

The XVth European Chestnut Days

Development of a biological control against
Cydia spp. with *Trichogramma spp.*

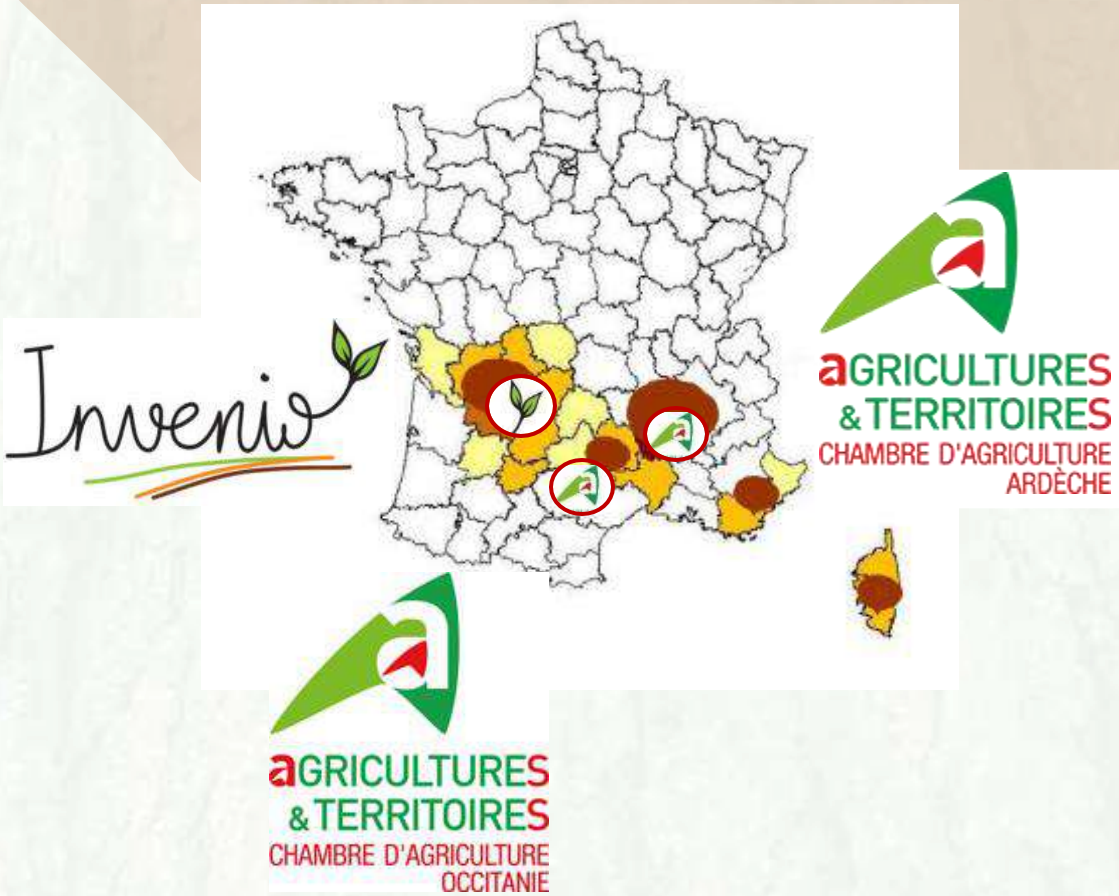


K. Pecharová, G. Groussier, M.N. Hébrard, N. Lebarbier, H. Déplaude, C. Portal, J.B. Philibert

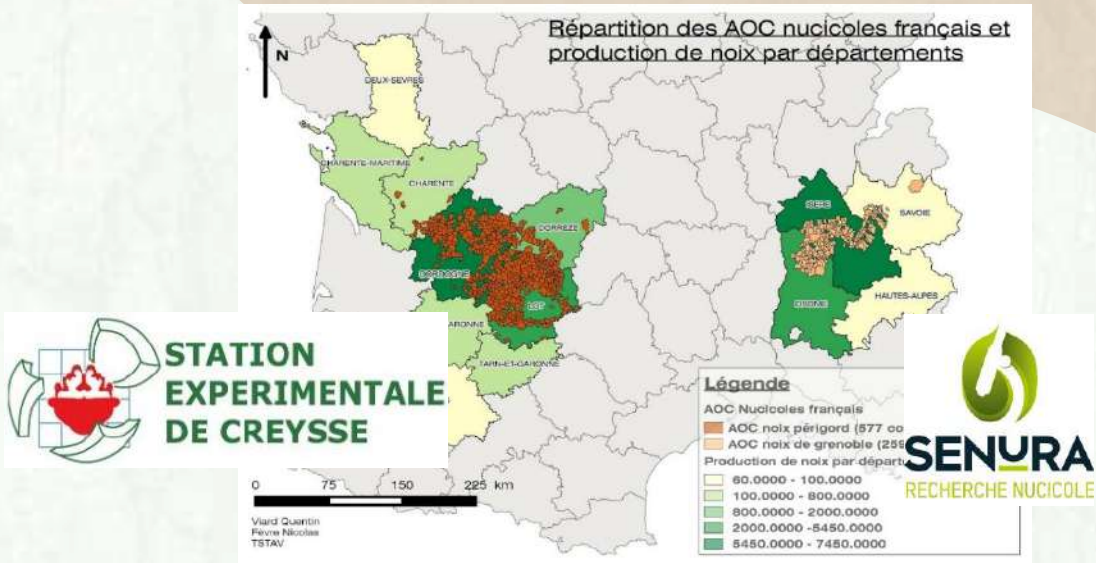
2025

Project (2023 – 2026)

Project CASDAR – Development of knowledge for agriculture and rural context



INRAE



Borer caterpillars in chestnut orchards

- *Cydia splendana* : can attack >50% fruits
- *Pammene fasciana* : can attack 20 – 40% fruits
- *Cydia fagiglandana* : new in France

Pest management in chestnut orchards

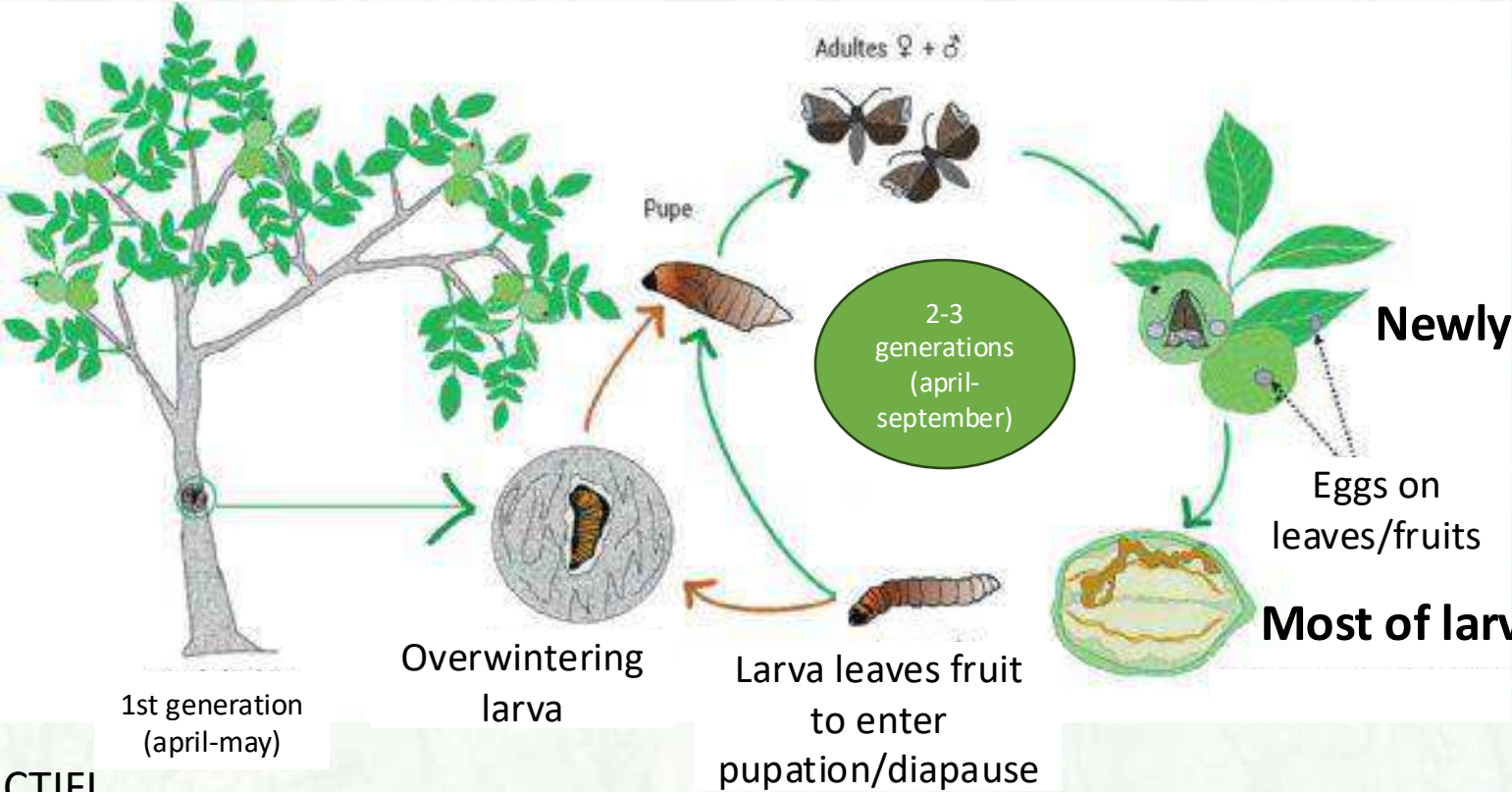
- High and complex canopy
- Difficult to access
- Few efficient alternative solutions & decreasing number



Pest management

Biological control:

- Using one organism (biological agent) to control another (pest)

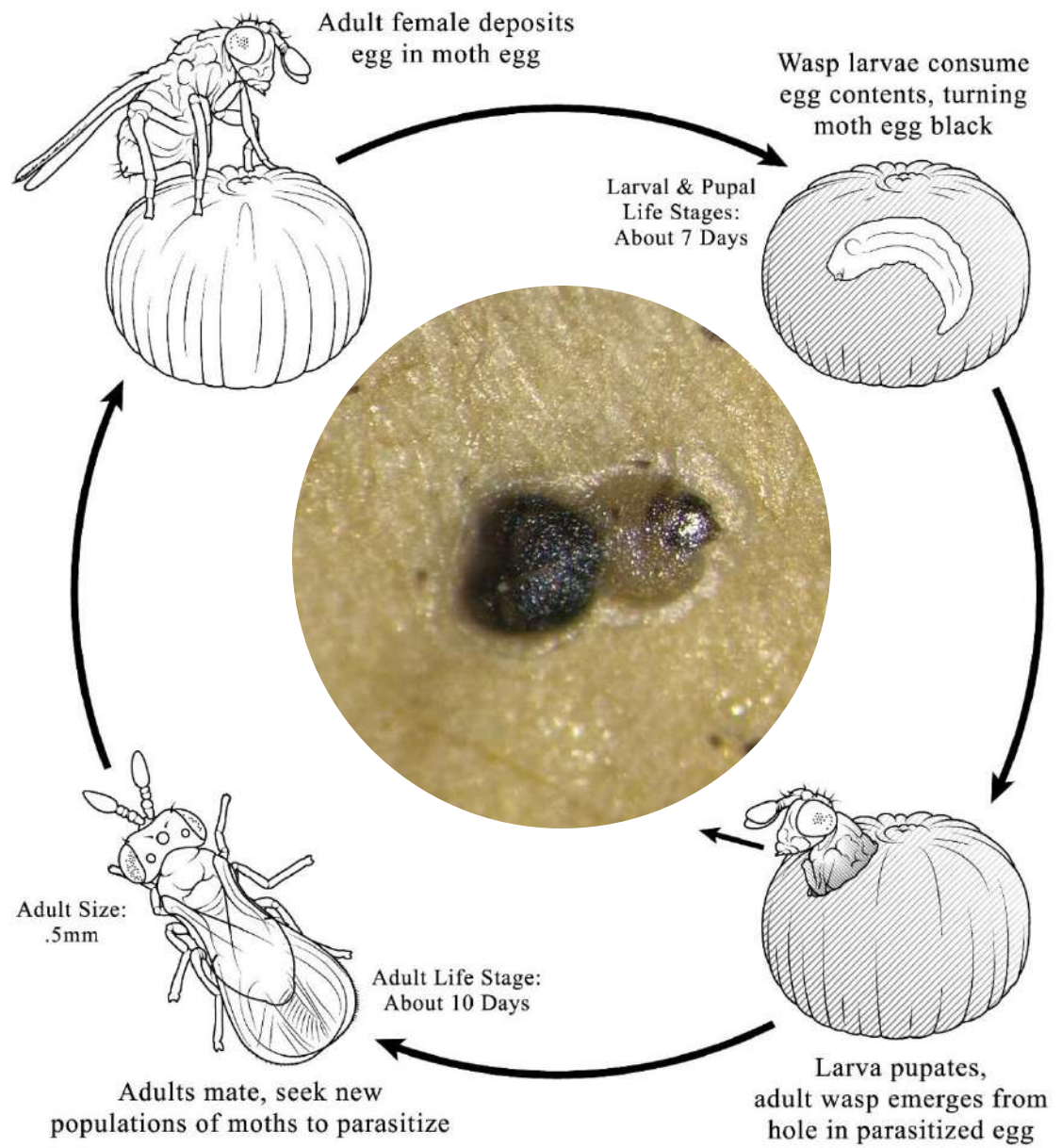


Newly hatched caterpillars quickly hide in fruits

Most of larval development: inaccessible to enemies

Trichogramma spp.

- Parasitoid micro-hymenoptera (0,5mm)
- + 200 species
- Egg parasitoid of mainly lepidoptera
- **Action before attack – limits damages**
- Short life-cycle (14 days at 22°C)
- Well-established husbandry
- Complementary to other biosolutions



Biocontrol with *Trichogramma*

More and more used strategy with a lot of potential

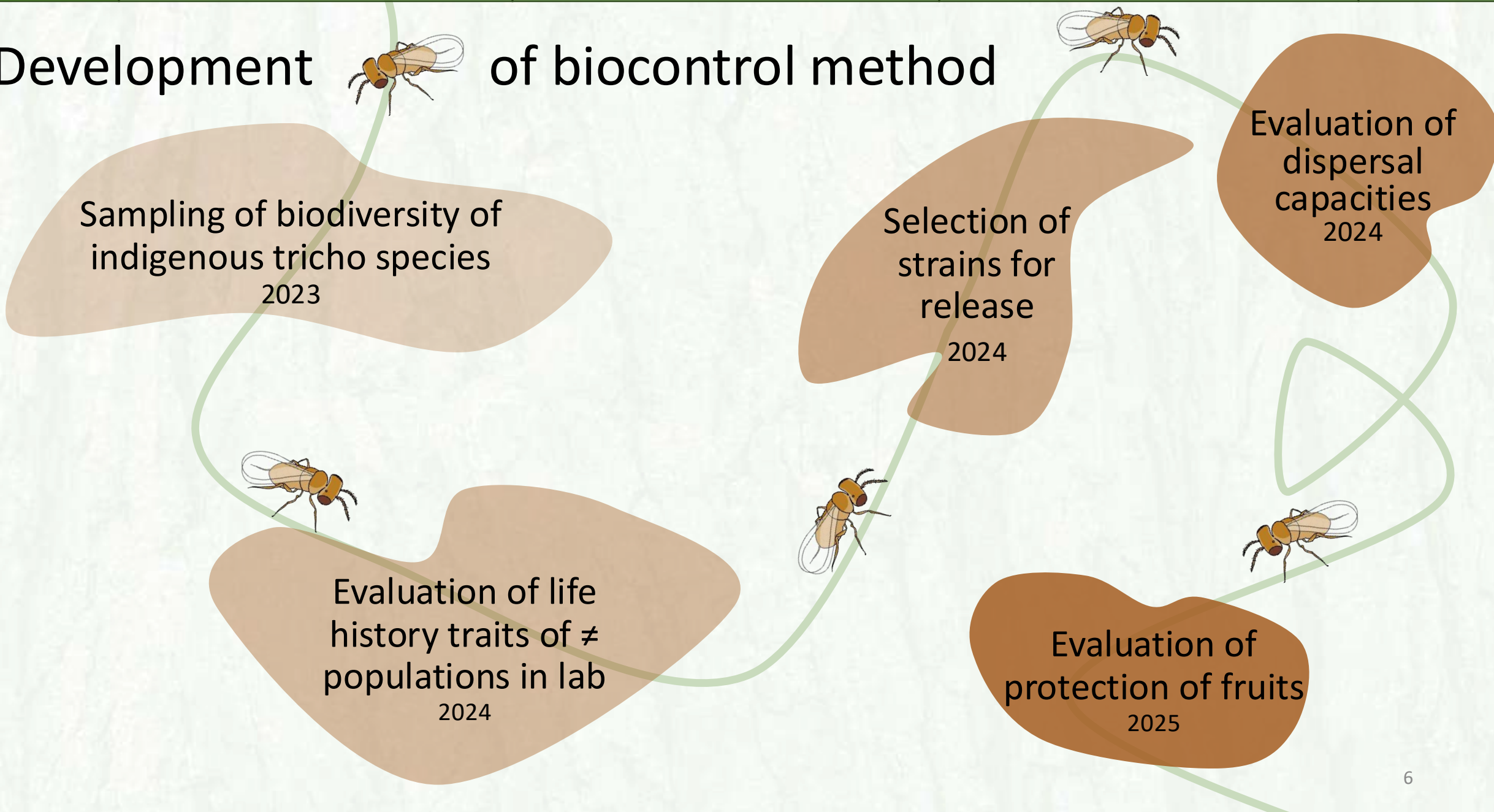
- Comparable protection to conventional methods
- Already used against some of the target species
- Already used in orchards
- Optimisation for each system is key

Inoculative biocontrol with native species

- Well adapted enemies
- Less non-target effects
- Easier legislation
- Reduced cost



Development of biocontrol method



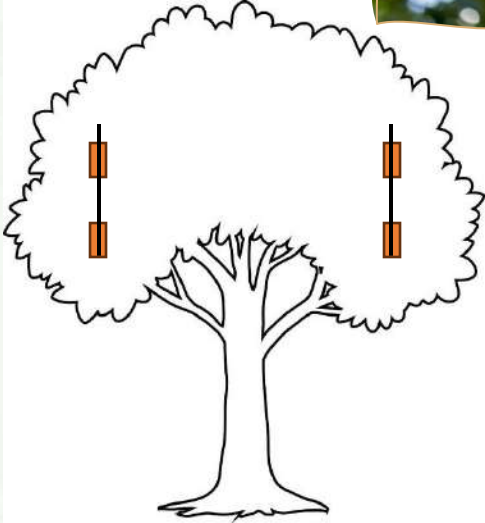
Sampling of indigenous *Trichogramma* in orchards

Challenges:

- Capture method:
 - Sentinel eggs
 - Fictitious host *Ephesia kuehniella*
 - Target* host *Cydia pomonella*
 - UV sterilisation for *E. kuehniella*
 - Non-fertilized eggs for *C. pomonella*
- Egg pest viability:
- High canopy: 2 - 11.7 m

2 placements / tree, each with 2 positions and both species of host eggs

5 orchards in total : 734 samples



Successfully capturing native *Trichogramma*

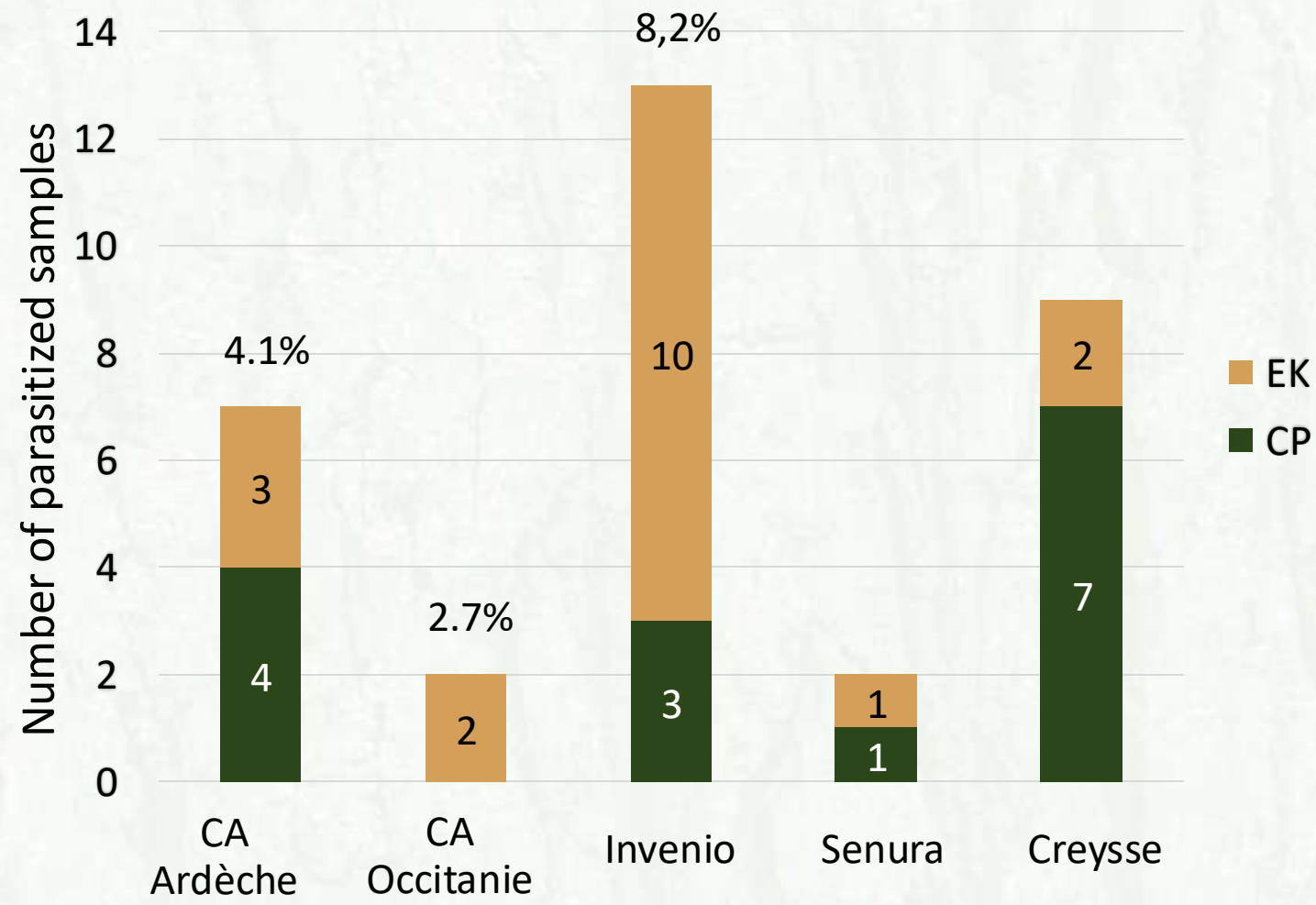
Global capture rate: 4.6 %

- > Good rate for this method
- > Captures on both hosts

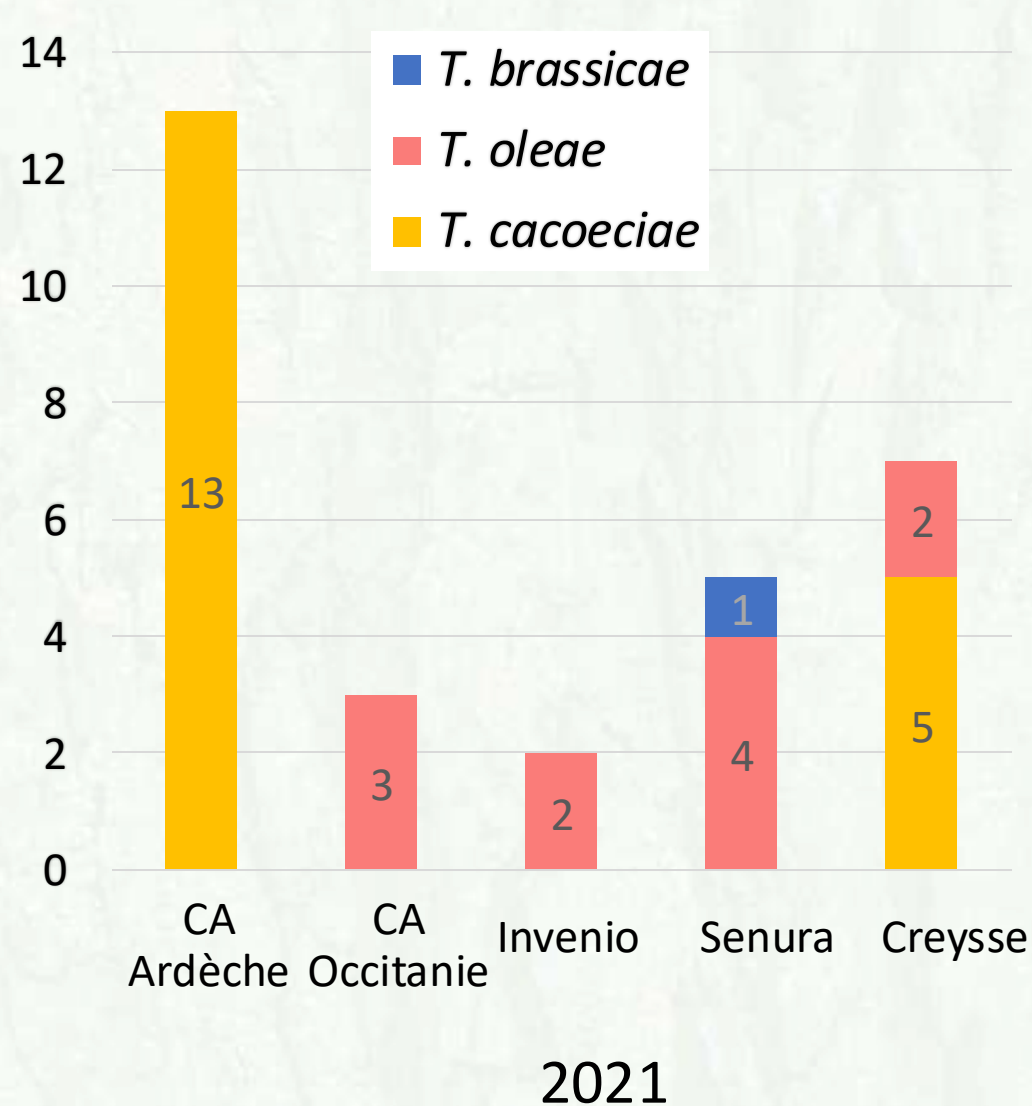
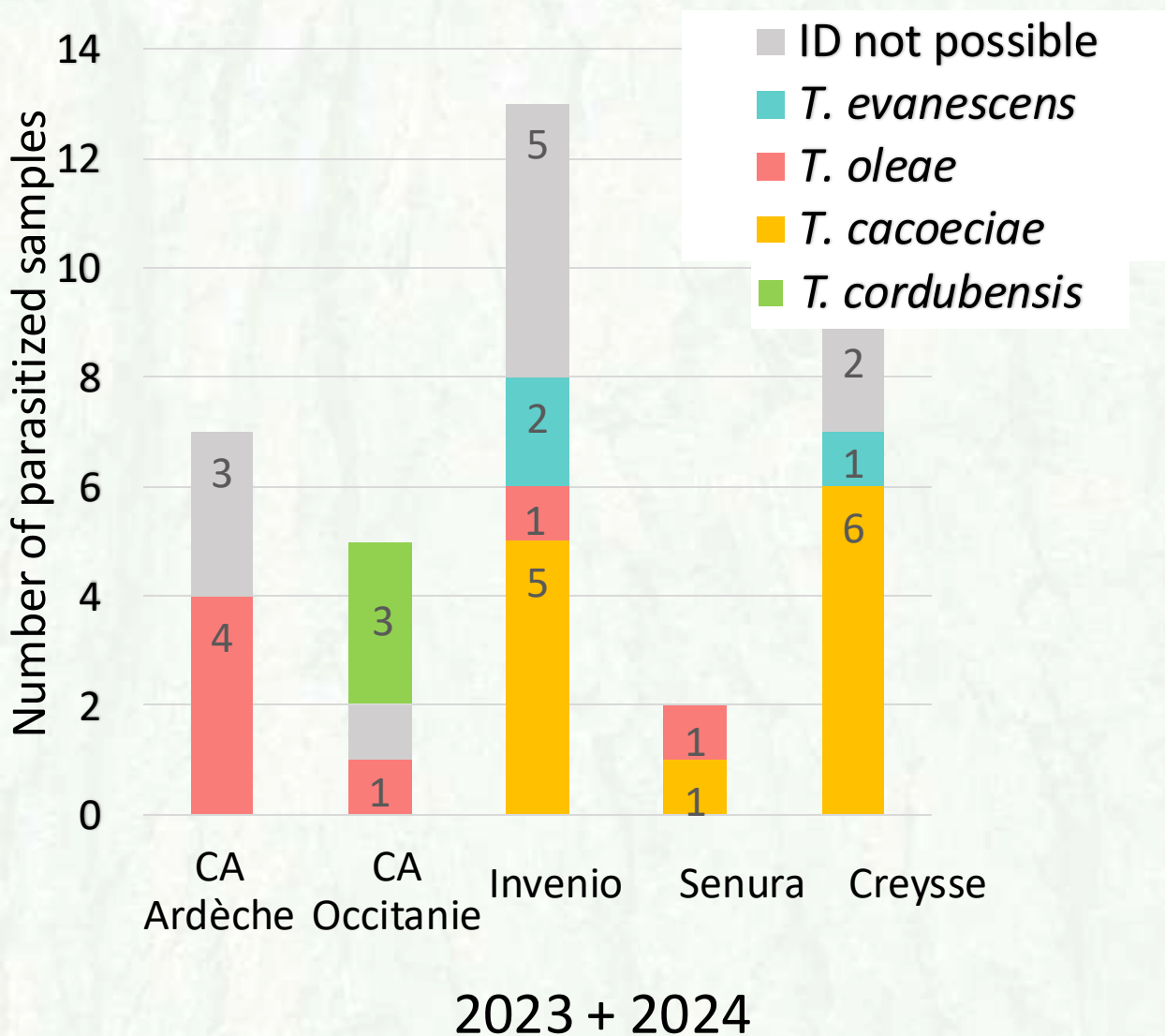
Mean height : 5.4 m (2.95 – 11.5 m)

In total : 34 parasitized samples

18 strains sucessfully reproduced in lab



Biodiversity of native *Trichogramma* in orchards



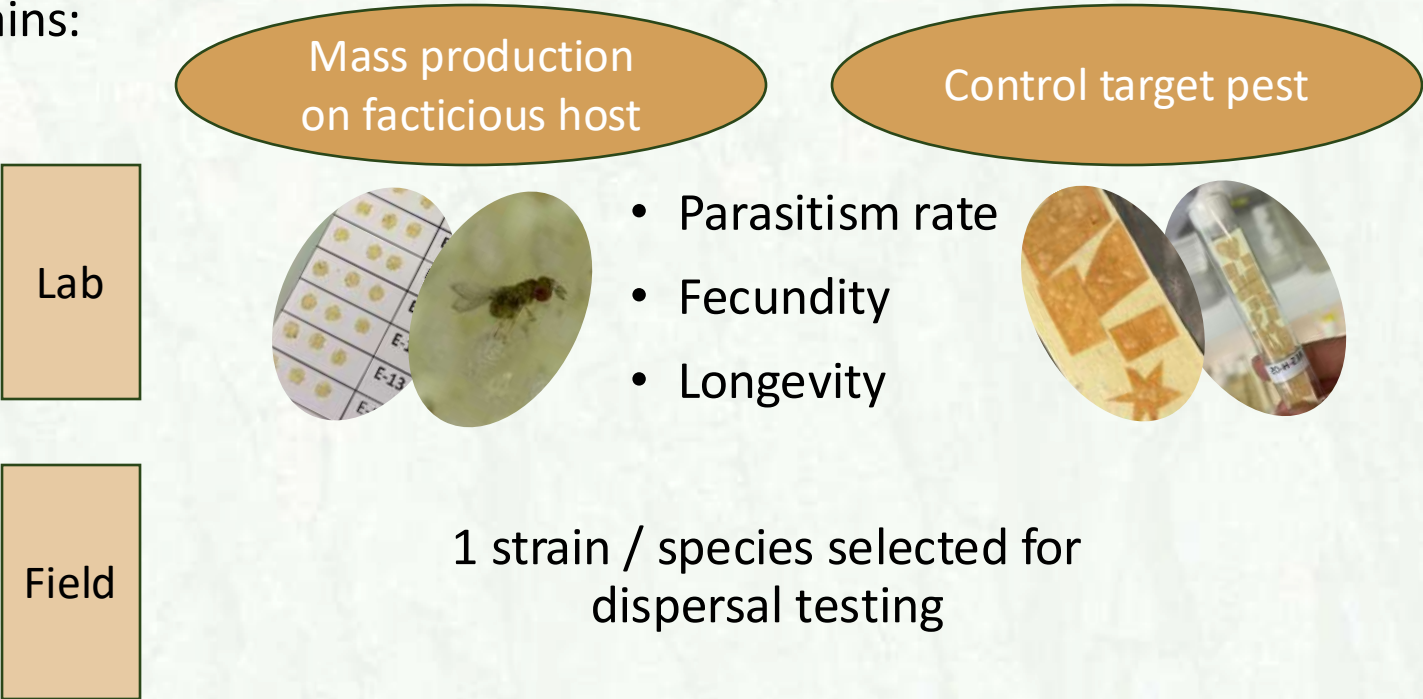
Selection of the best candidate for biocontrol

Simultaneous release of two species:

T. oleae* & *T. cacaoeciae

- Successfully reared in the lab
- Most often sampled
- Asexual

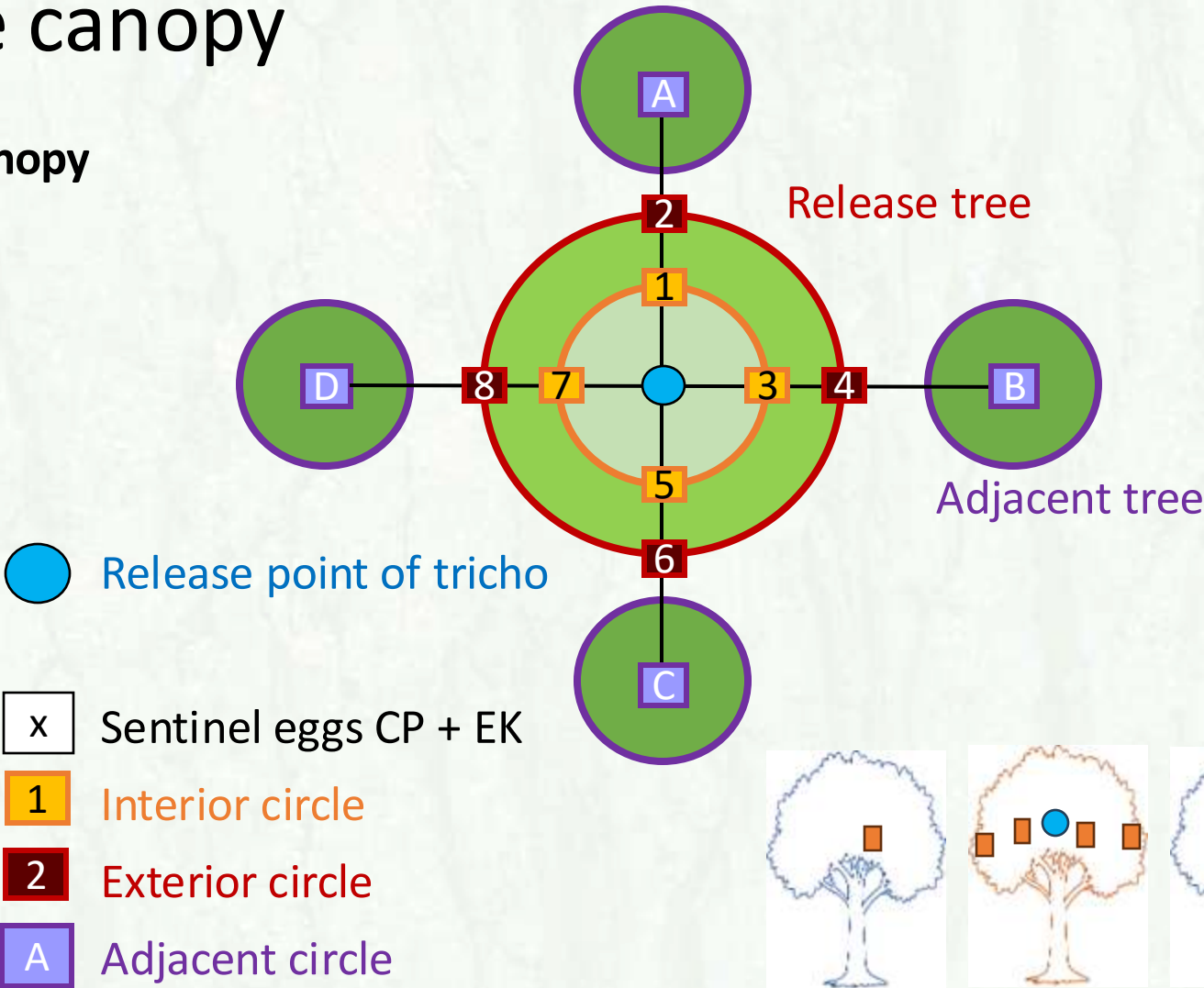
Evaluation of different strains:



Horizontal dispersal in the canopy

Release of emerged adults directly in the canopy

Sentinel eggs collected after 24h



Results

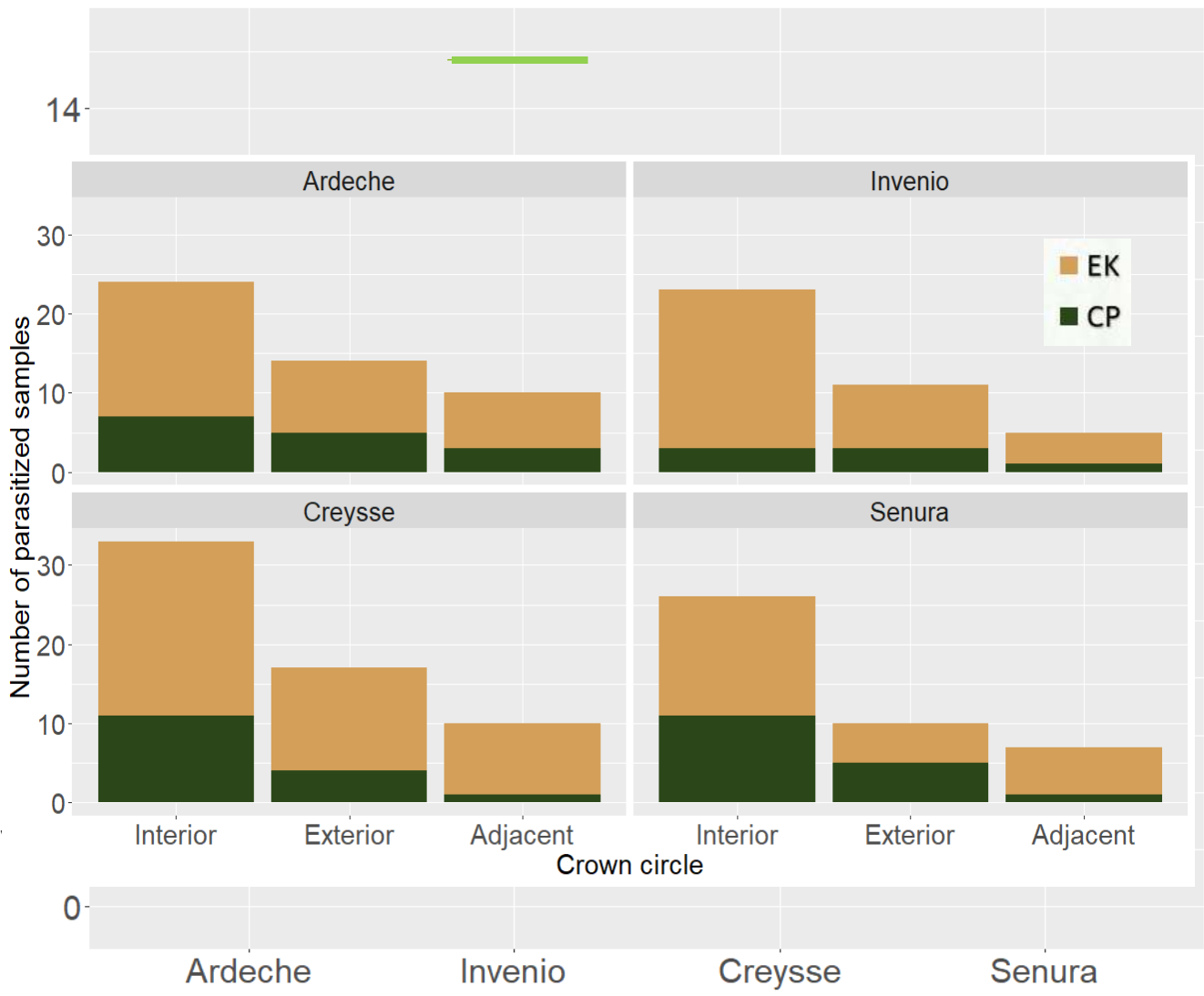
In 24h: both species released were recaptured

- 1.1 – 12.3 m
- In all directions
- Captures even on adjacent trees

Trichogramma disperse through high canopy

But 1 central release point not sufficient to quickly & reliably cover the entire tree crown

Distance range a



Releases to limit fruit damages

5 points of release per tree

Release and Control zone

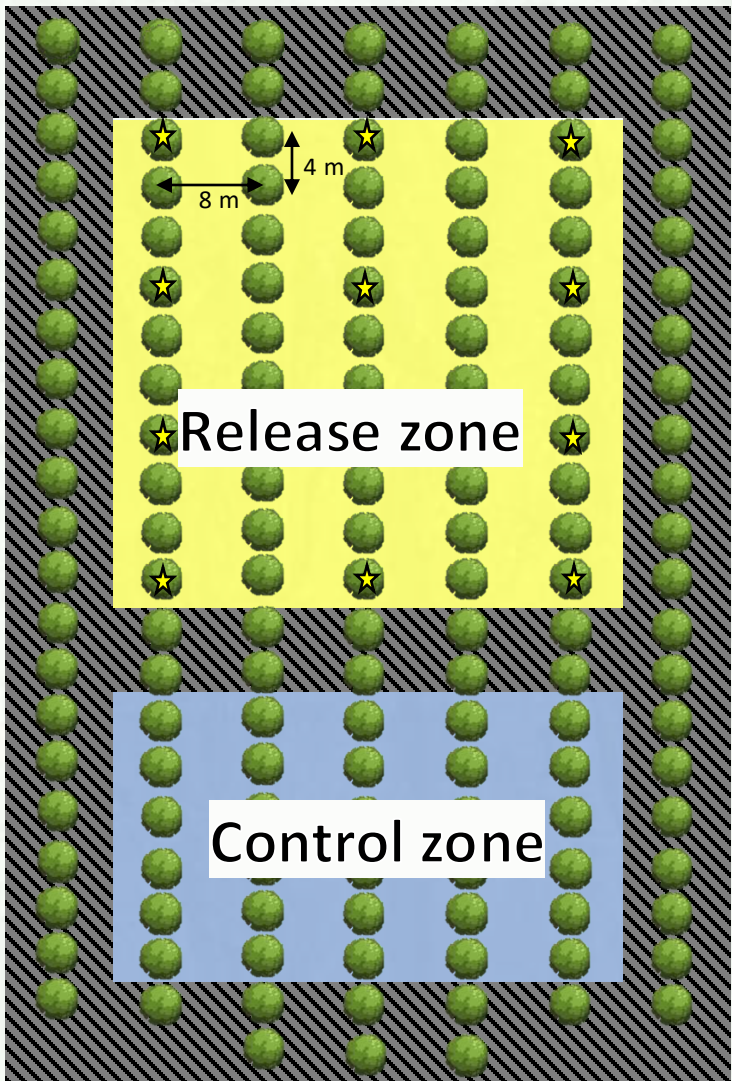
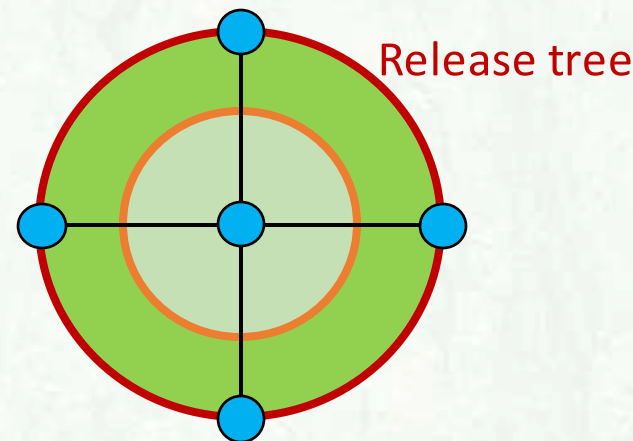
- 10 trees per release zone
- All 5 partners with 2 orchards / partner

1 release / week for 3 weeks – beginning infestation

Small dose : 50 000 trichogramma / ha

Expected results:

- Maintained presence of trichogramma – sentinel eggs
- Comparison of fruit damages between Release & Control zones



Perspectives

2026 – New releases

Optimisation of the method of:

- Dose effect
- Local production of *Trichogramma*
- Release in the high canopy via drones

International cooperations ?



Thank you for your attention!

