agriculture.

There are major concerns about the increasing threat of plant diseases on global food security which is why scientists at The Sainsbury Laboratory continue to advo-

cate for global plant pathogen surveillance systems.

“Increased awareness of emerging plant pathogens is necessary for scientists and farmers to rapidly respond and mitigate disease outbreaks.” says Clémence Marchal, post-doctoral scientist in Sophien Kamoun’s lab at The Sainsbury Laboratory, “This information is critical to have disease resistant crop varieties ready before disaster strikes.”

Plant immune systems rely on the innate genetic information contained in each seed to protect themselves against the specific pathogens they will encounter in their lifetimes.

To improve disease resistance in our crops, humans have relied on plant breeding methods since the dawn of agriculture.

Recent advances in genetic technologies have allowed us to speed up the process

of crop improvement even further by engineering immune receptors within plant cells that can recognize the presence of pathogens and trigger an immune response.

However, this requires researchers to sift through vast amounts of genetic data to find these particular resistance genes, making the discovery pipeline akin to ‘finding a needle in a haystack’.

The advantages of having a shorter and simpler approach in finding new genetic sources of disease resistance would be manifold.

Plant immunity often relies on intracellular nucleotide-binding, leucine-rich repeat receptors (NLR) to detect specific pathogens. Whilst singleton NLR proteins can recognise effectors (virulence proteins from the pathogen) and signal the immune response, research has

also revealed paired NLRs in which each partner plays distinct roles in pathogen effector recognition or immune signalling.

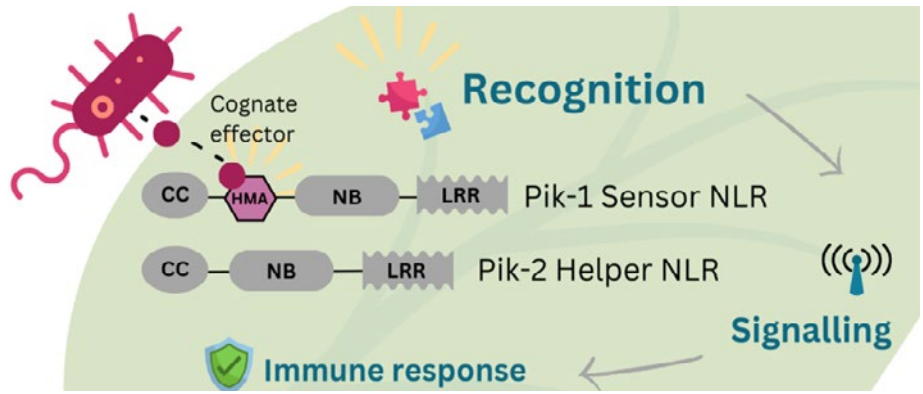
Pik-1 and Pik-2 are such an NLR receptor pair from rice. The integrated heavy metal associated (HMA) integrated domain of Pik-1, which is responsible for recognizing pathogen presence, can be mutated to confer new pathogen effector specificities as shown by De la Concepcion and colleagues in 2019.

However, modifications restricted by the plant's own genetic repertoire for pathogen recognition will limit the potential for recognising a wider range of pathogens and pests.

Jiorgos Kourelis, who is also a postdoctoral scientist in the Kamoun lab, was intrigued by the hypothesis that Pik-1 could potentially recognize completely novel pathogen effectors via swapping its HMA domain with different domains.

If new domains could be generated against specific pathogens on demand, could the Pik immune receptor complex be the ultimate scaffold to engineer made-to-order plant immune receptors?

Jiorgos proposed using animal adaptive immunity



as a potential source of on-demand domains, given that it has the capacity to generate antibodies against virtually any antigen it is exposed to. Together with Clémence, they tested the concept by focusing on the minimal antigen-binding fragment of single-domain heavy chain antibodies of camelid mammals, called nanobodies.

The researchers used published sequences of camelid nanobodies that target specific fluorescent proteins. They fused these nanobodies with the Pik immune receptor complex to create Pikobodies (Pik + nanobodies). To test the specificity of Pikobodies, two different fluorescent proteins were used, GFP and mCherry, which also allowed imaging techniques to be used for a more streamlined immune assay approach.

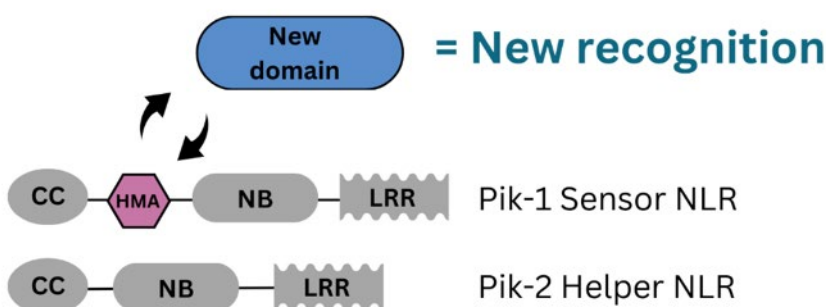
With the help of Andres Posbeyikian, a predoctoral intern in the Kamoun lab, Clémence conducted immune assay work which showed that these Pikobodies not only recognize their specific targets within

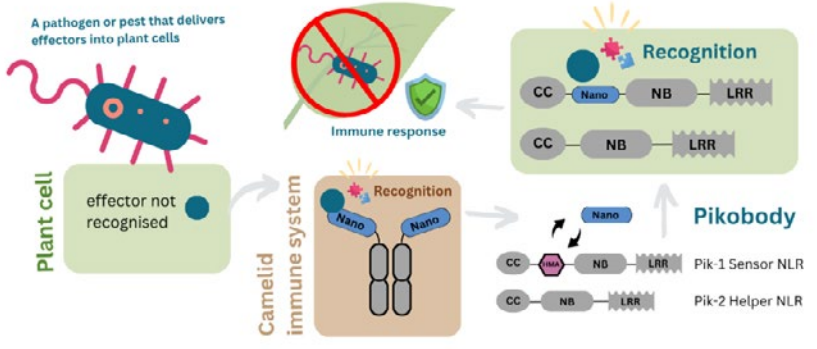
the plant cell environment but also produce a functional immune response. This was tested by modifying Potato Virus X to produce the target fluorescent proteins and infect a stable transgenic model plant, *Nicotiana benthamiana*, containing the genes to generate Pikobodies. Reduced viral load showed that pathogen recognition translated into resistance within the plant to levels comparable to that of Rx, a natural resistance gene that recognises Potato Virus X.

Jiorgos believes that generating nanobodies in a non-plant system reduces the risk of off-target binding with plant-derived proteins within the plant cell. He also highlights that it would be possible to use bioengineered libraries, instead of mammalian systems, to generate new nanobodies for different pathogens.

“We’re very excited about the potential applications of this technology.” says Jiorgos, “The short and simple pipeline could allow for so much more gene discovery and increase the possibility of developing robust disease resistance that pathogens are less likely to overcome over time.”

There are widespread benefits to a shorter and more





affordable, and therefore more accessible, discovery pipeline. Researchers in the Kamoun lab believe that the translation of their discoveries should be accessible and beneficial to communities all over the globe, especially those who have less options available to them to protect their crops.

The results of this proof-of-principle study show exciting potential for made-to-order resistance genes against any pathogen or pest that delivers effectors inside host plant cells. This is being followed up by proof-of-application studies. Group leader, Sophien Kamoun, says, "Pikobodies are a promising new technology that could revolutionize the way we engineer disease resistance by providing a pseudo-adaptive immune system to plants. We will now endeavor to apply the Pikobodies technology to crops and bring it to farmers throughout the world."



Upcoming events



ENI CBC PROGRAMME “Italy-Tunisia” 2014-2020

“PROMETEO” STRATEGIC PROJECT Presentation event of protocols and directives

*Laboratory of the cross-border knowledge village
at the Town Hall
Palazzolo Acreide, 11-13 May 2023*

Thursday, May 11, 2023

10:00 – 16:00 Field study visits on tree crops:

Olive growing Farm of Dr. Agronomist Enzo CARPINO located in c.da Chiappa, Palazzolo Acreide

Friday, May 12, 2023

10:00 a.m. – 13:00 a.m. Dissemination, presentation and comparison of the results obtained by the project partners

Inauguration of the Laboratory at the town hall of Palazzolo Acreide dedicated to PROMETEO meetings

10:00 – 10:30

Institutional greetings

*Directors of the Departments of Agriculture, Food and Environment (Di3A) and Chemical Sciences (DSC) of the University of Catania, Prof. Mario D'AMICO and Prof. Antonino LICCIARDELLO
Greetings from the ENI CBC "Italy-Tunisia" Managing Authority: Dr. Daniela BICA, Dr. Vincenzo PETRUSO*

Exhibition and comparison of the results achieved by the PROMETEO project by the project partners and associated partners

10:30 – 11:30

Contribution of experts in the sector to the formulation of innovative diagnostic protocols and presentations of the specific protocols proposed

Giuseppe LIMA

Department of Agriculture, Environment and Food, University of Molise, "New strategies for sustainable crop protection in the Mediterranean environment"

Giuseppe FRATE

Alba Milagro International S.p.A., "Features, mechanisms of action and use of products that can be used for the nutrition of citrus, almond and olive trees and for the side effects against phytopathogens and abiotic stresses"

Bruno SCANU

Department of Agriculture, University of SASSARI, "New phytosanitary emergencies of the olive tree: the case of Phytophthora on wild olive tree"

- Presentations of the specific protocols proposed and other experiences to share





- Najla SADFI *Tunis El Manar University, "Bioprotection of citrus fruits against *Penicillium* rots using epiphyte yeasts and bacteria"*
- Jouda MEDIOUNI *INRAT, "Work plan for entomology activities: validation of protocols and knowledge sharing"*
- 13:00 -14:30** **Lunch**
- 14:30 – 16:00** **PROMETEO technical and steering committees**
- 16:00 – 17:30** **Visit to the “Antonino Uccello” Museum of Peasant Civilisation**

Saturday May 13, 2023

10:00 a.m. – Dissemination seminar “The influence of climate change on Mediterranean arboreal crops and productions: comparison of experiences and good practices”

- Stefano G. LA MALFA *Di3A University of Catania - “Biological effects and agronomic impacts of climate change”*
- Ercole ALOE *Expert agronomist GAL Eloro - "Mediterranean olive cultivation facing climate change"*
- Mohamed BRAHAM & Ali BEN DHIAB *IO-Sousse Experts – “Impact of climate change on olive oil production”*
- Ali MHIRI *Former professor at INAT, pedologist and essayist - "Operational tools to address the influence of climate change on Mediterranean tree crops: the rain oasis"*
- Giosuè CATANIA *President of APO - "The role of advanced training in the field for the modernisation and competitiveness of the cross-border olive sector facing climate change"*
- Vladimiro GUARNACCIA *Department of Agricultural, Forestry and Food Sciences, University of Turin - "Effect of climate change on the diversity of citrus fungal pathogens in Europe and Africa, with a focus on wood diseases"*
- Giuseppe DIMINO *Director of Service 3 - Multi-functionality and diversification in agriculture - Sicilian Region Agriculture Dept. - "The role of interventions useful for tackling climate change in EU programming"*

11:00 a.m. – European Rural Parliament – Italy (ERP-Italy): Inaugural session of the Italian Rural Parliament

INSTITUTIONAL GREETINGS

- Dario CARTABELLOTTA *General Director of the Agriculture Dept. of the Sicilian Region*
- Raffaella DI NAPOLI *CREA, National Rural Network Task Force Coordinator*
- Giovanni GIUGLIANO *President of AIDCG*
- Pietro PUCCIO *President of the Sicilian Rural Network*
- Vincenzo MORALE *President of the Quality Fruits and Vegetables District of Sicily*



Greetings from a delegation of ERP-Italy members from various Italian regions

INTERVENTIONS

- Sergio CAMPANELLA *Director of LAG Elero and Secretary General ERP-Italy – Experiences and perspectives of ERP-Italy and its possible role in cross-border cooperation*
- Chedly ABDELLY *ANPR President – The opportunity for a Tunisian rural parliament and the guiding role of the promoting committee*
- Kim SMEDSLUND *Secretary General of PREPARE – National Rural Movements and Parliaments part of the European Rural Parliament partnership*
- Vanessa HALHEAD *Secretary General of ERCA – The European Rural Parliament and its work to support the rural communities of Europe*

CONCLUSIONS

- Tom JONES *ERCA President – Veni, vidi...let's go!*
- Nino SUTERA *ERP-Italy Coordinator - The Neo-Rurality Manifesto as a basis for joining ERP-Italy*

General information on PROMETEO

Main beneficiary

Università degli Studi di Catania (UNICT)

Partners

P2: Université de Tunis El Manar (UTM)

P3: Centre Technique des Agrumes (CTA)

P4: Institut National de la Recherche Agronomique de Tunisie (INRAT)

P5: Agence Nationale de Promotion de la Recherche scientifique (ANPR)

P6: Comune di Palazzolo Acreide (PALAZZOLO)

P7: Centro di Ricerca per l'Innovazione e Diffusione della conoscenza (CERID)

P8: Expergreen S.R.L. (EXPERGREEN)

PROMETEO PROJECT IN NUMBERS

| | |
|------------------------|-----------------------|
| Duration | 24 months |
| Project start-up | 29/10/2021 |
| Date of completion | 28/10/2023 |
| N. of project Partners | 8 |
| Overall budget | 1.459.103,08 € |
| EU Contribution | 1.291.659,13 € |

PROMETEO PROJECT ACTIVITIES

| | |
|--|-------------|
| Number of dissemination events and thematic meetings | 4 |
| Involved participants | 300+ |
| Project website | 1 |
| Social media channels | 4 |

OUR CONTACTS

Project website: <https://www.prometeo-italietunisie.eu>

E-mail address: info@prometeo-italietunisie.eu

Facebook: <https://www.facebook.com/Prometeo.ItalieTunisie>

Instagram: https://www.instagram.com/prometeo_italietunisie/

Twitter: https://twitter.com/prometeo_ItaTun

Youtube: <https://www.youtube.com/@prometeoitalietunisie4919>



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