Surveillance programs and diagnostic tools to preserve mediterranean fruit crops from emerging plant pathogenic bacteria: the case of ***Xylella fastidiosa*** and ***Candidatus* Liberibacter asiaticus**

***Maria Saponari* and Anna Maria D'Onghia**

CFS-43 Side event

"Stop those pests!"
Plant health's essential role in eradicating hunger and eliminating poverty

POnTE PestOrganisms ThreateningEurope

European Commission
Horizon 2020
European Union funding
for Research & Innovation

Euphresco

Two case studies: insect-vectored pathogens

Xylella fastidiosa Wells *et al.*

- **Xylem-limited bacterium**
- **Colonizes a wide range of host plants, usually without causing disease**
- **Present in the Americas, Taiwan, and now Italy and France**
  - **Major crops affected**
    - **Grape, citrus, alfalfa, peach, almond, plum, coffee, etc.**
- **Xylem sap-feeding insects are only vectors**

Recently reported in the Mediterranean Countries

Huanglongbing or Greening

Candidatus Liberibacter asiaticus, africanus, americanus

- ***Thought to be a bacterial disease caused by highly fastidious bacteria***
  - Have not been cultured
  - Koch's postulates not fulfilled
  - Member of the alpha-proteobacteria (gram -)
- ***Evidence***
  - Consistent association with the disease
- ***Graft and insect transmisson***
  - Can be separated from other disease causing organisms

Not present in the Mediterranean Countries

Because long-distance movement of plants for planting and propagating materials is the main driver of the geographic expansion of these 2 pathogens

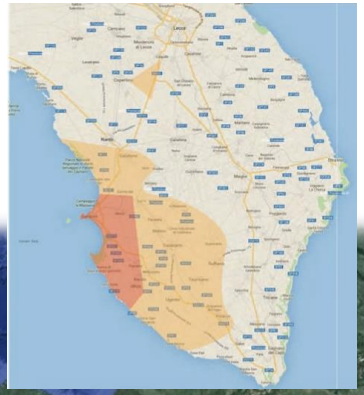
PREVENTION

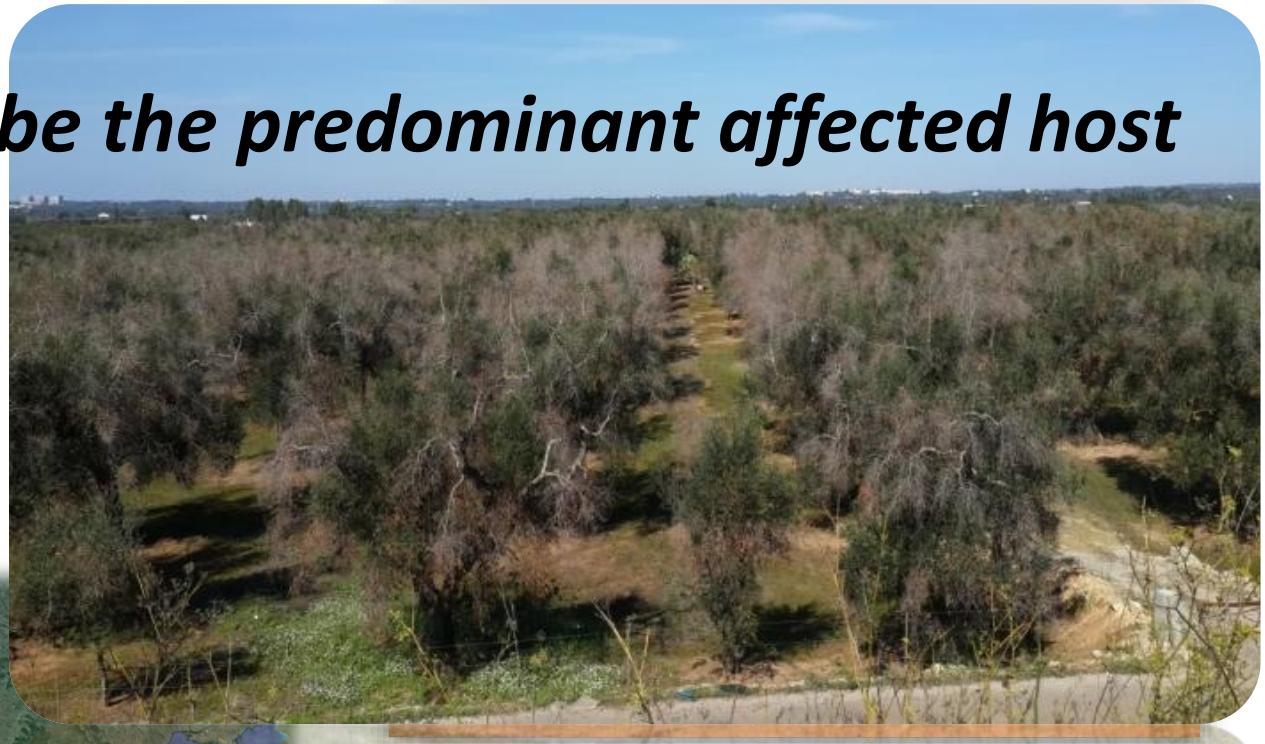
is critical and can be accomplished through:

- **Effective inspections on the traded propagating materials**
- **Surveillance programs in risky location(s)**
- **Effective tools for rapid identification of the target pathogen/vector**
- **Symptoms scouting**
- **Certification program**

The impact of *X. fastidiosa* infestation in the outbreak area in Southern Italy

Olive turned to be the predominant affected host





Apulia region

the largest olive producer region:
41% of the total olive production

But several other hosts are susceptible to the strain occurring in southern Italy



Acacia saligna (Labill.) Wendl.
Asparagus acutifolius L.
Catharanthus
Cistus creticus L.
Dodonaea viscosa Jacq.
Eremophila maculata F. Muell.
Euphorbia terracina L.
Grevillea juniperina L.
Laurus nobilis L.
Lavandula angustifolia Mill.
Lavandula stoechas L.
Myrtus communis L.
Myoporum insulare R. Br.
***Nerium oleander* L.**
***Olea europaea* L.**
Phillyrea latifolia L.
Polygala myrtifolia L.
Prunus avium (L.) L.
Prunus dulcis (Mill.) b
Rhamnus alaternus L.
Rosmarinus officinalis l
Spartium junceum L.
Vinca
Westringia fruticosa (Willd.) Druce
Westringia glabra L.

359 plant species

Up to February 2016, 44 new host species, 15 new genera 5 new families were reported 70% of these new hosts were reported from southern Italy, Corsica and southern France

Because X. fastidiosa associated diseases have very complex ecology

- ***SURVEILLANCE AND MANAGEMENT OF THE Xf-associated DISEASES has several challenges***
  - **High number of host plants to be inspected**
  - **Symptoms can be confused with other alterations (i.e. water stress or other abiotic causes**
  - **Symptoms can vary from one host plant to another**
  - **Infestation can be latent in some hosts**

The Apulian official surveillance system for *X. fastidiosa*:

multidisciplinary, multidata, multiactor

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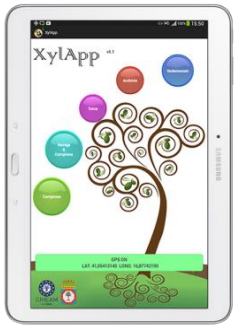
Remote sensing data

Geolocalization

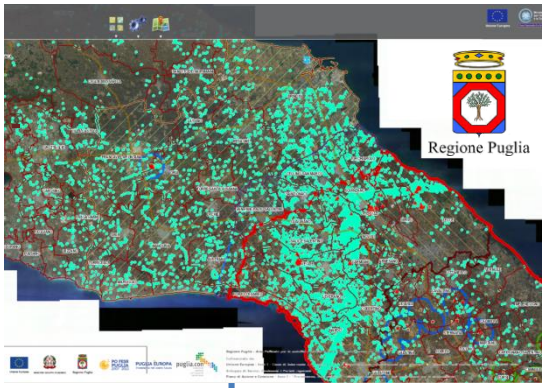
XylApp



Field data acquisition & transmission

Regional Carthographic Service

www.emergenzaxylella.it



Lab data transmission

- ✓ *Monitoring data*
- ✓ *Regional carthography & maps*

Samples

Spy insects

Plant

Labs

ELISA, PCR

Consiglio Nazionale delle Ricerche Istituto per la Protezione Sostenibile delle Piante

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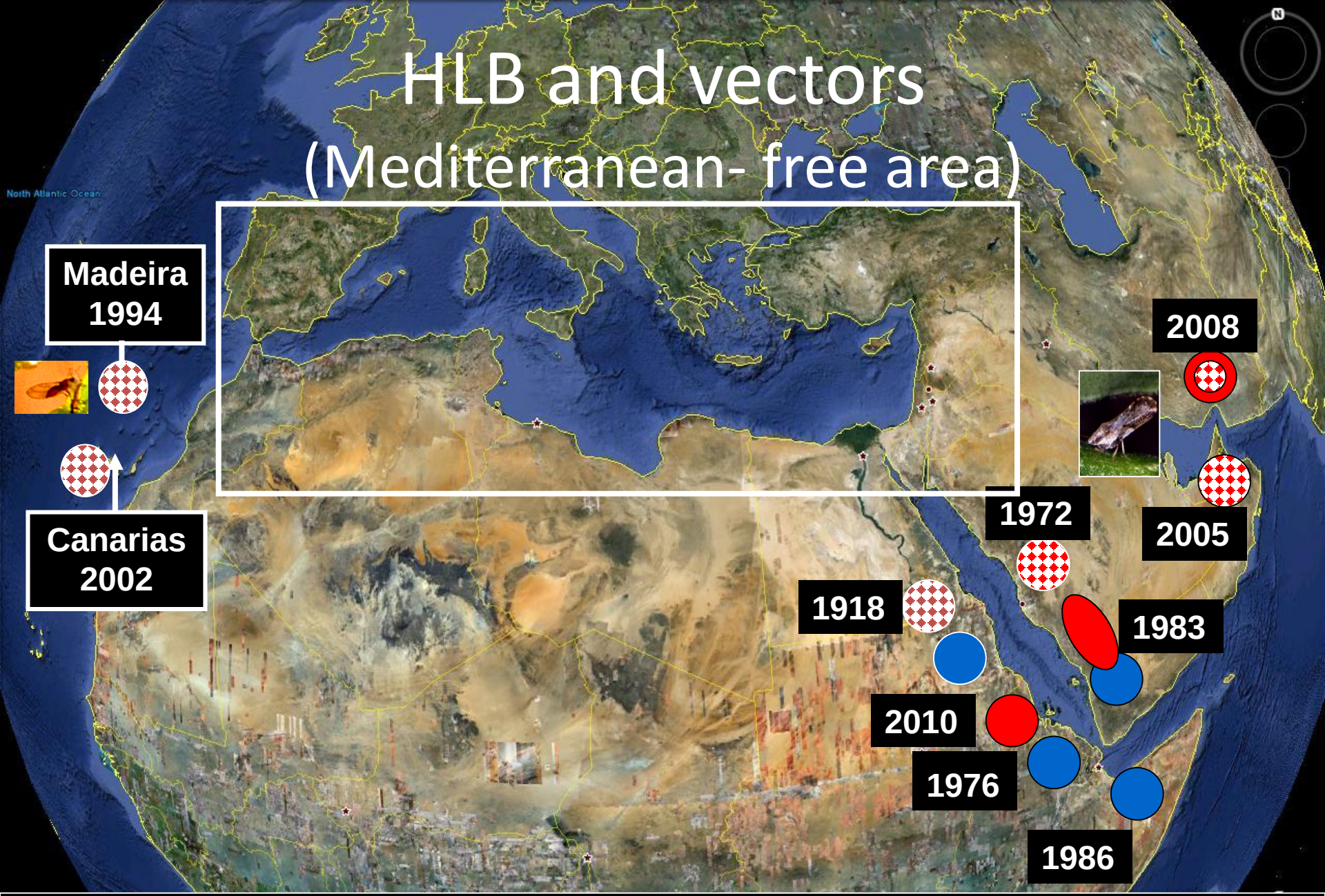
CRSFA

HLB and vectors
(Mediterranean- free area)



D. citri Asian HLB *T. erytreae* African HLB

CITRUS in São Paulo State, Brazil, before HLB

Example of a farm with poor HLB-management: the farm was destroyed.

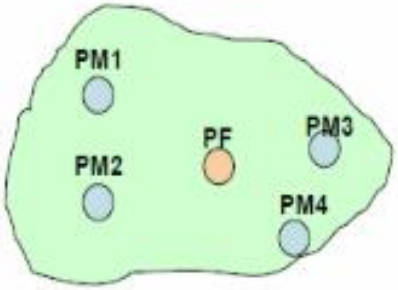
Because the vector has been found in Madeira and Canary island

Monitoring and inspection has been implemented

Canary Islands surveys: 2009 to 2013

14270 visually inspected trees (935 sampled and tested) and 783 *T. erytreae* individually analyzed

NO DETECTION OF HLB AGENTS



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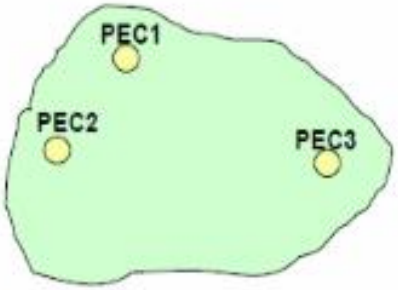


4 aleatory sampling (PM) & 1 fixed (PF)

+

Additionally all the Estrategic points (PEC)

Two main tasks:

1)Visual inspection for quarantine and common pests and diseases in PM & PFs.

2) Traps for quarantine pests in PF & PEC.

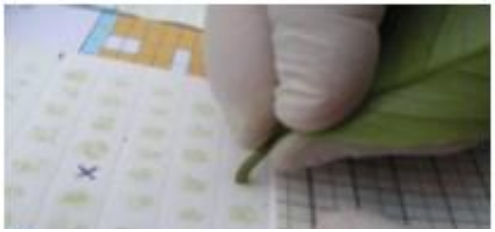
3,000 trees/year/inspector (carefully inspected in areas with traps)

Monitoring methods for citrus psyllid

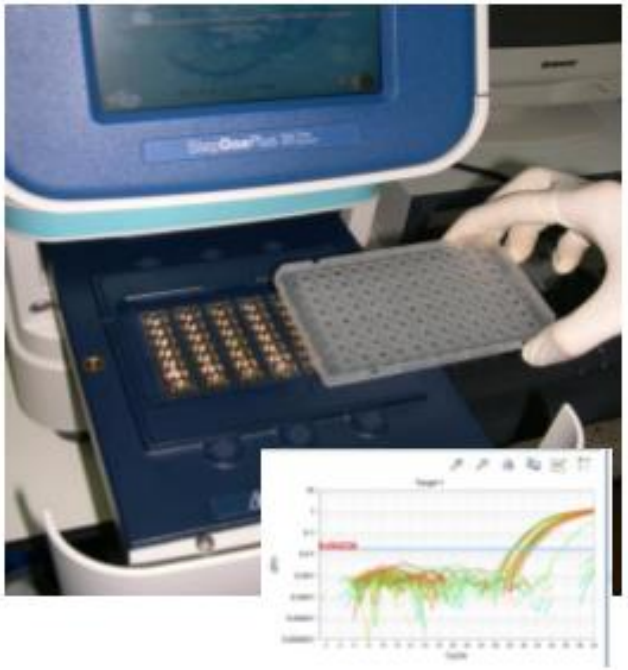
Tap samples

Sweep net

Stansly et al. 2010. Citrus Industry April



RAPID DIAGNOSTIC TOOLS



Critical aspects to implement for the implementation of effective preventive measures

PASSIVE SURVEILLANCE (public awareness, stakeholder education, etc.)

PEST RISK ASSESSMENT IN THE DIFFERENT COUNTRIES TO IDENTIFY:

- Risky areas to be prioritized for surveys and inspection
- Identify the major crop/host plants threatened by the inadvertent introduction of the harmful pathogen
- Inspections on consignments and side of production (nurseries)

AVAILABILITY OF INNOVATIVE TOOLS FOR INSPECTION, SAMPLING AND SURVEYS

RAPID AND RELIABLE DIAGNOSTIC PROCEDURE

CERTIFICATION PROGRAM FOR THE PRODUCTION OF PATHOGEN-FREE PROPAGATING MATERIALS