Rapid and transient evolution of specialization to seasonal host fruits in the invasive pest *Drosophila suzukii*

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Understanding how generalist herbivorous insects can infest so many host plants

Role of adaptive phenotypic plasticity?

Transient specialization to different host plants ?

Speed of adaptation?

➔ New agroecological approaches relying on maladaptive phenotypic plasticity or maladaptation to important crop plants

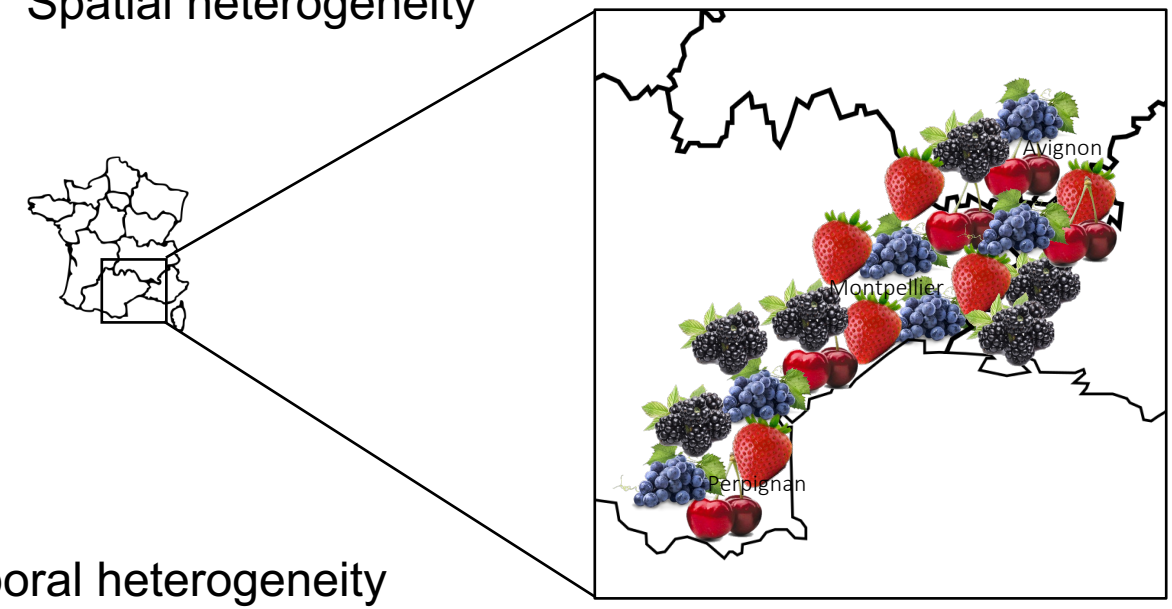
Understanding how generalist herbivorous insects can infest so many host plants

Drosophila suzukii

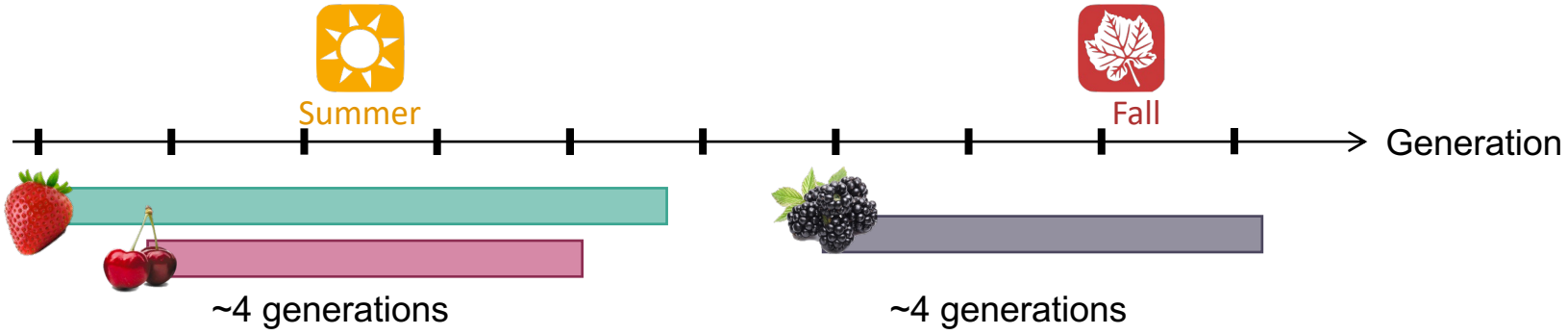
>17 plant families

Understanding how generalist herbivorous insects can infest so many host plants

Spatial heterogeneity

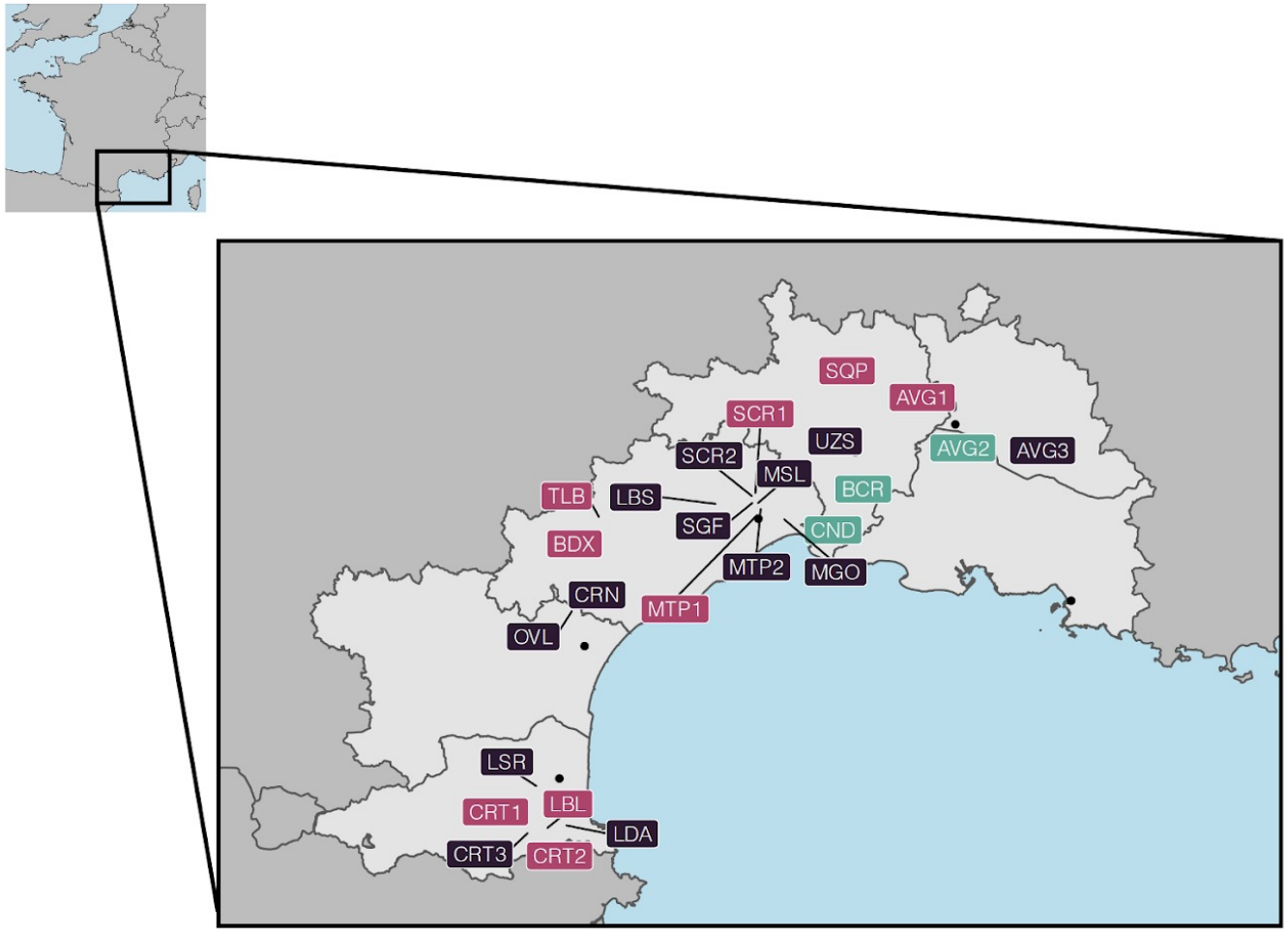


Temporal heterogeneity



➔ Relative role of local adaptation and adaptive phenotypic plasticity?

Adaptation of *D. suzukii* to its host plant (Laure Olazcuaga's PhD 2016-2019)

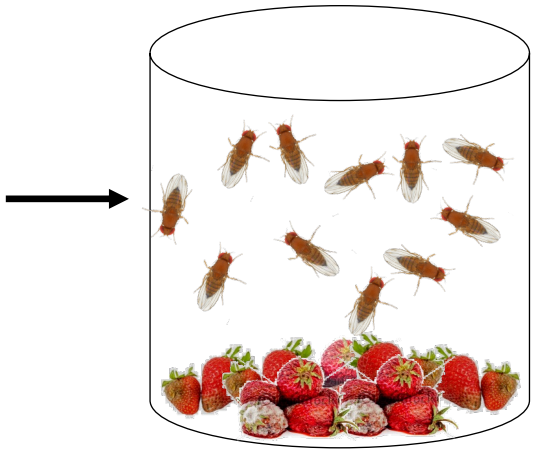


Olazcuaga *et al.* 2022 *Evol. Letters*

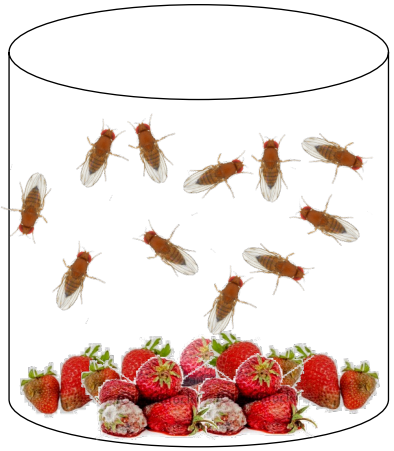
Populations from:

- Cherry
- Strawberry
- Blackberry

Reciprocal transplant experiment

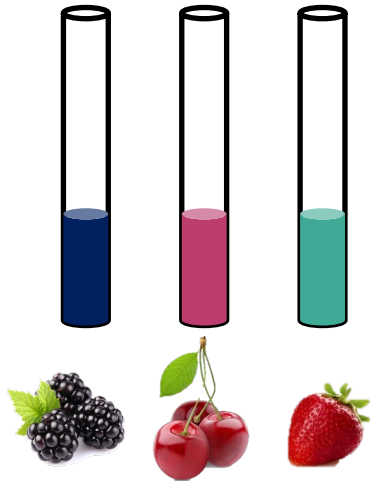


Reciprocal transplant experiment

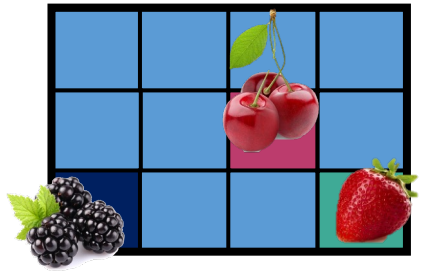


common garden
(2 generations)

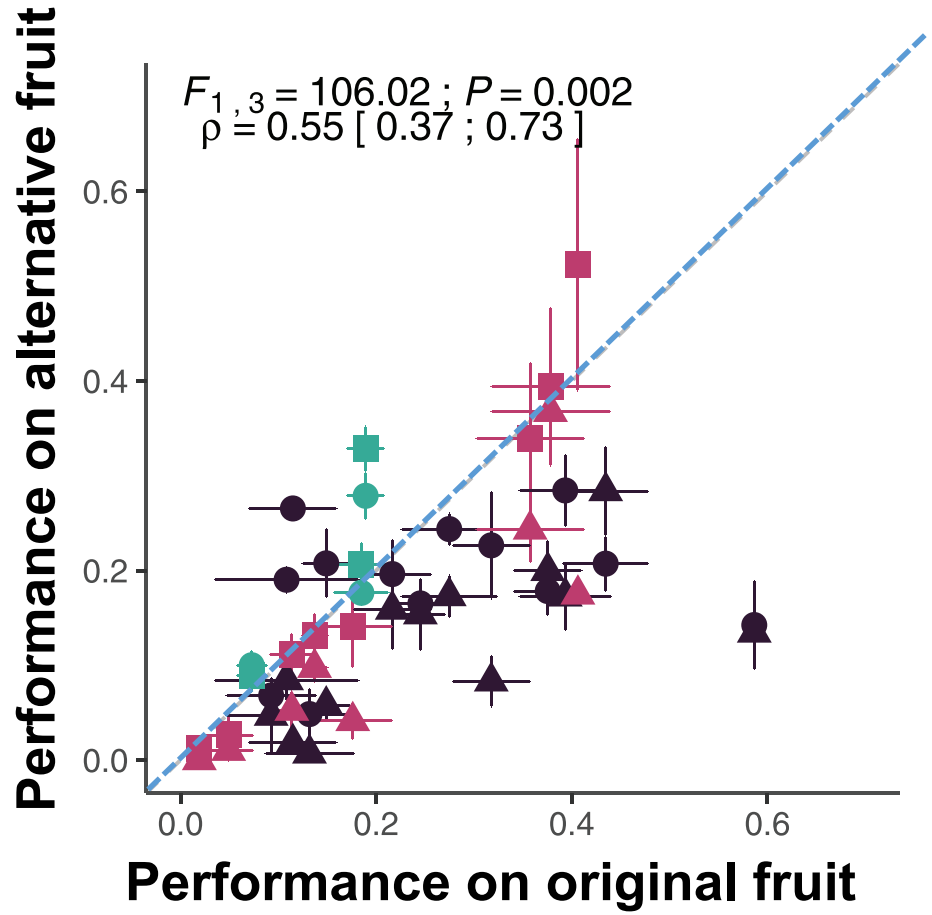
Offspring performance
(egg-to-adult survival)



Oviposition preference

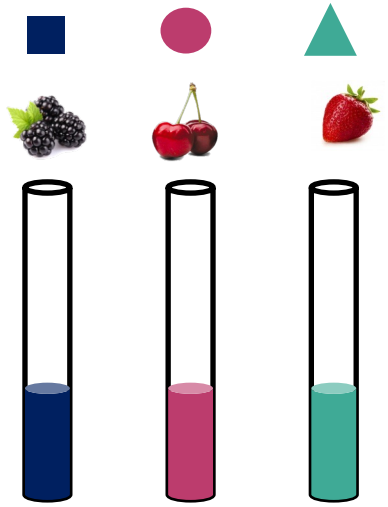


Offspring performance



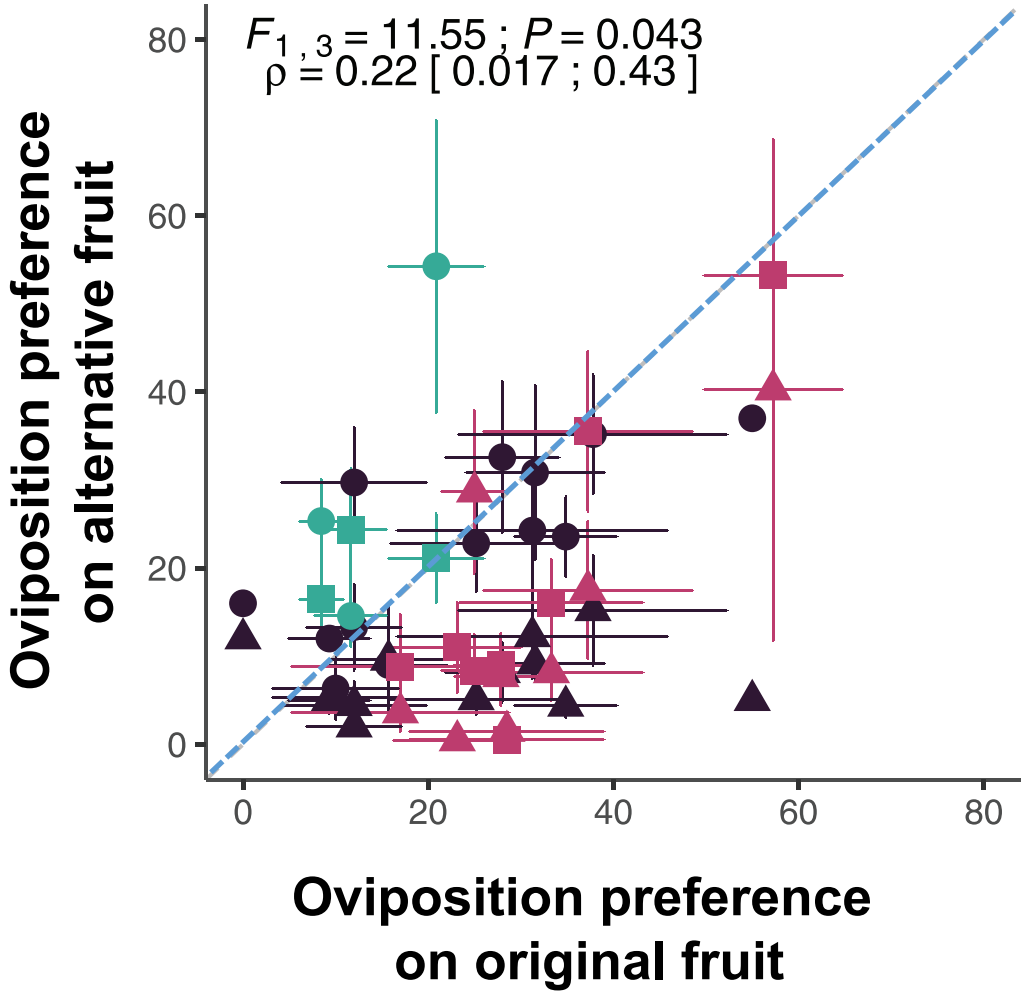
Populations from:

Media tested:



➔ Strong variation among populations
➔ Pattern of local adaptation

Oviposition preference



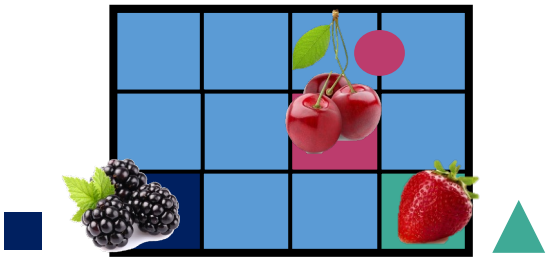
Populations from:

Cherry

Strawberry

Blackberry

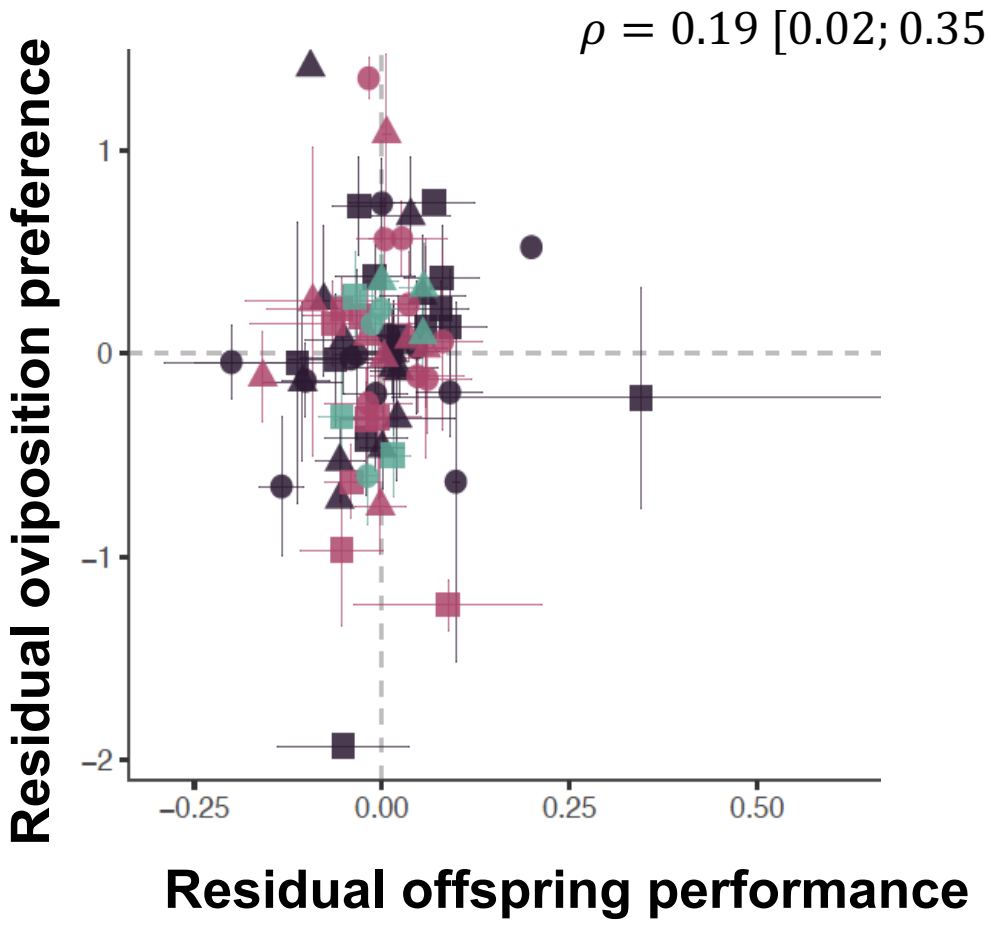
Media tested:



➔ Strong variation among populations

➔ Weak pattern of local adaptation

Correlation between performance and oviposition preference



Populations from:

- Cherry
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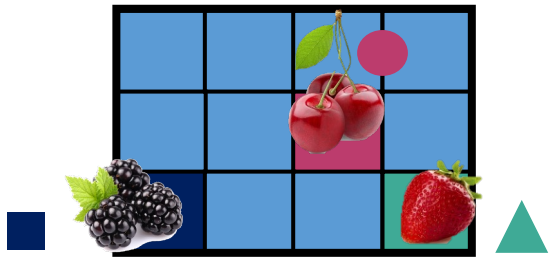


➔ Weak correlation

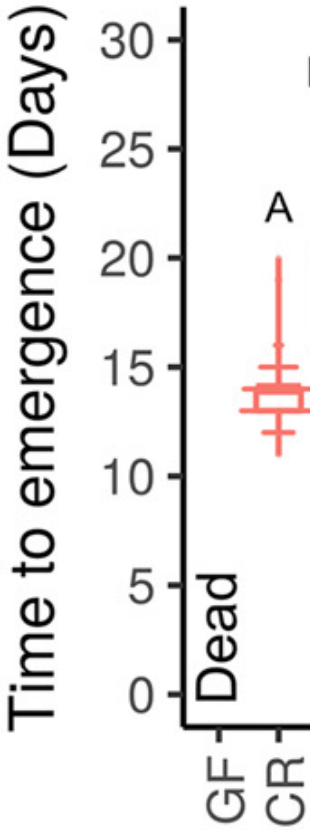
Two main hypotheses

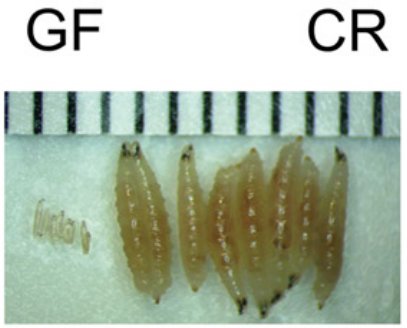
Variation among populations and pattern of local adaptation:

- H1: local adaptation of *D. suzukii* genotypes (G and G x E)
- H2: microbiota-induced adaptive phenotypic plasticity (C and C x E)

Importance of microbiota in *D. suzukii*

Conventionally reared

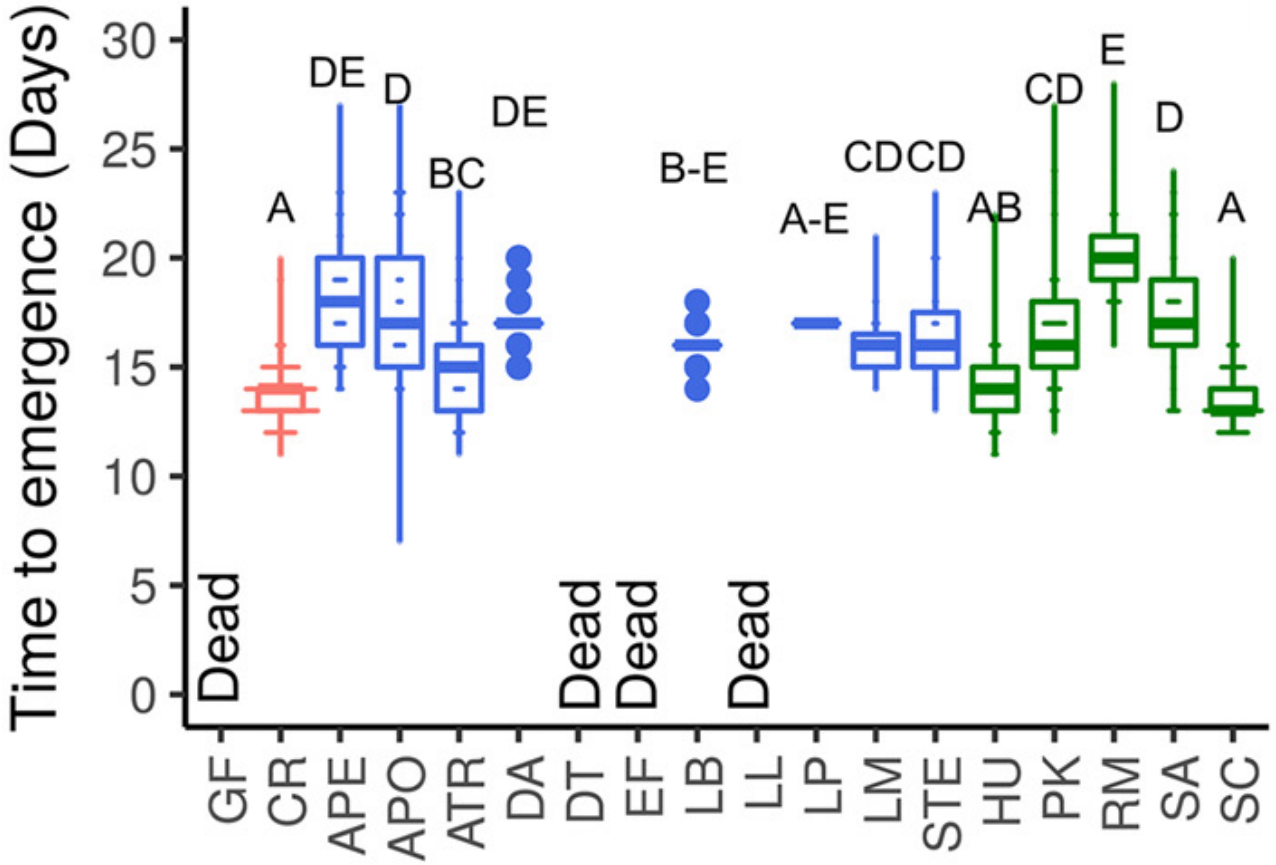




Bing et al 2018 *mBio*

Importance of microbiota in *D. suzukii*

Conventionally reared
Bacteria
Fungi



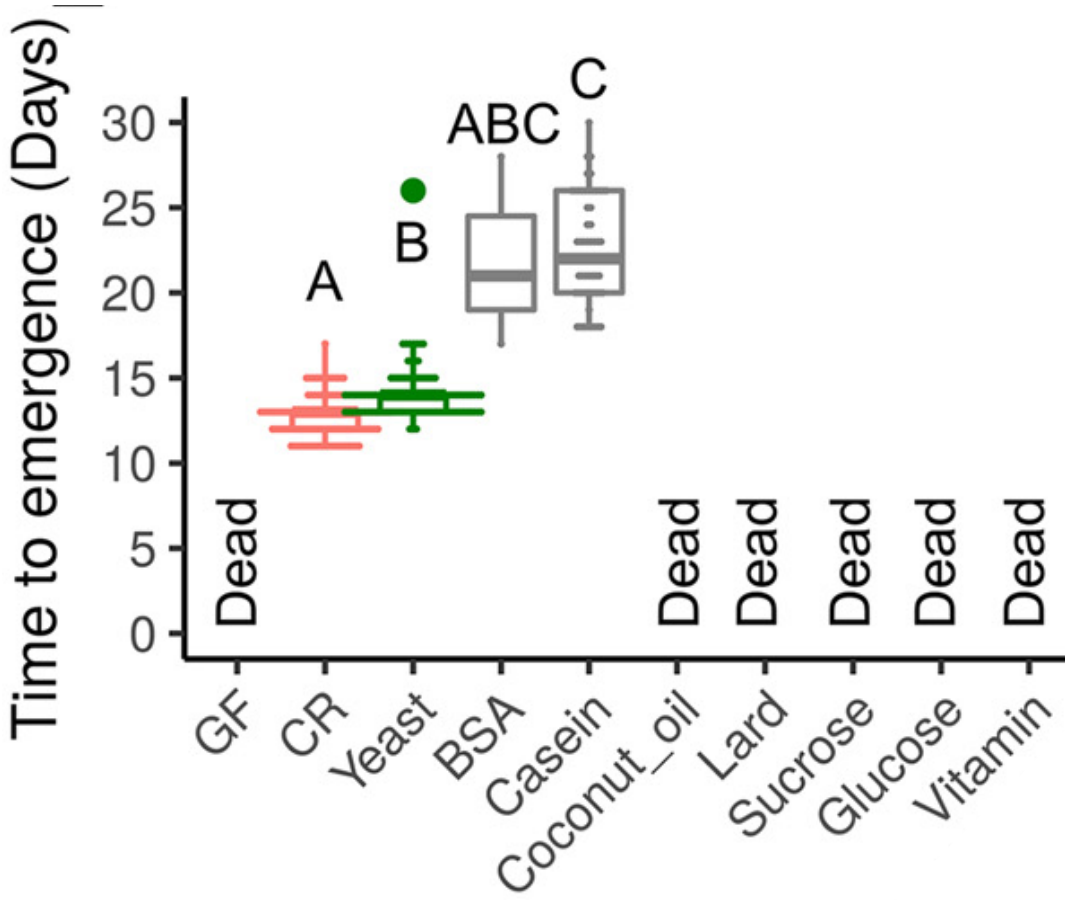
Bing et al 2018 *mBio*

Importance of microbiota in *D. suzukii*

Conventionally reared

Yeast

Protein



Bing et al 2018 *mBio*

H2: Microbiota-induced adaptive phenotypic plasticity

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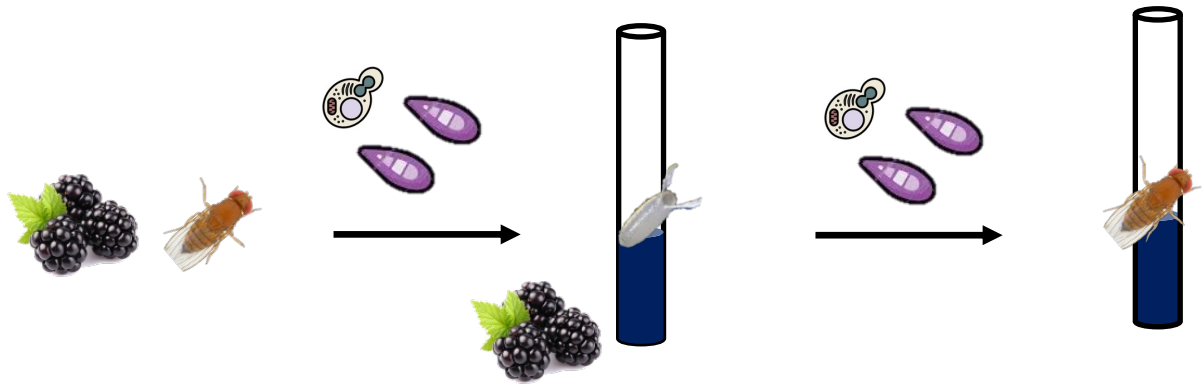

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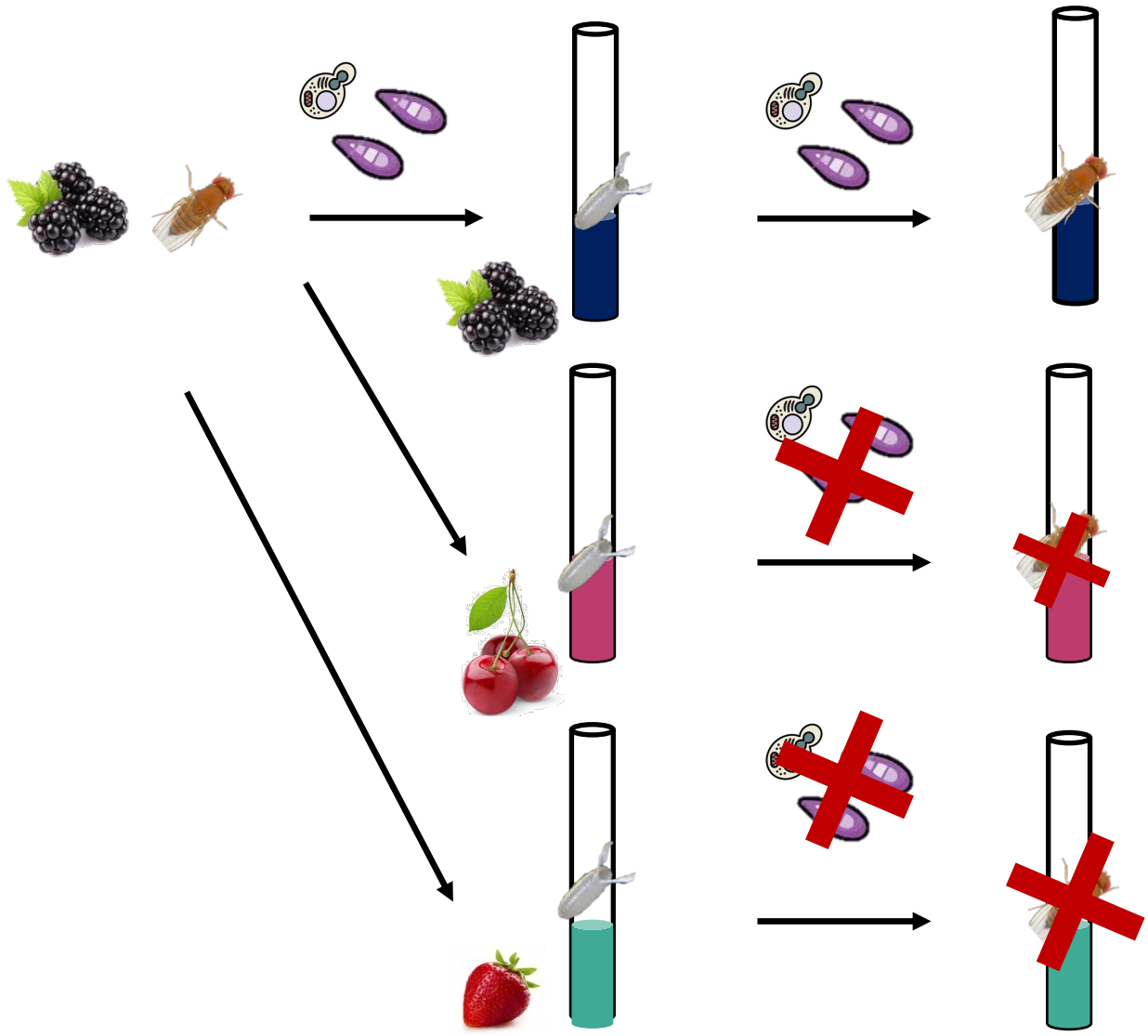
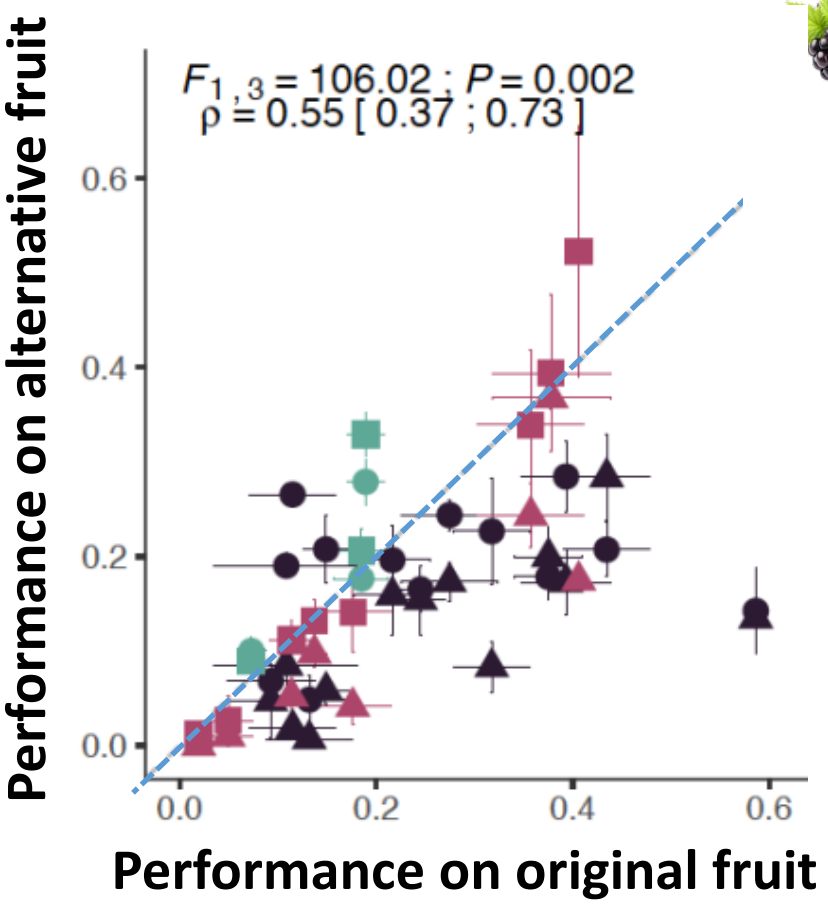
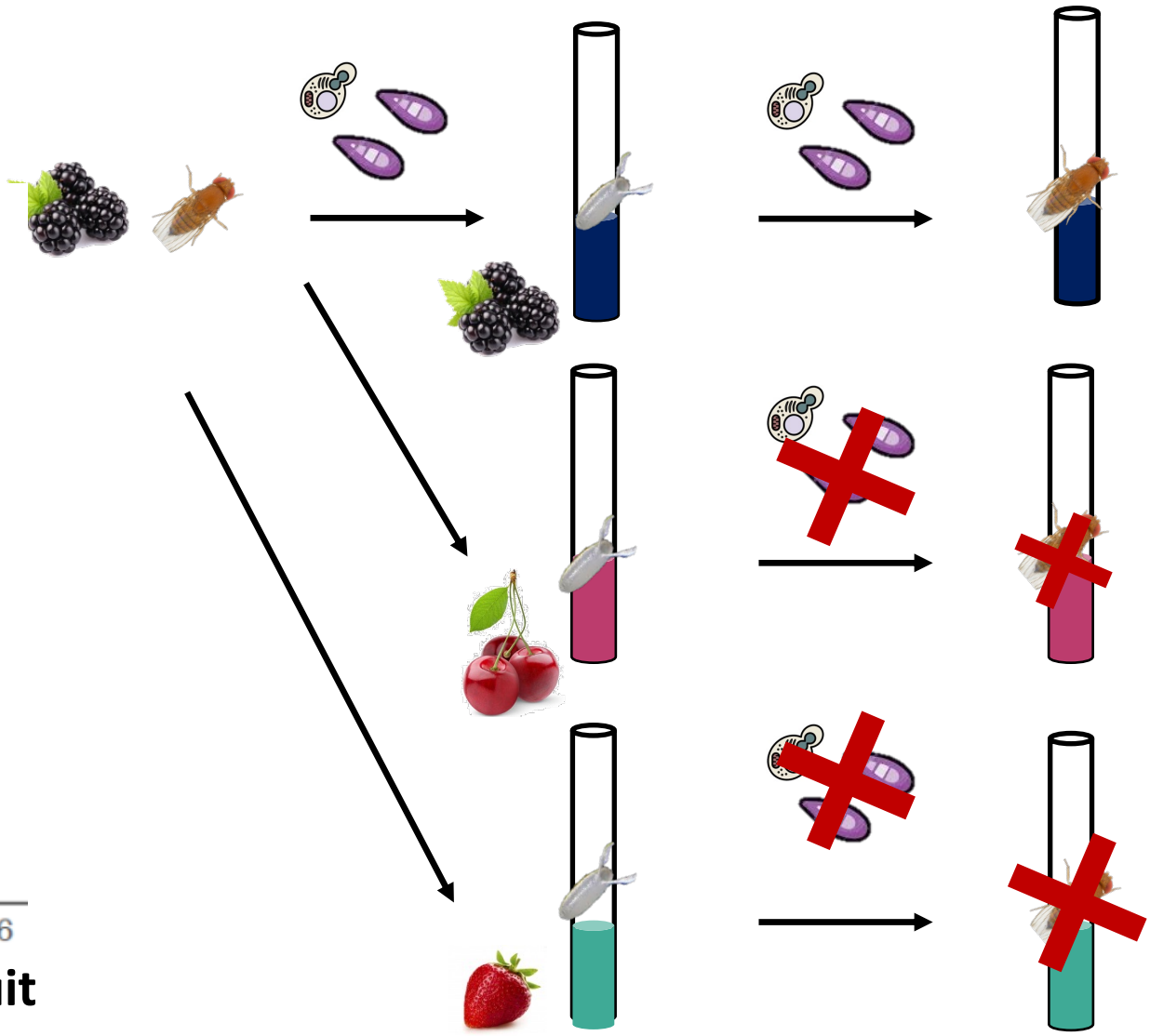


H2: Microbiota-induced adaptive phenotypic plasticity





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Variation among populations and pattern of local adaptation:

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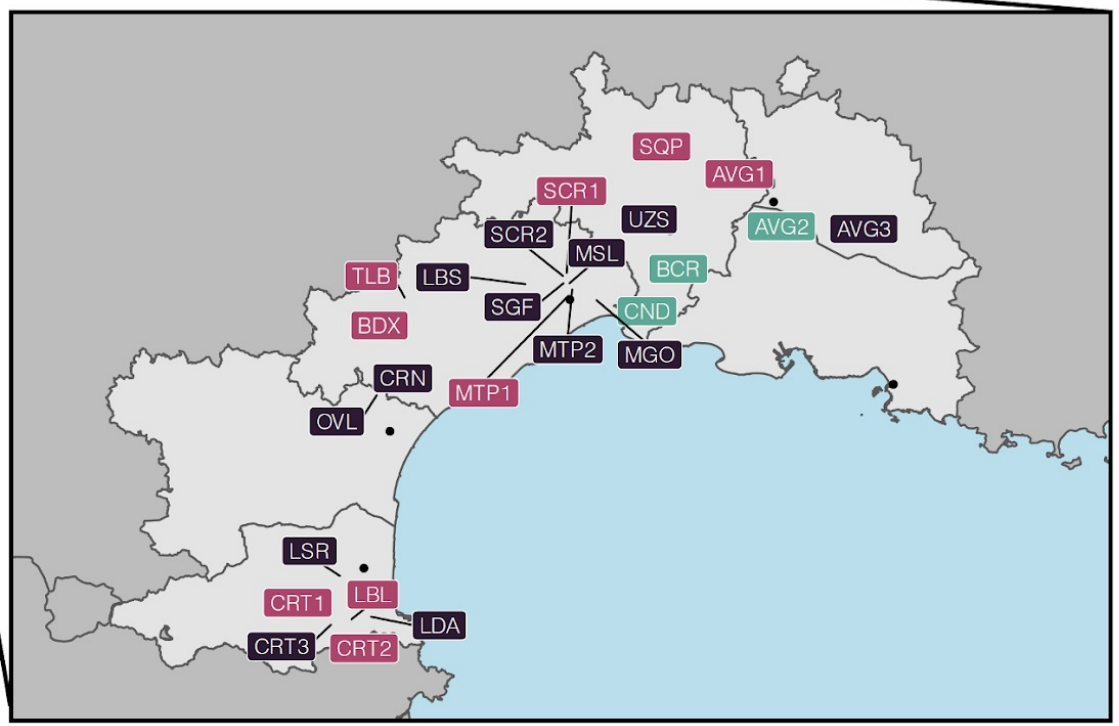
- H2: microbiota-induced adaptive phenotypic plasticity (C and C x E)

➔ Structure of the microbial community among populations and among fruits?
➔ Microbiota-induced phenotypic variation in *D. suzukii*?

Structure of the bacterial community using 16S metabarcoding



Populations from:

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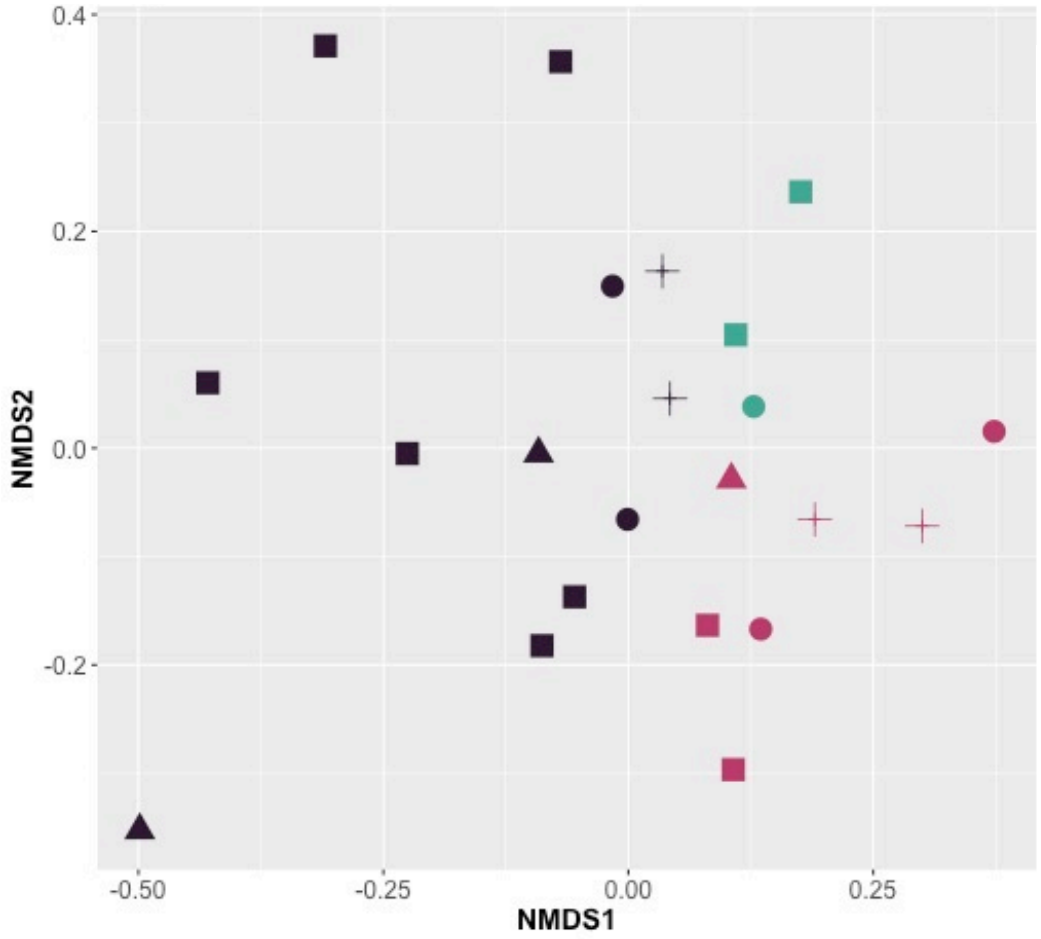


Populations from:

- Cherry
- Strawberry
- Blackberry

Area

- Avignon
- Béziers
- Montpellier
- Perpignan

➔ Strong structure of communities

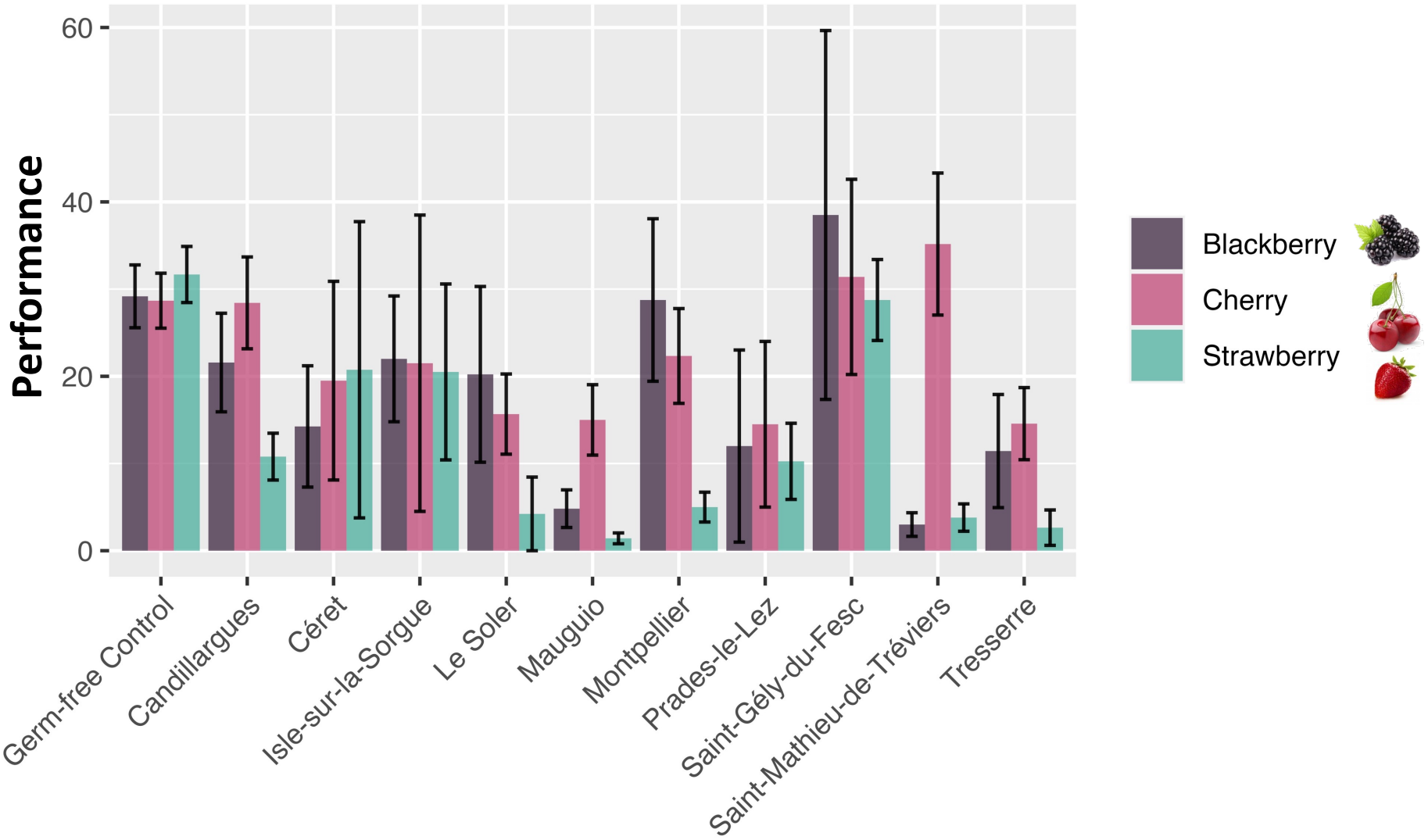
➔ Microbiota the most variable on blackberry

Microbiota-induced phenotypic variation

Natural population

Lab population

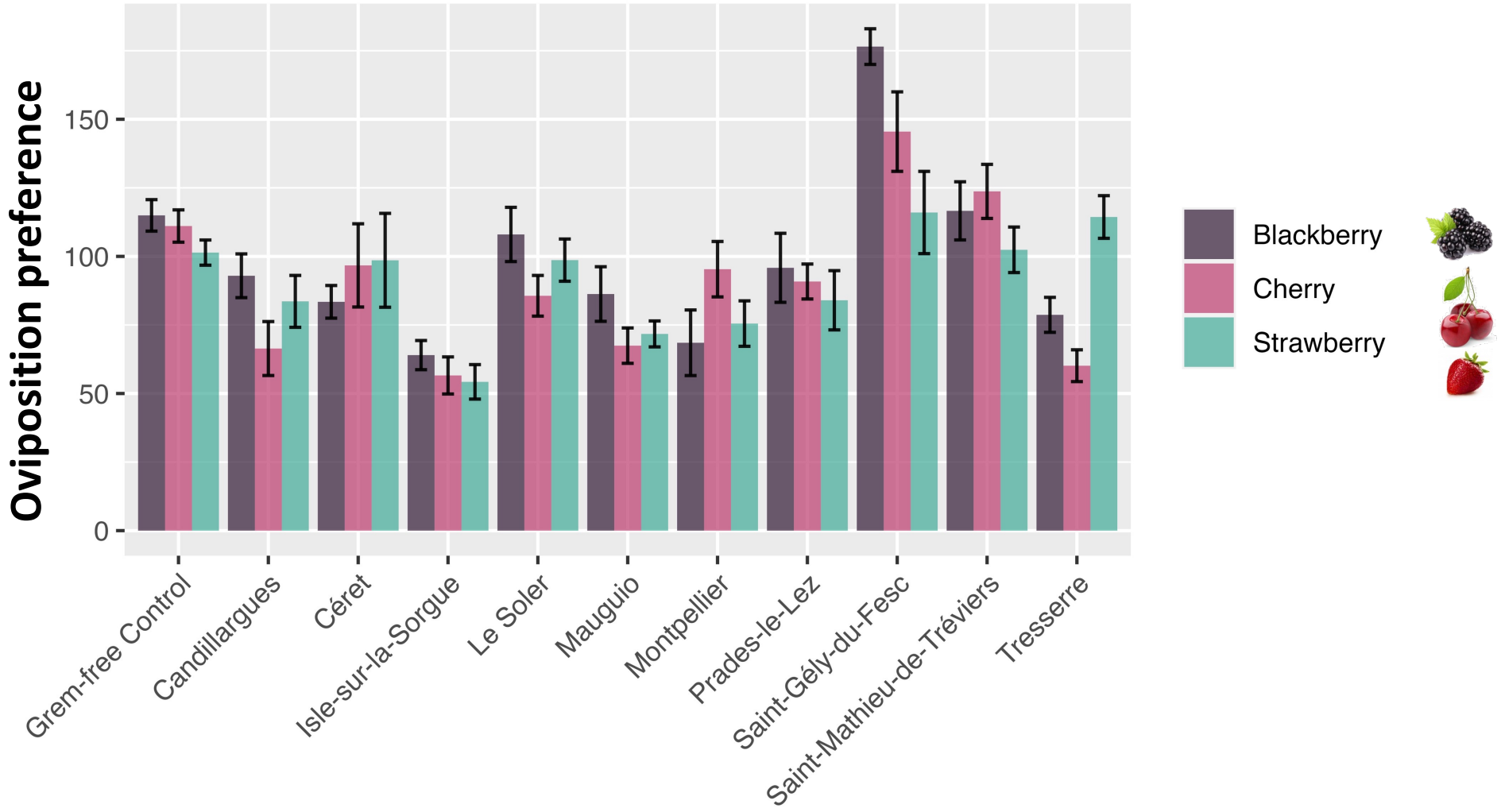
Microbiota-induced variation in performance



➔ Main effect of bacterial community (C) R^2=17%

➔ Interaction between bacterial community and fruit (C x E) R^2=5%

Microbiota-induced variation in preference



➔ Main effect of bacterial community (C) R^2=16%

➔ Interaction between bacterial community and fruit (C x E) R^2=5%

Conclusion and perspectives

- Strong variation among populations and pattern of local adaptation after two generations of common garden

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- H1: local adaptation of *D. suzukii* genotypes (G and G x E)

➔ Underlying genetic architecture?

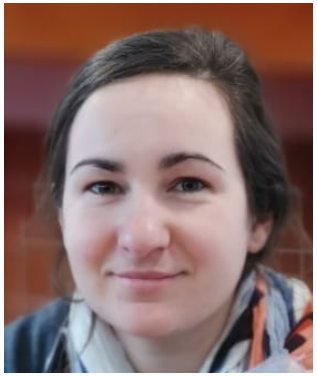
- H2: microbiota-induced adaptive phenotypic plasticity (C and C x E)

➔ Transmission of microbiota between parents and offspring?

➔ Identification of taxa with general or fruit-specific effects

- New agroecological approaches relying on maladaptive phenotypic plasticity or maladaptation to important crop plants

Merci !

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