

# Sentinel insects to anticipate, detect and monitor Xylella fastidiosa outbreaks

Pauline Farigoule, Maxime Lambert, Anne-Alicia Gonzalez, Xavier Mesmin, Sabine Nidelet, Marguerite Chartois, Jean-Pierre Rossi, Sylvain Santoni, Jean-Yves Rasplus, Astrid Cruaud

### ▶ To cite this version:

Pauline Farigoule, Maxime Lambert, Anne-Alicia Gonzalez, Xavier Mesmin, Sabine Nidelet, et al.. Sentinel insects to anticipate, detect and monitor Xylella fastidiosa outbreaks. 3rd European Conference on Xylella fastidiosa and XF-ACTORS final meeting, Apr 2021, Online Event, France. , 10.5281/zenodo.4682793. hal-03840979

HAL Id: hal-03840979 https://hal.inrae.fr/hal-03840979

Submitted on 16 Nov 2022

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers. L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



















3<sup>rd</sup> European Conference on Xylella fastidiosa and XF-ACTORS final meeting

# Sentinel insects to anticipate, detect and monitor *Xylella fastidiosa* outbreaks

Pauline Farigoule<sup>1,2</sup>, Maxime Lambert<sup>2</sup>, Anne-Alicia Gonzalez<sup>3</sup>, Xavier Mesmin<sup>2</sup>, Sabine Nidelet<sup>2</sup>, Marguerite Chartois<sup>2</sup>, Jean-Pierre Rossi<sup>2</sup>, Sylvain Santoni<sup>3</sup>, Jean-Yves Rasplus<sup>2</sup> & Astrid Cruaud<sup>2</sup>

- <sup>1</sup> AgroParisTech, Paris, France
- <sup>2</sup> CBGP, INRAE, CIRAD, IRD, Montpellier SupAgro, Univ. Montpellier, Montferrier-sur-Lez, France
- <sup>3</sup> UMR AGAP, INRAE, Montpellier, France















# INTRODUCTION

Monitoring of plant pathogens is usually carried out by analyzing symptomatic plant material. However when plants are frequently asymptomatic, which is the case for *Xylella fastidiosa (Xf)*, this approach is problematic because it limits our ability to early detect the bacterium and to understand and control its **spread.** To complement plant survey and facilitate large-scale monitoring, we propose to generalize the use of insect vectors (Philaenus spumarius) as sentinels.



# **QUESTIONS**

- How to carry out a large-scale monitoring of Xylella fastidiosa?
- What is the prevalence of Xf in vector populations in Corsica ?



# **MATERIALS AND METHODS**

developed We high throughput method based on a two-step PCR approach followed bv Illumina sequencing (Cruaud et al., 2017). LeuA and HolC were targeted to identify the three main subspecies of **Xf** (multiplex, pauca fastidiosa). This approach enables larger screening than classic (nested) PCR approaches followed bv Sanger sequencing.

Amplification Addition of of the target illumina Gel electrophoresis: adapters and DNA estimation of the euA and HolC indexing of prevalence. samples for multiplexing MiSeq Sequencing: determination of the subspecies. **Amplified** Total DNA Target DNA extracted from target DNA ready for one insect and sequencing purified (Cruaud Host DNA (Philaenus spumarius)

Second PCR

• We used this approach **to monitor the spatio-temporal prevalence of** *Xf* within populations of *P. spumarius* (27 populations of 30 specimens each).

et *al.*, 2018)

First PCR

• DNA was extracted from **single specimens** and **4 replicates of PCR** were performed for each specimen and each gene.



DNA of Xylella fastidiosa

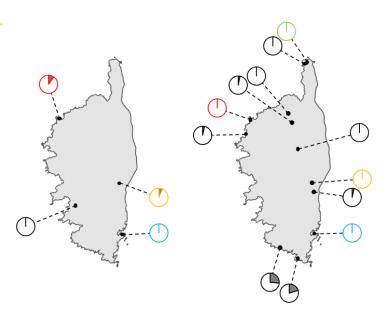
DNA prepared for sequencing

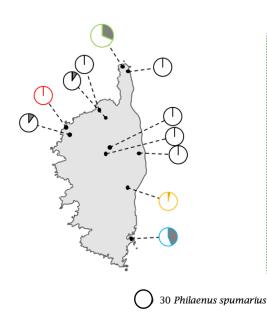
# **RESULTS AND DISCUSSION**

2017

2018

2019





Prevalence of Xylella fastidiosa within populations of Philaenus spumarius in Corsica. Colored pies highlight four sites monitored repeatedly. Corsica with a prevalence in insects of up to 43% depending on the region and the year of sampling.

Xf is present in

occurs

throughout

- Xf is present in ecosystems assumed uncontaminated on the basis of plant monitoring
- No spatial, temporal or vegetation-related pattern of Xf prevalence in insects seem to emerge from our first results.

Porportion of individuals

Infected

Not infected

Our results confirm that Xf introduction in Corsica likely predates 2015, suggest ecological resilience of ecosystems and argue in favor of using insect vectors for Xf survey at large scale in Europe.





# **BIBLIOGRAPHY**

Cruaud P., Rasplus J.-Y., Rodriguez L.J., Cruaud A., 2017, High-throughput sequencing of multiple amplicons for barcoding and integrative taxonomy., *Scientific reports* 7:41948.

Cruaud A., Gonzalez A-A., Godefroid M., Nidelet S., Streito J-C., Thuillier J-M., Rossi J-P., Santoni S., Rasplus J-Y., 2018, Using insects to detect monitor and predict the distribution of *Xylella fastidiosa*: a case study in Corsica., *Scientific Reports*, 8:15628.

# **ACKNOWLEDGEMENTS**

We thank F. Casabianca (INRAE, Corte, France) and L. Hugot (CNBC Corse, France) for their collaboration in setting up a research project in Corsica

This work was funded by the SPE department of the INRAE; the Territorial Collectivity of Corsica; the Horizon 2020 XF-ACTORS Project SFS-09-2016; the French Ministry of Agriculture and the Euphresco network.

















