A population genetic approach on whitefly vectors of begomoviruses

Delatte Hélène
Research questions

- Whitefly vectors of begomoviruses on vegetables (South West Indian Ocean islands, Senegal):
  - Species and genetic diversity
  - Associated endosymbionts and their effects on hybridisation
  - Invasive biological traits

- Recent studies started on Cassava-colonising whiteflies in Africa
La Réunion: context

A resident whitefly population described (Bourriquet, 1938)

Before 1997: no whitefly problem, neither any begomovirus reported on vegetable or cassava

AFTER 1997: whitefly upsurge and begomovirus symptoms on tomato (Peterschmitt et al., 1999; Delatte et al., 2005, Delatte et al., 2007)
La Réunion: Species and genetic diversity

2 SPECIES (mtDNA)

Indigenous of the IO islands (Delatte et al. 2005, 2011) → IO species

Exotic introduced at the end of the 90ies (Delatte et al. 2005, 2007) → MEAM1 species
SWIO: Distribution and genetic diversity of species

- IO distribution area
- (nuclear SSR) 7 geographic clusters: Maurice/Réunion & Seychelles
- (mt DNA) diversity >> continent

Continental origine and ancestral colonisation of the IO Islands
La Réunion: Species and genetic diversity

On nuclear data (SSR):
→ 2 species and 1 hybrid population

AFC, on populations, GENETIX

Delatte et al. 2006
La Réunion: Associated endosymbionts and their effects on species hybridisation?

High and specific endosymbiont diversity

Non random hybridization between species partially linked to endosymbionts (→ IO(CA)xMEAM1)

Endosymbiont diversity within IO and MEAM1

R: Rickettsia
C: Cardinium
A: Arsenophonus
H: Hamiltonella

Thierry et al., 2011
La Réunion: what’s triggering invasion?

Life history traits (exp. performed on tomato)

- Fecundity
- Longevity
- Length of development
- Body size of adults & eggs

However in the field still both populations persist!

Delatte et al., 2009
La Réunion: A new invader!

High upsurges observed in two sites on La Réunion: first detection of the arrival of MED species in 2010

Pairwise $F_{ST}$ between *Bemisia tabaci* species

<table>
<thead>
<tr>
<th></th>
<th>MEAM1</th>
<th>IO</th>
<th>MEDQ1</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAM1</td>
<td>0.27**</td>
<td></td>
<td></td>
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<tr>
<td>IO</td>
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<td>0.32**</td>
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<tr>
<td>MEDQ2</td>
<td>0.36**</td>
<td>0.34**</td>
<td>-0.018</td>
</tr>
</tbody>
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No nuclear genetic differentiation Q1/Q2
No hybrids MED MEAM1 or IO, whereas MEAM1 and IO hybrids still found in the field

Thierry *et al.*, 2014
Whitefly and endosymbiont diversity associated on vegetables in SENEGAL

Nuclear diversity (SSR) // MtDNA (sequencing COI) // Endosymbiont diversity according to host plant/season/sites

MED > MEAM1
No hybrids
Endosymbionts diversity very different according to sp.

Delatte et al., 2014
La Réunion SWIO: What’s on going?

- Crossings between MEAM1 and IO with different endosymbionts
- Endosymbiont heritability
- Mating behaviour between MEAM1 & IO
- Insecticide susceptibility between MEAM1 & IO

...>> are on going experiments in the lab.
Recent studies conducted in collaboration on Cassava-colonising whiteflies in Africa
Cassava Virus Pandemic in East/Central Africa and the Role of Vector Insects: Driving Factors behind Super-abundant Population(s) of the Whitefly *Bemisia tabaci* (Gennadius) in Newly Affected CMD Pandemic Areas of Tanzania

**Lensa Sefera TAJEBE**
PhD fellowship Erasmus Mundus, joint university diploma

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Which species, and how these cassava whitefly species are structured within pandemic and non pandemic areas in Tanzania?

MED, IO, SSA1 *Bemisia tabaci* species and *B. afer*

SSA 1 Populations structured into 3 sub-groups, linked to pandemic, intermediate and non pandemic populations, however with gene flow
Brice Marabena TOCKO

PhD fellowship (SCAC, PRASAC, CIRAD), joint university diploma (University of Bangui-University of La Réunion)

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Species diversity, associated endosymbionts and genetic structuring of cassava colonising whiteflies in Central Africa
Sampled countries

- Centrafrique
- Gabon
- Congo
- Cameroun
Relevant publications of the « team of La Réunion» on the insect vector *Bemisia tabaci*

Thanks for your attention !!

Whitefly team of La Réunion

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