

# BACKGROUND

## The effects of temperature and propagule pressure on the establishment success of *Ceratitis capitata* (Wiedemann)

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Introduction + biosecurity  
Understanding factors important



Liebholt et al. (2012); Saccaggi et al. (2021)

# BACKGROUND

Environmental suitability + propagule pressure = **successful establishment**

**Propagule pressure** = propagule size + propagule number

**Agricultural produce** continuously introduced – higher **risk** for establishment?



Lockwood et al., 2005, 2009; Bacon et al. 2014

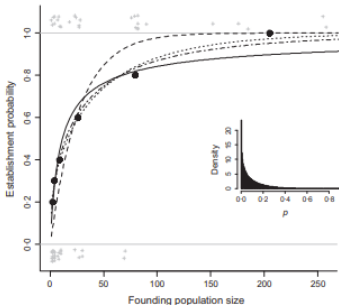
# BACKGROUND

## Important questions:

1. Low propagule size < multiple introductions (propagule number)?
2. Total propagule size > important than number of times introduced (propagule number)?



# BACKGROUND



Memmott et al. in 2005; Duncan et al. 2014

# BACKGROUND

**Tephritidae** significant agricultural pests - **4000** species

**Spread** to many locations outside of their native range

*Ceratitis capitata* – **Mediterranean fruit fly**

High **invasive capacity** due to:

- Broad larval host range - polyphagous
- High rates of reproduction
- Dispersal capacity
- Tolerance to wide range of climatic conditions



# AIM

Determine whether **temperature** and **founding population density** determine **establishment** success in *Ceratitis capitata*

### Expectations:

- Optimal temperatures = more establishment
- Larger founding population sizes = more establishment
- Multiple introductions = more establishment



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# EXPERIMENTAL OUTLINE

**PREPARATION**

**INTRODUCTIONS**

Founding population size	1F + 1M	2F+2M	2F+2M	4F+4M	4F+4M	4F+4M	8F+8M	8F+8M	8F+8M	10F+10M	10F+10M	10F+10M
Introduction events	1	1	2	1	2	4	1	2	4	1	2	4
Day 0	1f+1m	2f+2m	1f+1m	4f+4m	2f+2m	1f+1m	8f+8m	4f+4m	2f+2m	10f+10m	5f+5m	2f+2m
Day 1												
Day 2			1f+1m		2f+2m	1f+1m		4f+4m	2f+2m		5f+5m	2f+2m
Day 3												
Day 4						1f+1m			2f+2m			2f+2m
Day 5												
Day 6						1f+1m			2f+2m			2f+2m
Day 7												
Day 8												2f+2m

X 20 @ 20°C, 25°C, 30°C

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# EXPERIMENTAL OUTLINE

**PREPARATION**

**INTRODUCTIONS**

**DATA COLLECTION**

- Number of pupae
- Number of adults emerging (F1)
- Establishment successful** = n+founding population density adults emerge and survive for a minimum of five days

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# PRELIMINARY RESULTS

Average establishment success

86% at **25°C**

79% at **30°C**

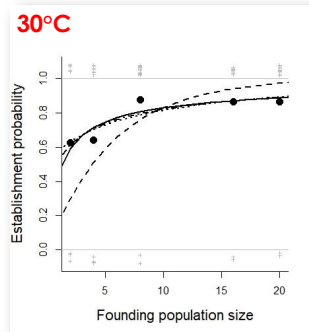
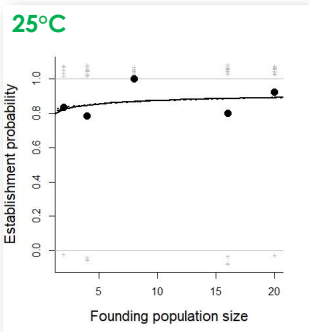
GLMs no difference between establishment success

Different founding population sizes ( $p = 0.794$ )

Number of introduction events ( $p = 0.805$ )

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# PRELIMINARY RESULTS



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# CONCLUSION + MOVING FORWARD

**For successful establishment -**

At 25°C and 30°C **no difference** between propagule size and propagule number

Other studies show larger effects at **colder temperatures** - next step

Could determine efforts required to **prevent introductions** in specific environmental conditions



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Thank you!

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