



# Screening of olive germplasm for resistance to *Xylella fastidiosa* ST53: the state of the art

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Sostenibile delle Piante, Bari (IT)



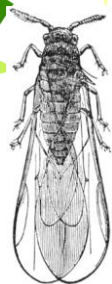
**Universitat**  
de les Illes Balears



European  
Commission



# GENETIC RESISTANCE TO PATHOGENS AND PESTS



Phylloxera




*Citrus tristeza virus*

The history of  
Plant Pathology  
reports several  
examples of  
successes  
against  
epidemics and  
plant diseases

Genetic resistances to bacteria, including *Xylella*, are known in several plant species (i.e. apple, pear, poplar, potato, tomato, alfalfa, corn, cotton, rice, etc.)

**From susceptibility to immunity: several degrees of resistance/tolerance**

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- **DIFFERENT SOURCES OF NATURAL RESISTANCE TO *XYLELLA FASTIDIOSA* (XF) HAVE BEEN DESCRIBED IN GRAPEVINES AND CITRUS**

**LACK OF INFORMATION ON POSSIBLE SOURCES OF RESISTANCE/TOLERANCE IN THE OLIVE GERMPLASM.**

# Biodiversity in olive germplasm: huge number of cultivars in several international collections

Variability Inter-cultivar

Variability Intra-cultivar (Clones)

**Need to identify  
resistant/tolerant  
cultivars/clones**





# PRELIMINARY FIELD OBSERVATIONS OF A FEW CULTIVARS IN SALENTO, HAVE SHOWN THAT **DIFFERENTIAL RESPONSES TO XF INFECTIONS** EXIST







**Leccino**

**Carolea**



Leccino

Ogliarola



Leccino

Ogliarola







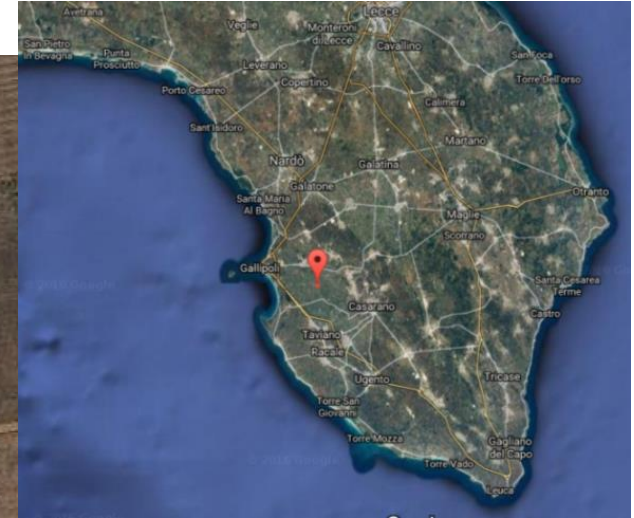
### 3 main research lines

Continuous survey in the infected area for the search of symptomless cultivars and olive seedlings

Experimental fields for the evaluation of the susceptibility to different cultivars to *Xf* infection

Overgrafting on infected trees for the faster identification of resistance (**Quick Tolerance test**)

# Suitable site in infected area selected for the experimental field



# First experimental plot, 2015, with the EFSA support



**Arbequina**

**Arbosana**

**Cellina di  
Nardò**

**Cima di Melfi**

**Coratina**

**Don Carlo**

**Frantoio**

**FS17**

**Koroneiki**

**Leccino**





# This plot was extended in April 2016



- ASCOLANA TENERA
- BELLA DI SPAGNA
- CELLINA DI NARDO'
- CIPRESSINO
- DOLCE DI CASSANO
- ITRANA
- LECCINO
- MAIATICA
- NOCELLARA ETNEA
- NOCELLARA MESSINESE
- NOCIARA
- OGLIAROLA
- OLIASTRO
- PENDOLINO
- PERANZANA
- PICHOLINE
- SIMONE
- TERMITE DI BITETTO
- TOSCANINA



# Further extended in November 2016



Xylella Fastidiosa Active Containment Through a multidisciplinary-Oriented Research Strategy



**SEE POSTER IFAPA (LEON ET AL.)**

Ice Agogia  
Ice Agogia  
o.p.  
o.p.  
Frantoio x Arbosana  
Frantoio x Arbosana  
Frantoio x Arbosana  
Koroneiki o.p.  
Koroneiki x Empeltre  
Koroneiki x Empeltre  
O. cerasiformis  
O. cerasiformis  
PicualxJea9  
PicualxJea9  
JA5 - subsp. europaea var. sylvestris  
MSAC43 - subsp. europaea var. sylvestris  
OLM28 - subsp. europaea var. sylvestris  
OLM40 - subsp. europaea var. sylvestris  
TN10 - subsp. guanchica  
TN2 - subsp. guanchica



# 2017: 40 NEW SELECTIONS PROVIDED BY IFAPA (CORDOBA)



Xylella Fastidiosa Active Containment Through a  
multidisciplinary-Oriented Research Strategy



JUNTA DE ANDALUCIA

**SEE POSTER IFAPA (LEON ET AL.)**



Abou Kanani	Syria
Arbequina	Spain
Arbosana	Spain
Ascolana Tenera	Italy
Ayvalik	Turkey
Barnea	Israel
Barri	Syria
Canino/caninese	Italy
Changlot Real	Spain
Chemlal de Kabylie	Algeria
Chetoui	Tunisia
Chiquitita	Spain
Coratina	Italy
Empeltre	Spain
Frantoio	Italy
Galega	Portugal
rdal Sevillana	Spain
Grappolo	Italy
Hojiblanca	Spain
Kalamon	Greece
Koroneiki	Greece
Lastovka	Croatia
Leccino	Italy
Maarri	Syria
Manzanilla de Sevilla	Spain
Mari	Iran
Mastoidis	Greece
Megaritiki	Greece
Memçik	Turkey
Meski	Tunisia
Moraiolo	Italy
Morrut	Spain
Picholine	France
Picholine marrocaïne	Marocco
Picual	Spain
Picudo	Spain
Shengeh/Fishomi	Iran
Toffahi	Egypt
Uovo di Piccione	Italy
Uslu	Turkey



# HALF EXPOSED IN INFECTED AREA BEFORE TO BE TRANSPLANTED NEXT SPRING IN THE FIELD



Xylella Fastidiosa Active Containment Through a  
multidisciplinary-Oriented Research Strategy



Istituto per la Protezione Sostenibile delle Pianta  
Consiglio Nazionale delle Ricerche



European Conference on Xylella fastidiosa 2017: finding answers to a global problem

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Chetoui	Tunisia
Chiquitita	Spain
Coratina	Italy
Empeltre	Spain
Frantoio	Italy
Galega	Portugal
Gordal Sevillana	Spain
Grappolo	Italy
Hojiblanca	Spain
Kalamon	Greece
Koroneiki	Greece
Lastovka	Croatia
Leccino	Italy
Maarri	Syria
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Meski	Tunisia
Moraiolo	Italy
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Picholine marrocaïne	Marocco
Picual	Spain
Picudo	Spain
Shengeh/Fishomi	Iran
Toffahi	Egypt
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# HALF NEEDLE INOCULATED UNDER CONTROLLED CONDITIONS (IN BARI)



Xylella Fastidiosa Active Containment Through a multidisciplinary-Oriented Research Strategy



Istituto per la Protezione Sostenibile delle Pianta

Consiglio Nazionale delle Ricerche



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Picudo	Spain
Shengeh/Fishomi	Iran
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Uovo di Piccione	Italy
Uslu	Turkey



# 2015: 2 experimental fields in infected area



**COLDIRETTI**



**UNIVERSITÀ  
DEGLI STUDI DI BARI  
ALDO MORO**



**Centro di Ricerca  
Sperimentazione e Formazione  
in Agricoltura "Basile Caramia"**



Istituto per la Protezione Sostenibile delle Pianta  
Consiglio Nazionale delle Ricerche





# Overgrafting for a «Quick tolerance test»

  
**FORESTAFORTE**  
PRODUTTORI DAL 1583




  
Istituto per la Protezione Sostenibile delle Piant  
Consiglio Nazionale delle Ricerche

  
Centro di Ricerca  
Sperimentazione e Formazione  
in Agricoltura "Basile Caramia"

**SEE POSTER «LA NOTTE ET AL.»**



The numbers:  
**12 hectares**  
**5000 overgrafts**  
**260 cultivars**



**The complete list of the cultivar under  
screening is now available on the  
webpage of XF-ACTORS:**

**<http://www.xfactorsproject.eu>**

## SCREENING OF OLIVE CULTIVARS FOR SEARCHING SOURCES OF RESISTANCE TO XYLELLA FASTIDIOSA

09/11/2017







# **SOME PRELIMINAR ENCOURAGING RESULTS:**

## **Leccino and FS-17**

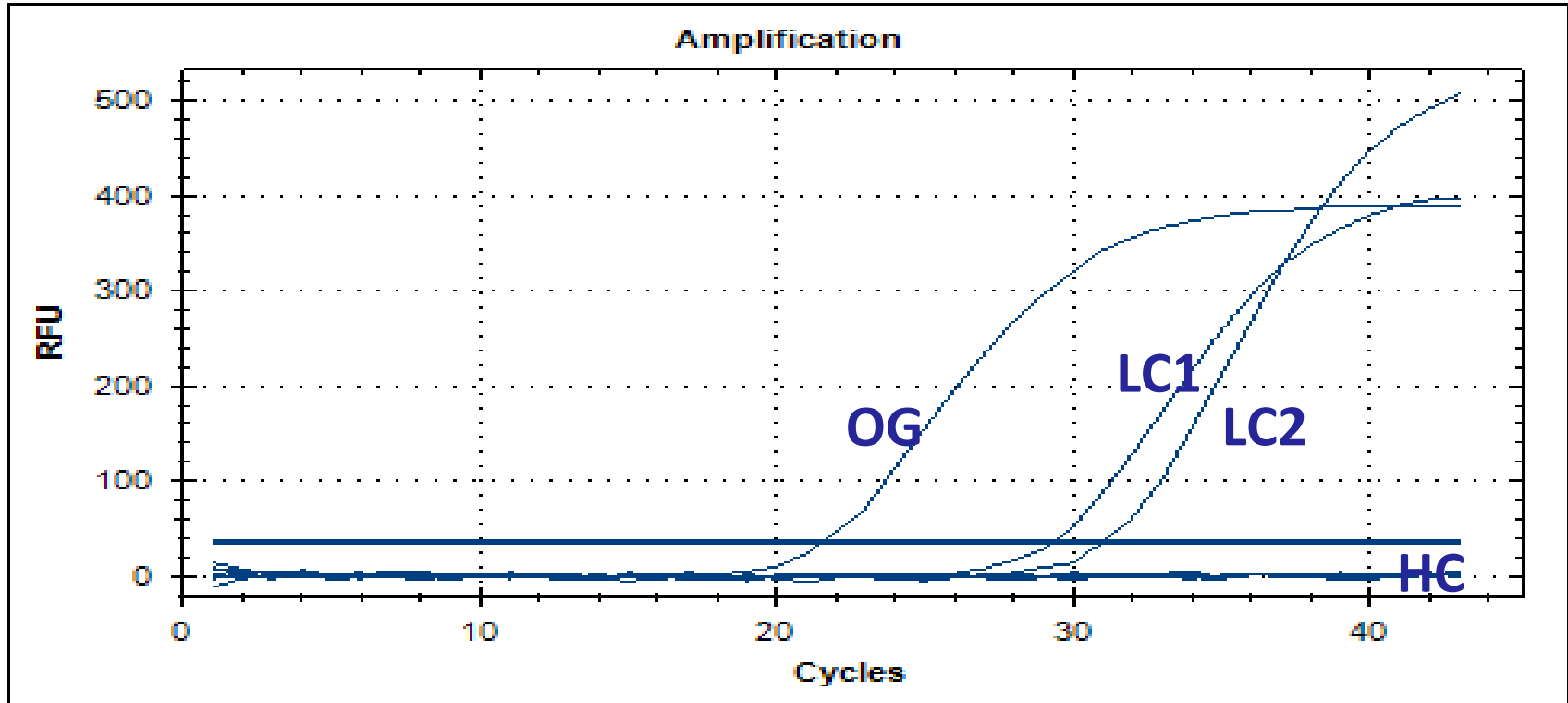


### Evidences of resistance:

Low population of *Xylella* in Leccino (only 1-2%) and even less (0,5%), in FS-17 vs Ogliarola

Comparative analysis of the transcriptome (Leccino vs Ogliarola) show that in infected Leccino there are overexpressed genes involved in mechanisms of resistance previously reported in citrus resistant to xylella

# Quantitative PCR assay



**OG= ogliarola salentina; LC= Leccino, HC= healthy control**



RESEARCH ARTICLE

Open Access



# Transcriptome profiling of two olive cultivars in response to infection by the CoDiRO strain of *Xylella fastidiosa* subsp. *pauca*

Annalisa Giampetruzzi<sup>1</sup>, Massimiliano Morelli<sup>2</sup>, Maria Saponari<sup>2</sup>, Giuliana Loconsole<sup>1</sup>, Michela Chiumenti<sup>2</sup>, Donato Boscia<sup>2</sup>, Vito N. Savino<sup>1</sup>, Giovanni P. Martelli<sup>1</sup> and Pasquale Saldarelli<sup>2\*</sup>

# Identification of genes involved in defense response

## Genes under study

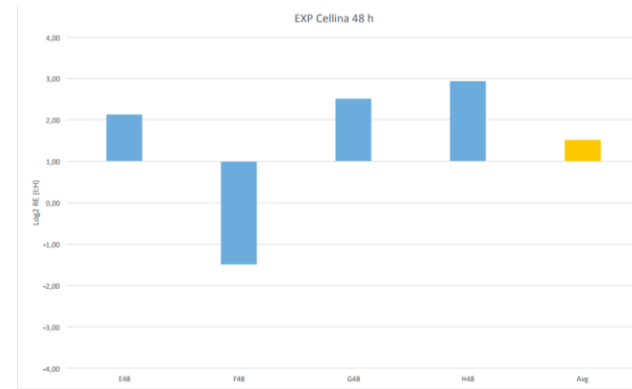
- surface receptors
- expansin (overexpressed in Ogliarola; underexpressed in resistant mandarin (De Souza et al.)
- Calcium transporting, Calcium protein-kinase, Calcium binding (De La Fuente et al.)

## Evaluation of expression in susceptible and resistant cultivars

in greenhouse

on field plants

RNA – cDNA - qPCR



# Resistenza a *Xylella fastidiosa* in diverse cultivar di olivo

## STRATEGIC ROLE OF STAKEHOLDERS

FORESTAFORTE  
PRODUTTORI DAL 1583



IN  
breve

### OSSERVAZIONI E RILEVAMENTI

da saggi diagnostici effettuati su un'area di circa 10 ettari.

...hanno fatto accrescere qualsiasi speranza di eradicazione, facendo concentrare gli sforzi su azioni di contenimento e sulla ricerca di soluzioni che consentano una convivenza sostenibile con il batterio.

### Individuare cv resistenti a *Xylella fastidiosa*

L'attuale indisponibilità di cure atte a eliminare *X. fastidiosa* dalle piante infette indirizza verso più concrete strategie di convivenza, rappresentate dalla ricerca di fonti di resistenza nell'olivo e incoraggiate dalle promettenti risultanze delle analisi effettuate su soggetti della cv Leccino. Peraltro, l'individuazione di germoplasma resistente a *Xylella* è contemplata negli Stati Uniti tra le strategie di gestione della malattia di Pierce

di D. Boscia, G. Altamura, A. Ciniero, M. Di Caro, C. Dongiovanni, G. Fumarola, A. Giampetruzzi, P. Greco, P. La Notte, G. Loconsole, F. Manni, G. Melcarame, V. Montilon, M. Morelli, N. Murrone, F. Palmisano, P. Pollastro, O. Potere, V. Roseti, P. Saldarelli, A. Saponari, M. Saponari, V. Savino, M.R. Silletti, F. Specchia, L. Susca, D. Tauro, D. Tavano, P. Venerito, S. Zicca, G.P. Martelli

**L**a Puglia meridionale è da qualche anno alle prese con una epidemia di un ceppo di *Xylella fastidiosa*, batterio da quaran-

mente tra il 2008 e il 2010.

Dal focolaio, che tre anni e mezzo fa era confinato in un'area del diametro di una decina di chilometri, si è passa-





# RESEARCH TEAM INVOLVED IN THIS STUDY



Instituto de Investigación y Formación Agraria y Pesquera  
**CONSEJERÍA DE AGRICULTURA Y PESCA**

