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## Wolbachia and diet modulation interact and affect the performance of an invasive fruit fly

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BACKGROUND

## *Drosophila suzukii*



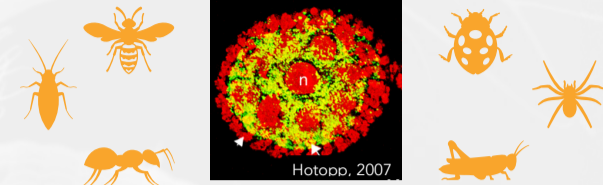
- Drosophilidae from Asia, **invasive** worldwide
- Highly **polyphagous** (cultivated and wild fruits)
- Lay eggs on **ripening fruits** unlike other *Drosophila*
- Present year-round
- Multiple generations per year (3 to 16)

## wSuz

(*D. suzukii*'s *Wolbachia* strain)

- **Variable prevalence** (USA: 17% / EU: 46%)
  - Imperfect maternal transmission but **stably maintained** in populations
  - **No consensus on wSuz effect:**
    - No cytoplasmic incompatibility ?
    - Effect on fecundity and viability ?
- **WsuZ may provide an advantage to *D. suzukii* when changing host, mitigating the physiological costs induced by its polyphagy**

## Wolbachia

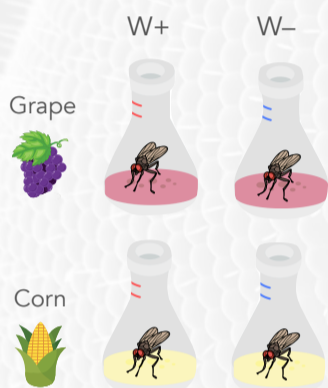


- Intracellular **endosymbiont** of arthropods
- Infect ~50% of insect species
- Maternally transmitted
- Maintained by **manipulating reproduction** or **giving ecological advantage**

## Question: Could wSuz play a role in *Drosophila suzukii* performance after a diet shift?

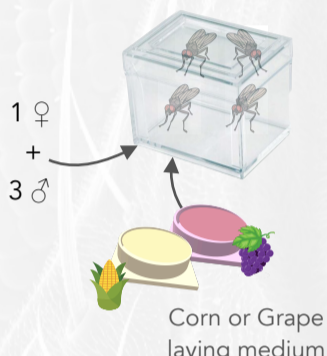
METHODS

4 lab populations of *D. suzukii* with the same genetic background



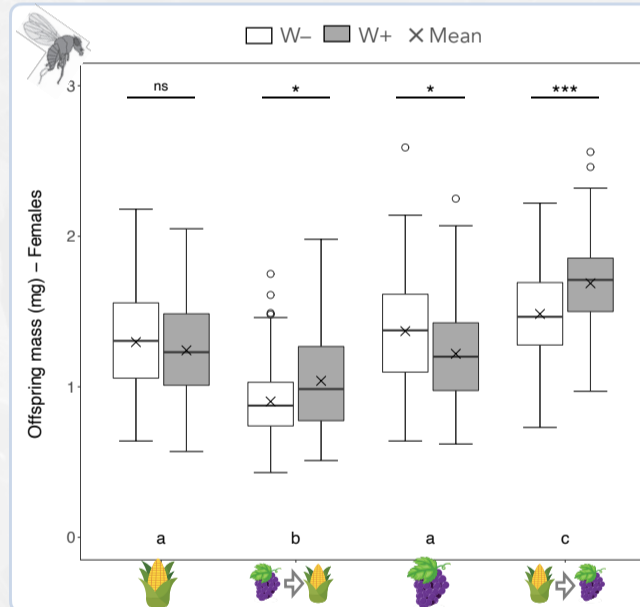
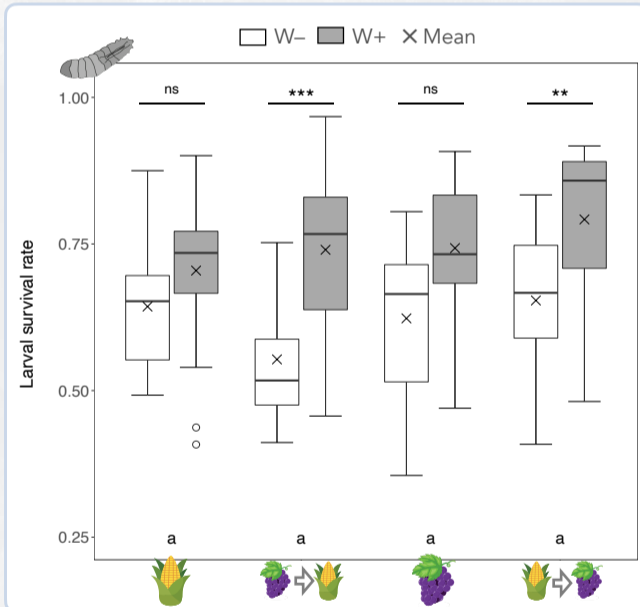
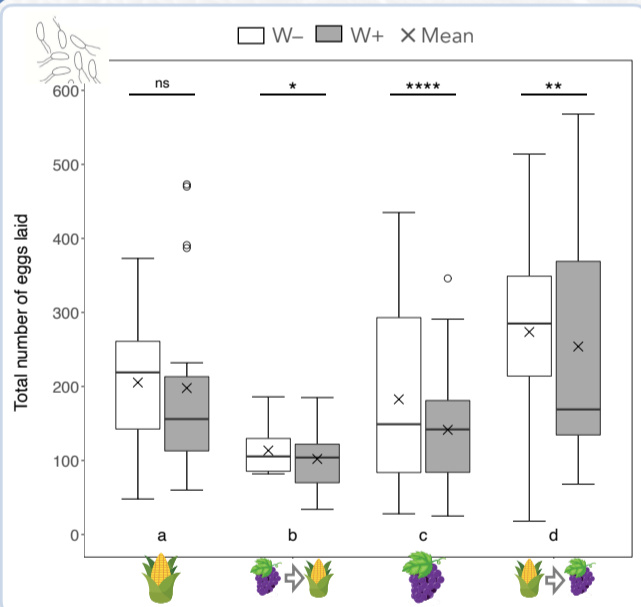
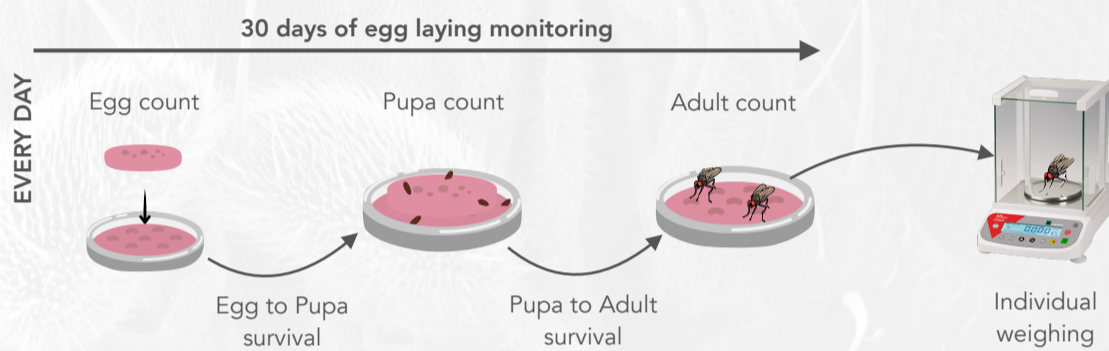
Maintained for > 10 generations

Laying box preparation



N = 25 ♀

25 females of each population were placed individually in laying boxes with 3 males. Each box contained either Corn or Grape medium for the females to lay on. Thus, the female had to lay eggs either on the medium they originated from or on a different medium, thereby simulating a diet shift.



RESULTS & DISCUSSION

	Stable medium	Medium change	
		Grape → Corn	Corn → Grape
Fecundity	Grape > Corn	⊖	⊕
Survival	ns	ns	ns
Offspring mass	ns	⊖	⊕

## MEDIUM EFFECT SUMMARY WOLBACHIA

wSuz might have an **energetic cost** for the female, reducing its egg production. However, it increased the offspring viability suggesting a **mutualistic role**. The mutualism might be linked to a **stressful situation** for the fly, such as the medium change.

wSuz	Stable medium	Medium change
Fecundity	ns / ⊖	⊖
Survival	ns	⊕
Offspring mass	ns / ⊖	⊕

- **Fecundity and mass modulated according to the new diet** → females would favor a laying medium with suitable nutritional composition, otherwise lay fewer and poorer quality eggs
- The effect of diet shift on fecundity and offspring mass **lessen after some generations** to reach an intermediate value → niche adaptation
- **No effect on survival** → both media allow complete development

## PERSPECTIVES

Broaden our knowledge on *WsuZ* role:

- How can it help *D. suzukii* in a natural context with multiple fruits?
- What is its physiological cost?
- Can it change if the abiotic environment (e.g., temperature, humidity) vary?

→ **Integrative approach is needed to answer**

- **Slightly decrease in fecundity** → Fitness cost
- **Enhances larval survival** → Better nutrient assimilation?
  - ▶ **Direct effect?** E.g. amino acid or iron supplement
  - ▶ **Indirect effect?** E.g. microbiome modulation
- **Increases offspring mass only when medium changes** → Relevant in a multitrophic context where *D. suzukii* females lay eggs on different fruits varying in nutritional composition



FOR FURTHER INFORMATION  
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