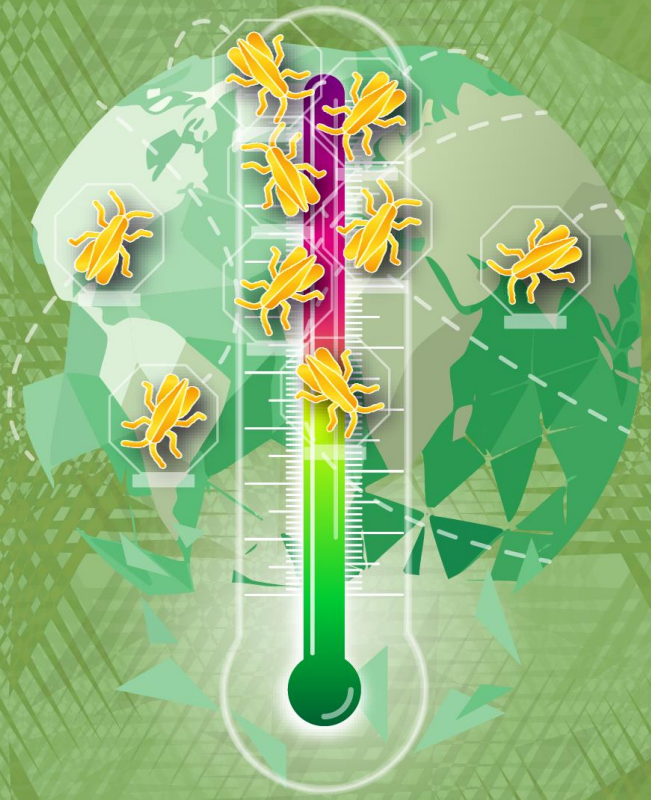
IPPC Webinar Series

Climate Change and Phytosanitary Issues

1–2 October 2025 | 14:00–16:00 CET



IMPACT OF CLIMATE ON THE ASIAN CITRUS PSYLLID AND SPREAD OF HUANGLONGBING

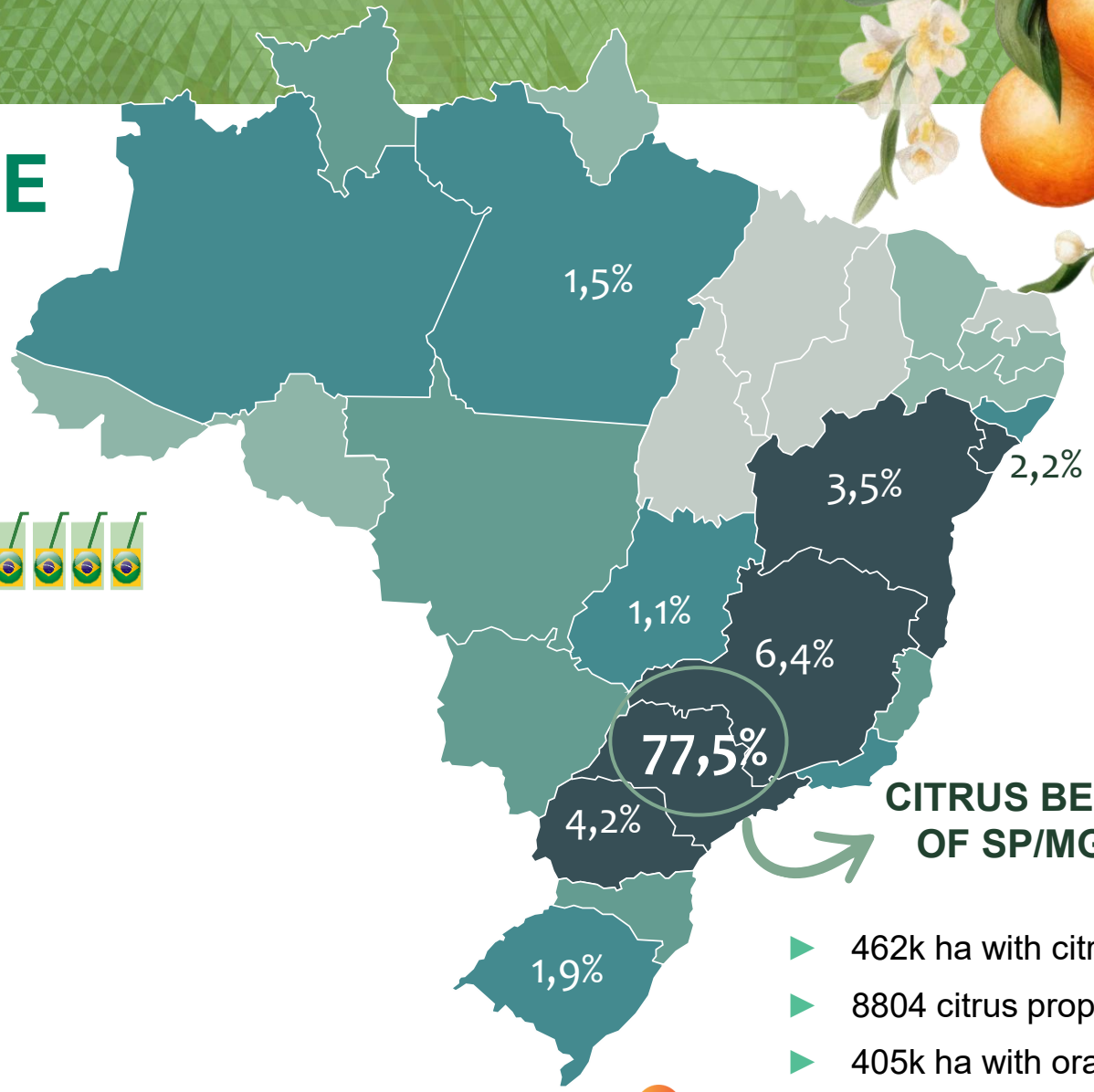
Arthur Fernando Tomaseto

Fundecitrus

BRAZILIAN CITRICULTURE

- 17.6M ton of orange
- 575.4k ha
- 30.6 ton/ha
- 68% of juice produced in the world
- US$ 2 billion/year juice export

Source: IBGE 2023 and CitrusBR



CITRUS BELT OF SP/MG

- 462k ha with citrus
- 8804 citrus properties
- 405k ha with oranges (88%)
- 200k direct jobs

Fundecitrus

GREENING OR HUANGLONGBING

- **The most devastating citrus disease in the world**
- ACP × Bacteria × Citrus trees
- First report in Brazil in 2004
- ~100M of infected trees
- 25M of boxes lost in 2024/25 season

Fundecitrus

IPPC Webinar Series

Climate Change and Phytosanitary Issues

Fundecitrus

SCIENCE AND SUSTAINABILITY IN CITRICULTURE

WHO WE ARE

- Non-profit association
- Reference in science and sustainability for citriculture
- Searching for competitive and innovative solutions for the main challenges since 1977
- Maintained by citrus growers and the orange juice industry

CUTRALE

citrosuco

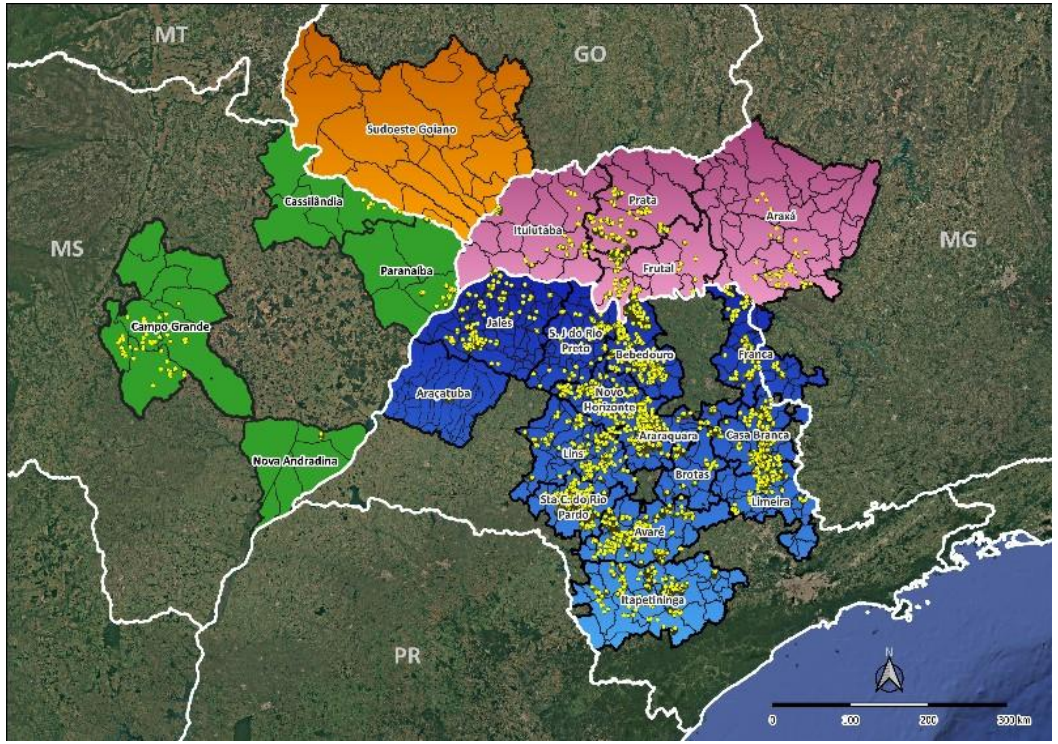
LDC. Louis Dreyfus Company

Climate Change and Phytosanitary Issues | 1–2 October 2025 | 14:00–16:00 CET

Fundecitrus
SCIENCE AND SUSTAINABILITY IN CITRICULTURE

PSYLLID ALERT SYSTEM

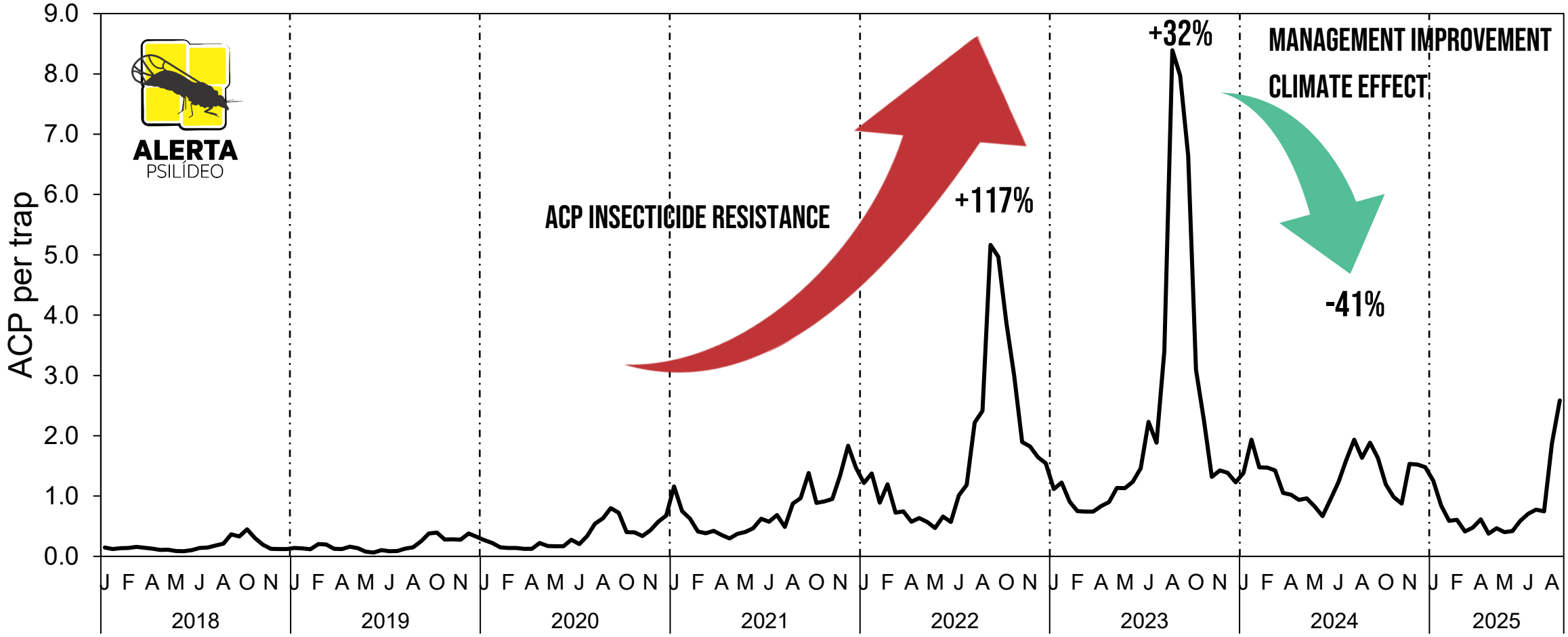
ALERTA PSILÍDEO



- **Monitoring** ACP population
- Ongoing analyses of HLB control tactics **(e.g., Area-wide HLB management)**
- System improvement with **ACP risk maps**
- **38k yellow stick traps.** Information every 15 days

Fundecitrus
SCIENCE AND SUSTAINABILITY IN CITRICULTURE

ACP POPULATION



Fundecitrus

IPPC Webinar Series

Climate Change and Phytosanitary Issues

IMPACT OF CLIMATE ON ACP BIOLOGY

TEMPERATURE INFLUENCE ACP BIOLOGICAL CYCLE AND VIABILITY (%) TEMPERATURES HIGHER THAN 32º C ARE UNFAVORABLE TO ACP

Table 5. *Mean duration (± SD) for the egg and nymphal stages and biological cycle (egg–adult) of* Diaphorina citri *reared on Rangpur lime and at different temperatures (ºC)*

Temperature (ºC)	Duration (days)		
	Egg	Nymph	Biological cycle
18	7.7 ± 0.67 a	35.8 ± 0.71 a	43.5 ± 1.31 a
20	6.4 ± 0.17 b	24.5 ± 0.34 b	30.9 ± 0.52 b
22	5.9 ± 0.16 b	23.8 ± 0.36 b	29.6 ± 0.66 b
25	4.5 ± 0.11 c	12.6 ± 0.26 c	17.1 ± 0.29 c
28	3.2 ± 0.19 d	12.2 ± 0.25 c	15.4 ± 0.16 cd
30	2.9 ± 0.17 d	9.4 ± 0.41 c	12.4 ± 0.24 d
32	2.6 ± 0.23 d	9.4 ± 0.66 c	12.1 ± 0.37 d

Mean values followed by the same letter in the column are not different by Tukey test (P ≤ 0.05).
RH: 70 ± 10%, and 14 : 10 h (light : dark) photoperiod.

Table 6. *Mean viability (± SD) for the egg and nymphal stages and biological cycle (egg-adult) of* Diaphorina citri *reared on Rangpur lime and at different temperatures*

Temperature (ºC)	Viability (%)		
	Egg[ns]	Nymph	Biological cycle
18	95.0 ± 0.68	70.7 ± 3.04 a	67.2 ± 1.31 a
20	95.2 ± 0.92	70.0 ± 2.41 a	66.6 ± 1.94 a
22	88.4 ± 3.98	72.5 ± 2.72 a	64.1 ± 2.63 a
25	93.8 ± 3.40	74.0 ± 4.64 a	69.4 ± 2.98 a
28	89.8 ± 2.58	77.5 ± 3.98 a	69.5 ± 1.62 a
30	90.5 ± 5.03	73.8 ± 3.65 a	66.8 ± 0.83 a
32	81.6 ± 4.50	7.0 ± 2.77 b	5.7 ± 2.61 b

Means followed by the same letter in the column are not different by Tukey test (P ≤ 0.05).
ns, non-significant.
RH: 70 ± 10% and 14 : 10 h (light : dark) photoperiod.

Nava et al., 2007

TEMPERATURE AFFECTS ACP OVIPOSITION

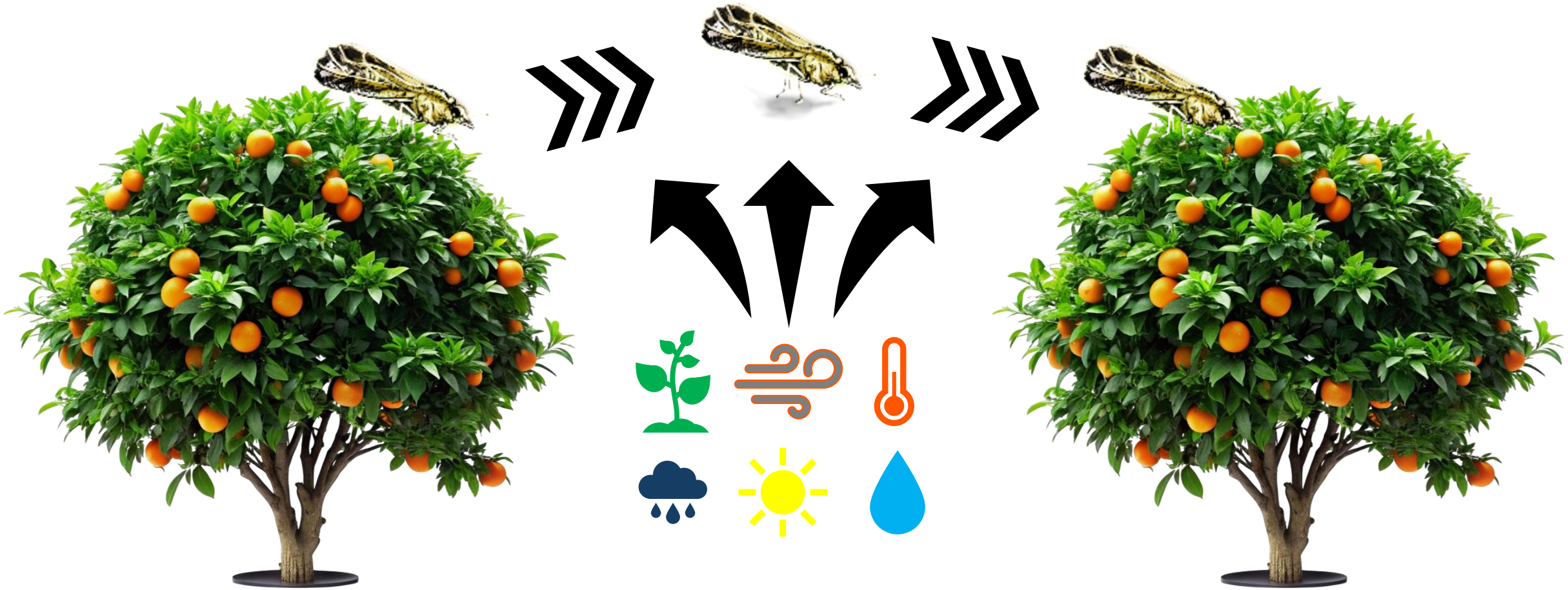
Table 4. Oviposition (eggs per female, mean ± SE) and longevity (days, mean ± SE) of female D. citri *at six temperatures*

Temp. (°C)	*N*	Mean longevity of female	Mean no. eggs per female
15	18	88.3 ± 4.31	171 ± 25.1
20	22	50.6 ± 2.61	494 ± 50.5
25	25	39.7 ± 1.39	626 ± 22.3
28	21	34.7 ± 1.13	748 ± 34.7
30	25	33.5 ± 1.08	316 ± 30.9
33	23	28.7 ± 1.38	67 ± 10.3
	F	98.4	70.2
	df	5, 128	5, 128
	P	<0.001	<0.001

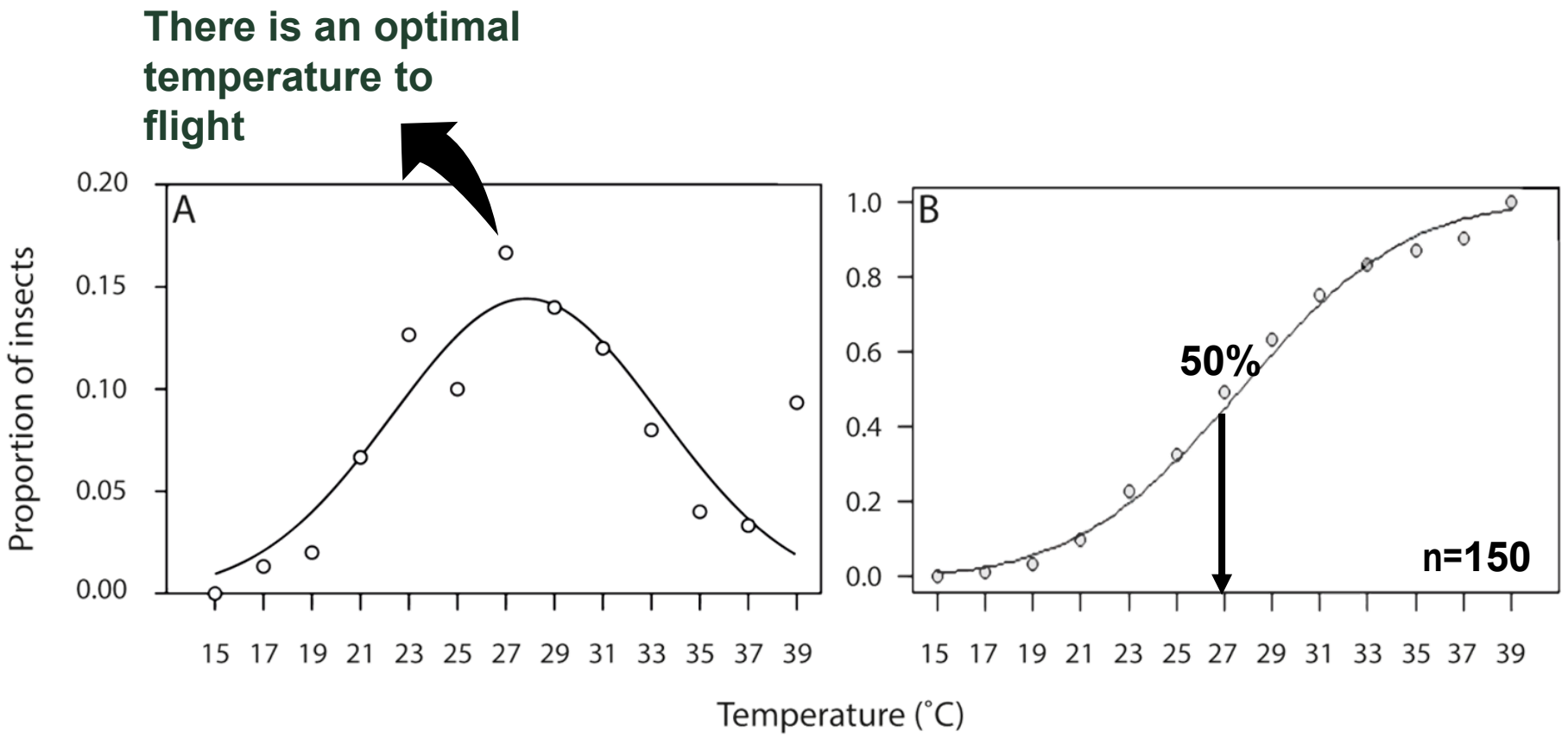
Liu e Tsai, 2000

Fundecitrus

IMPACT OF CLIMATE ON ACP DISPERSAL



OPTIMAL TEMPERATURE TO ACP FLIGHT

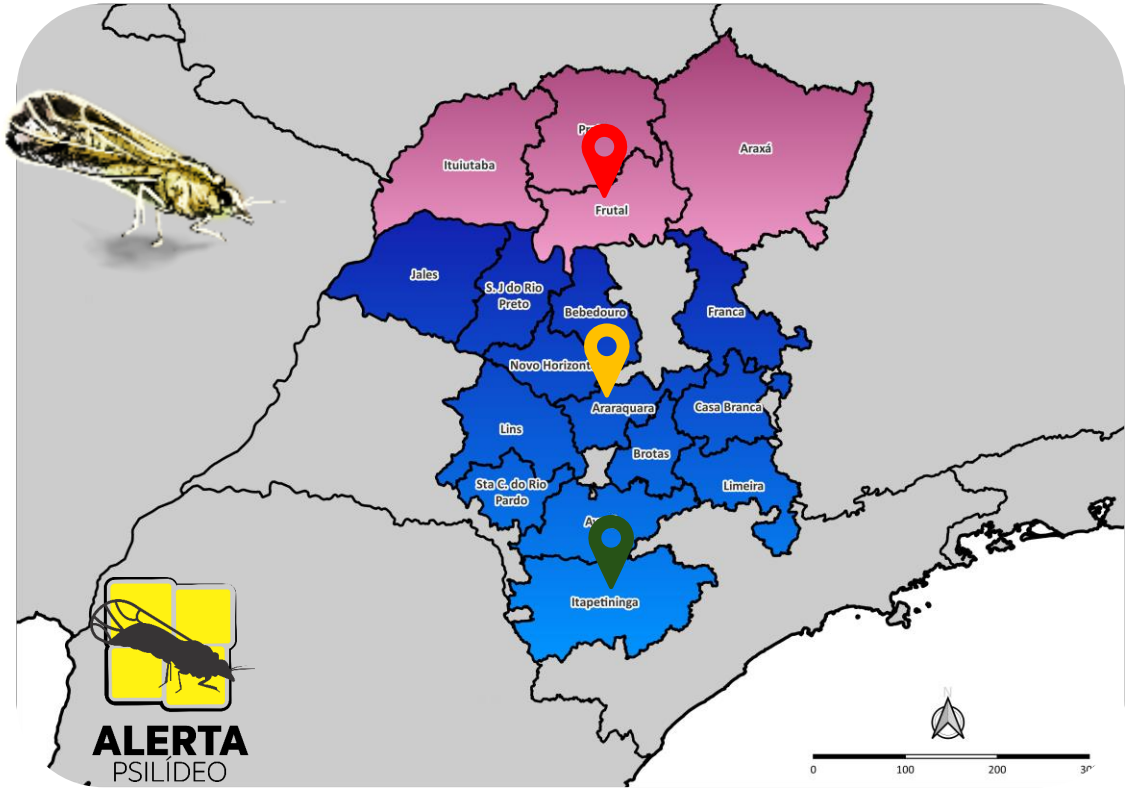


Tomaseto et al., 2018

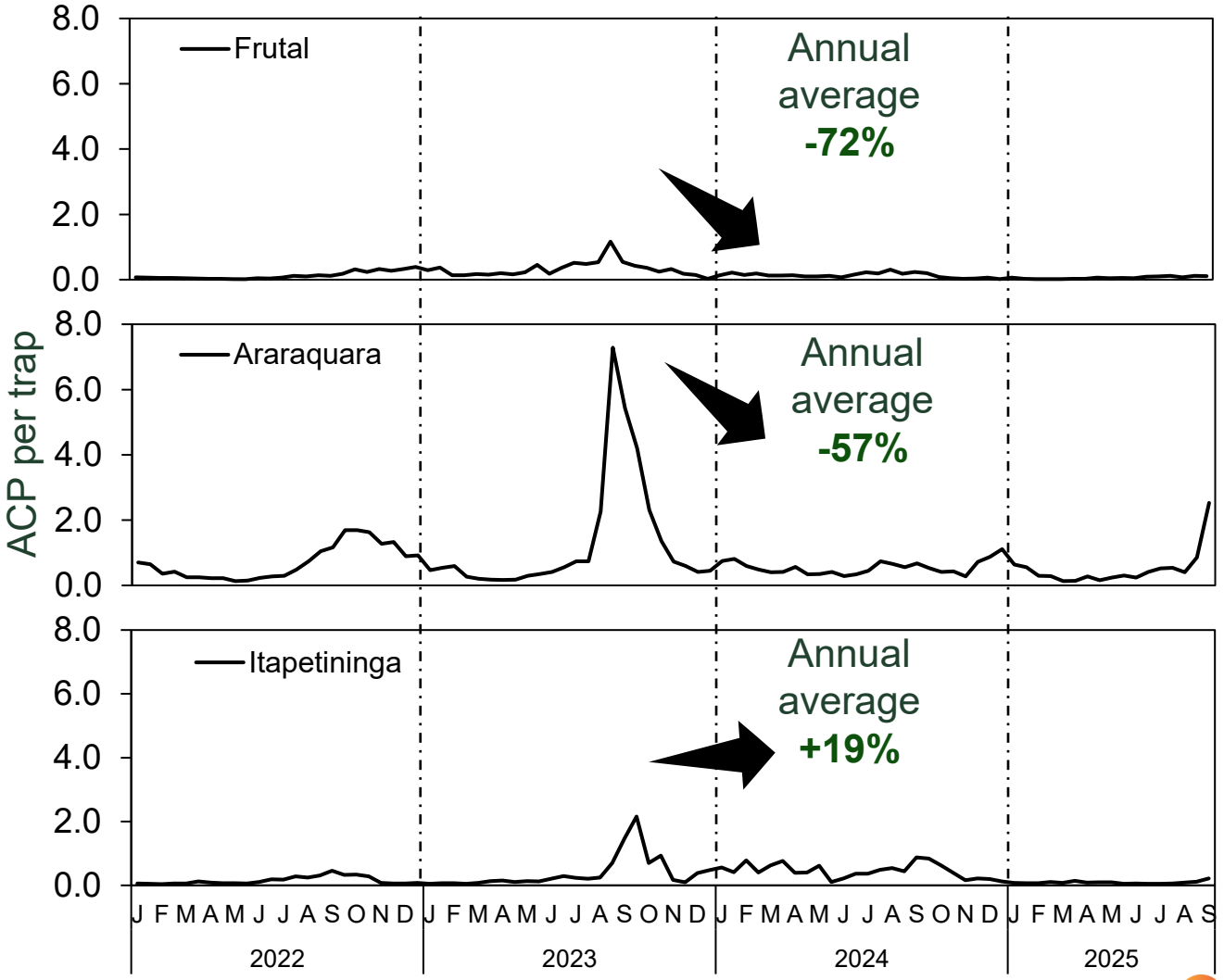
- Take-off temperature threshold (TTT_{50}) = **27,14 ± 1,01 °C**

Fundecitrus

REGIONAL ACP POPULATION



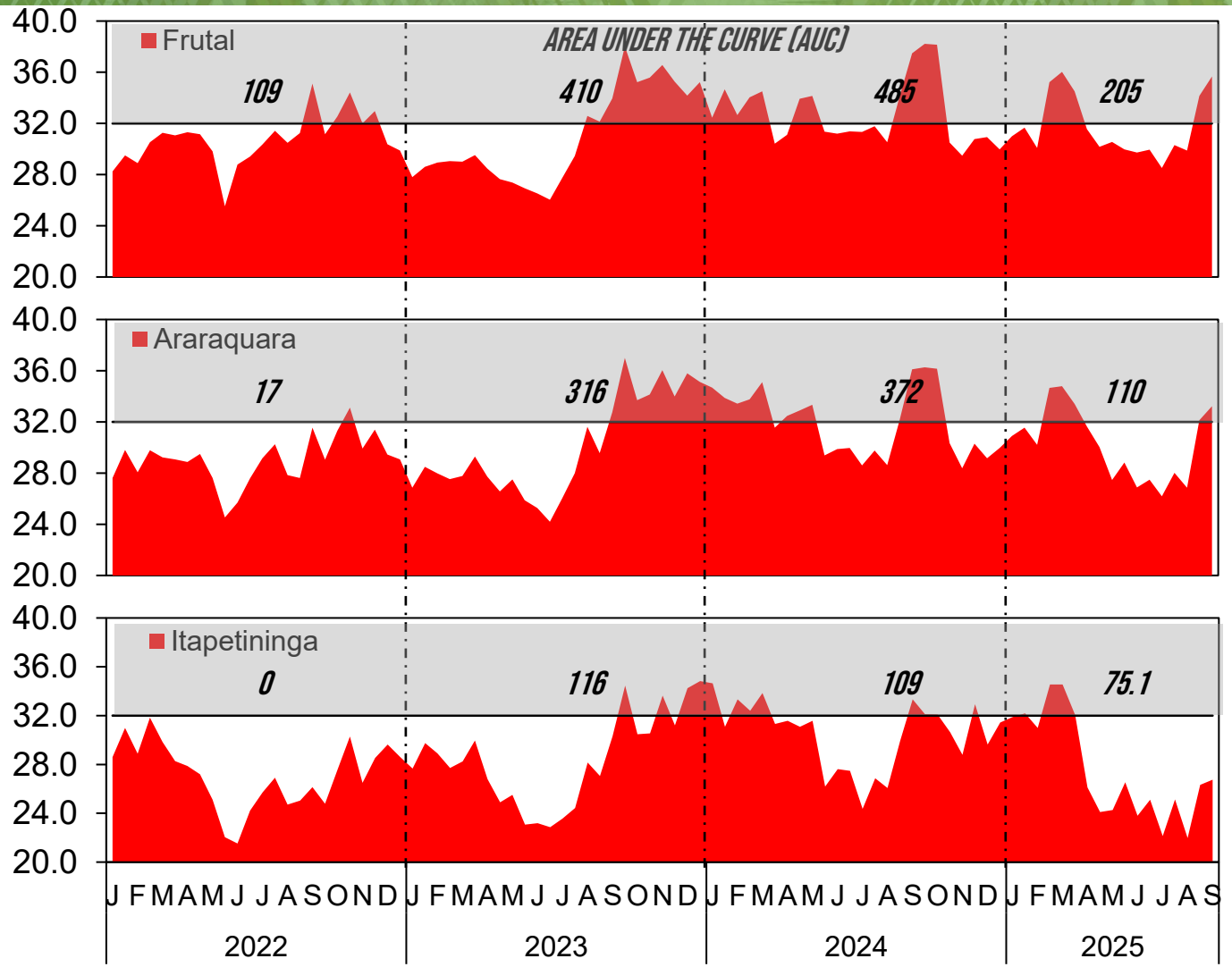
FRUTAL | ARARAQUARA | ITAPETININGA



Fundecitrus

IMPACT OF CLIMATE ON DIFFERENT REGIONS

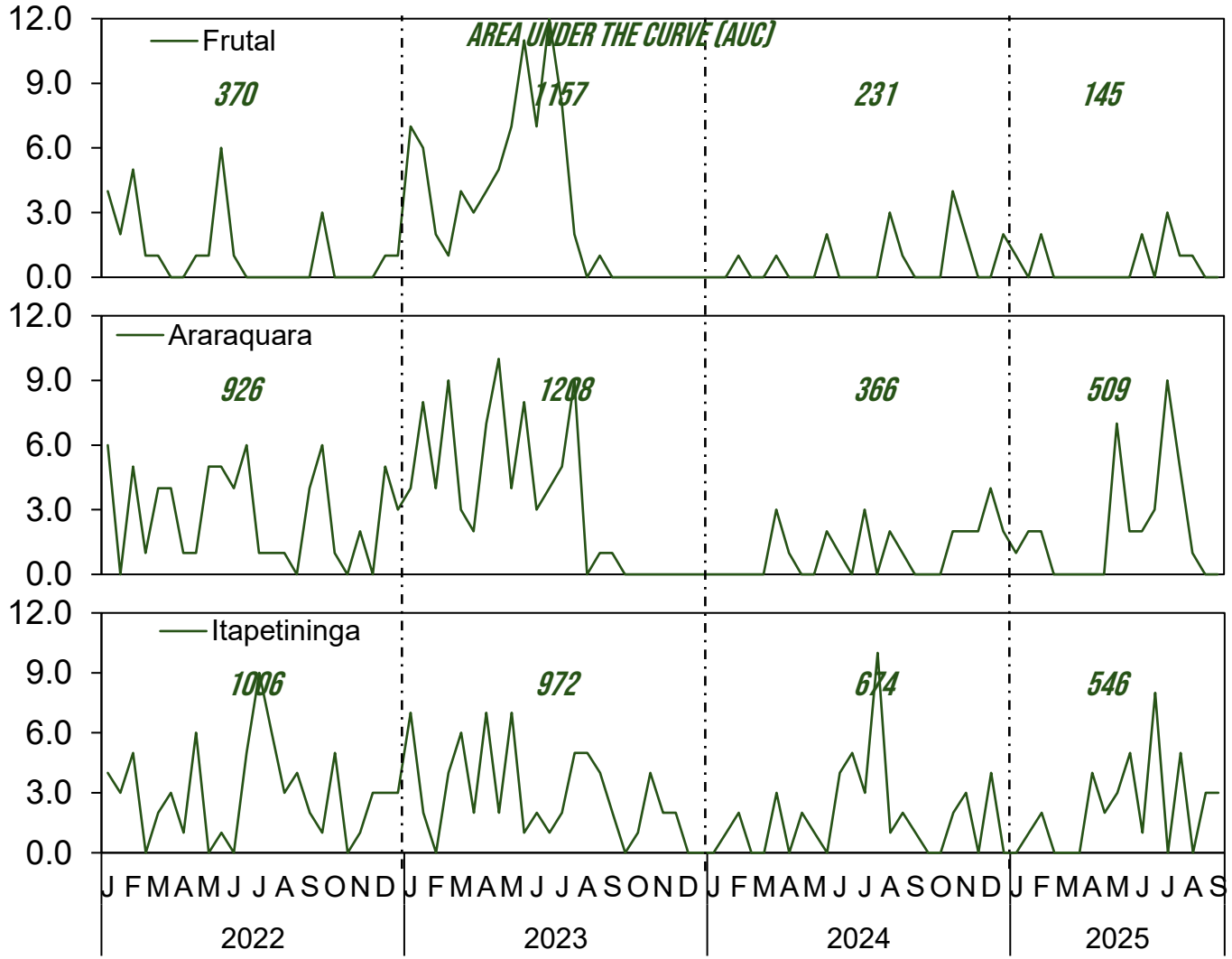
MAXIMUM TEMPERATURE (ºC)



Source: NASA POWER

IMPACT OF CLIMATE ON DIFFERENT REGIONS

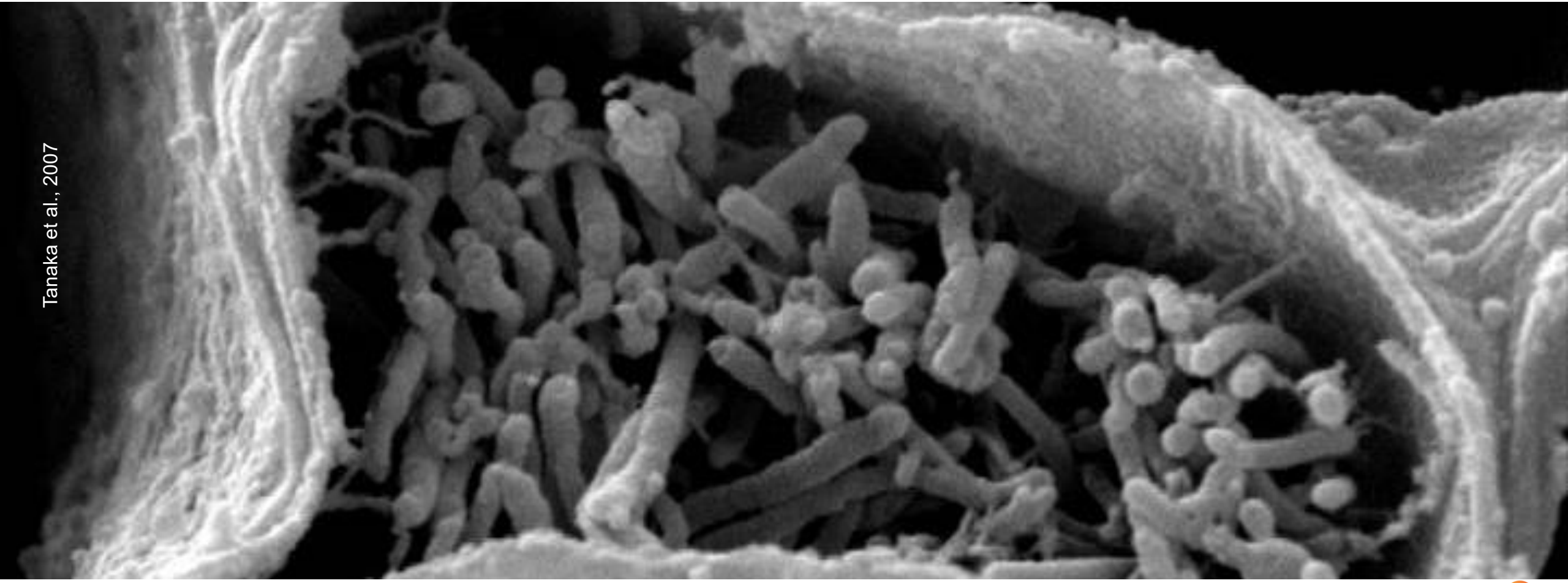
DAYS IN OPTIMAL TEMPERATURE (26 – 28 ºC)



Source: NASA POWER

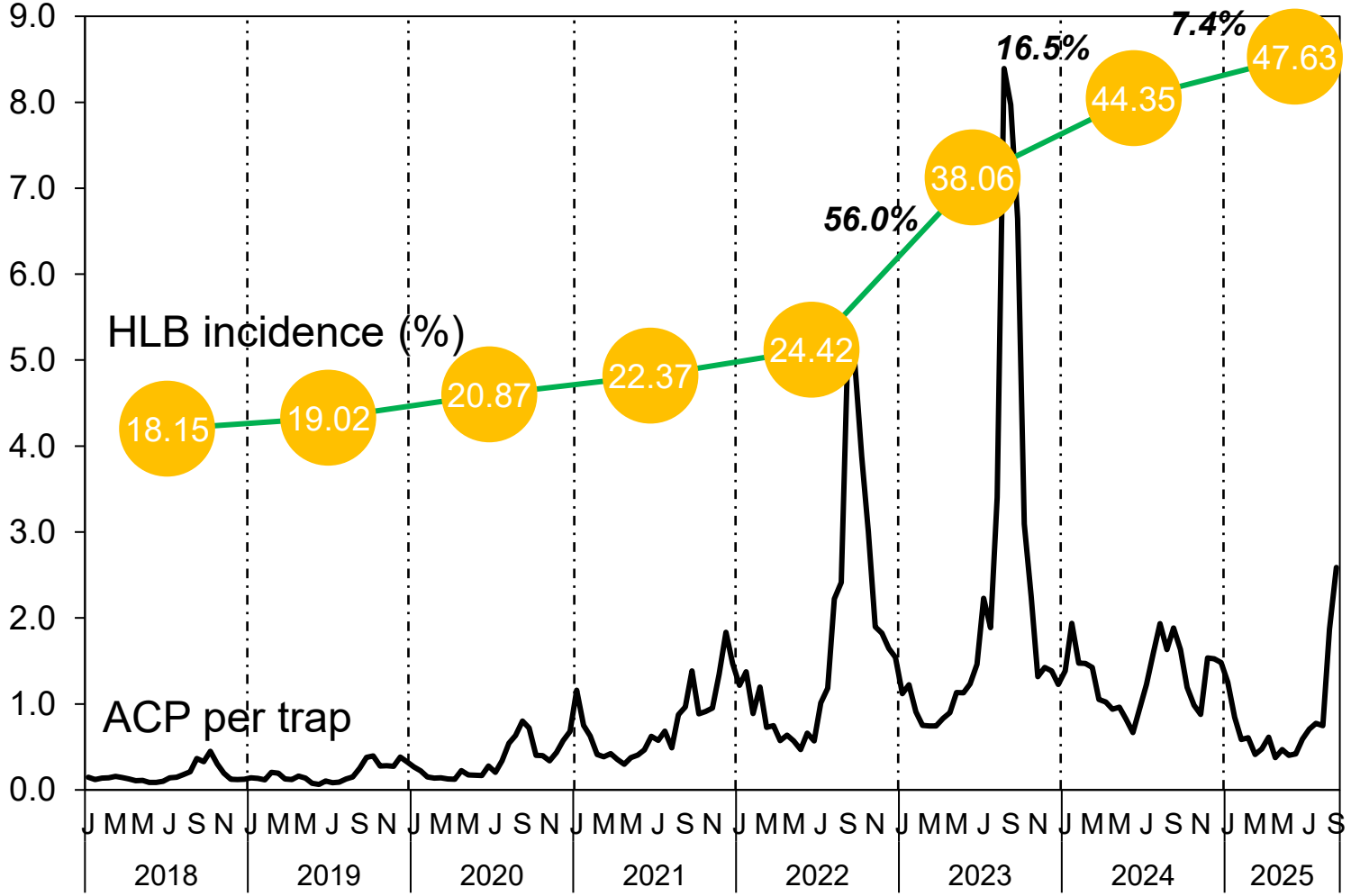
Fundecitrus

IMPACT OF CLIMATE ON HLB BACTERIA



Tanaka et al., 2007

HLB INCIDENCE AND PSYLLID POPULATION

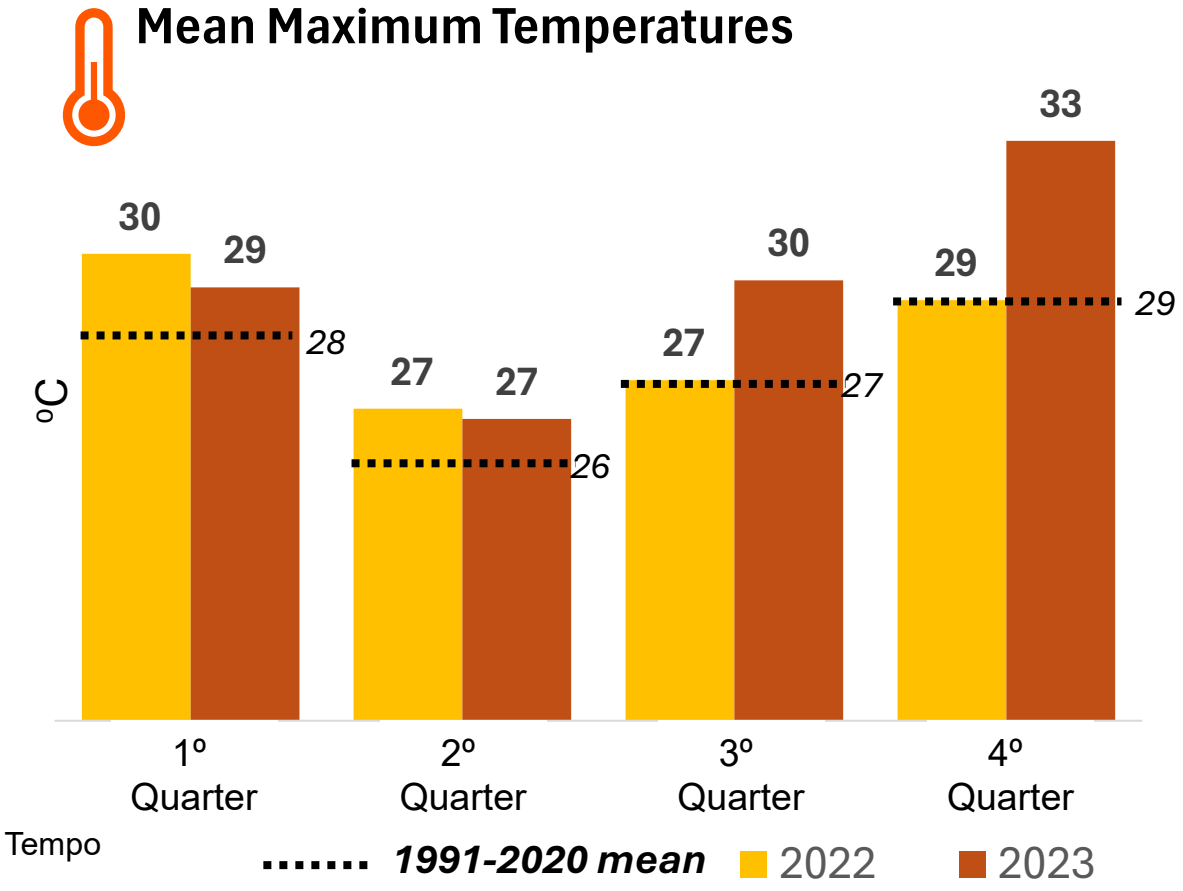


Hypotheses

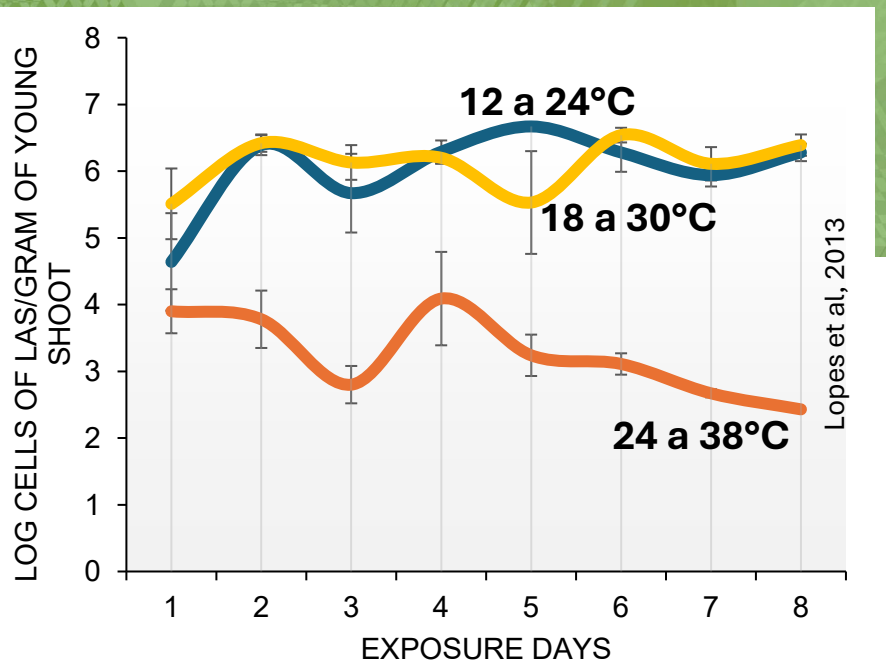
- ACP population in 2023 was less efficient to transmit the bacteria than the population in 2022
- The low ACP population in 2024 (climate and management) reduced the incidence increase rate in 2025

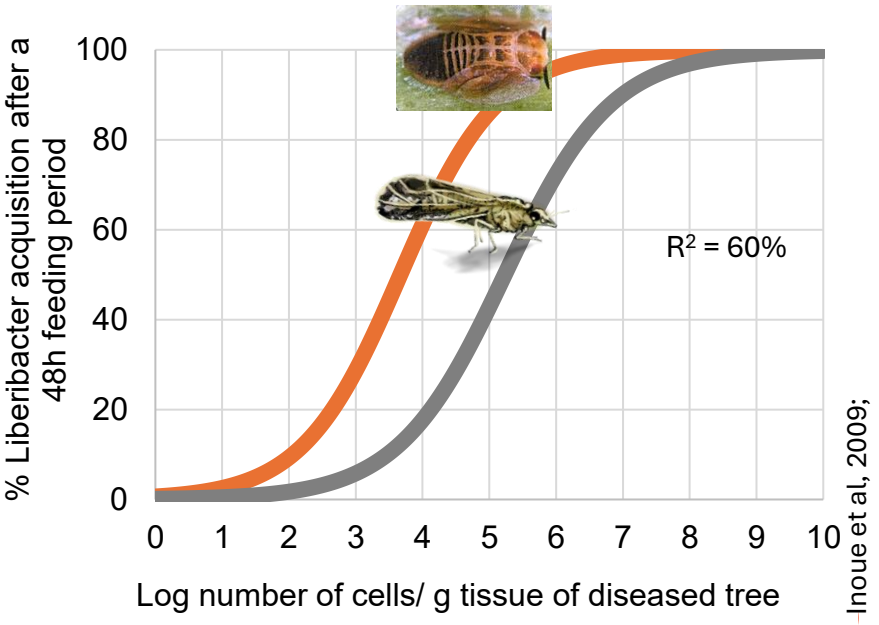
Fundecitrus

TEMPERATURE AND BACTERIA CONCENTRATION

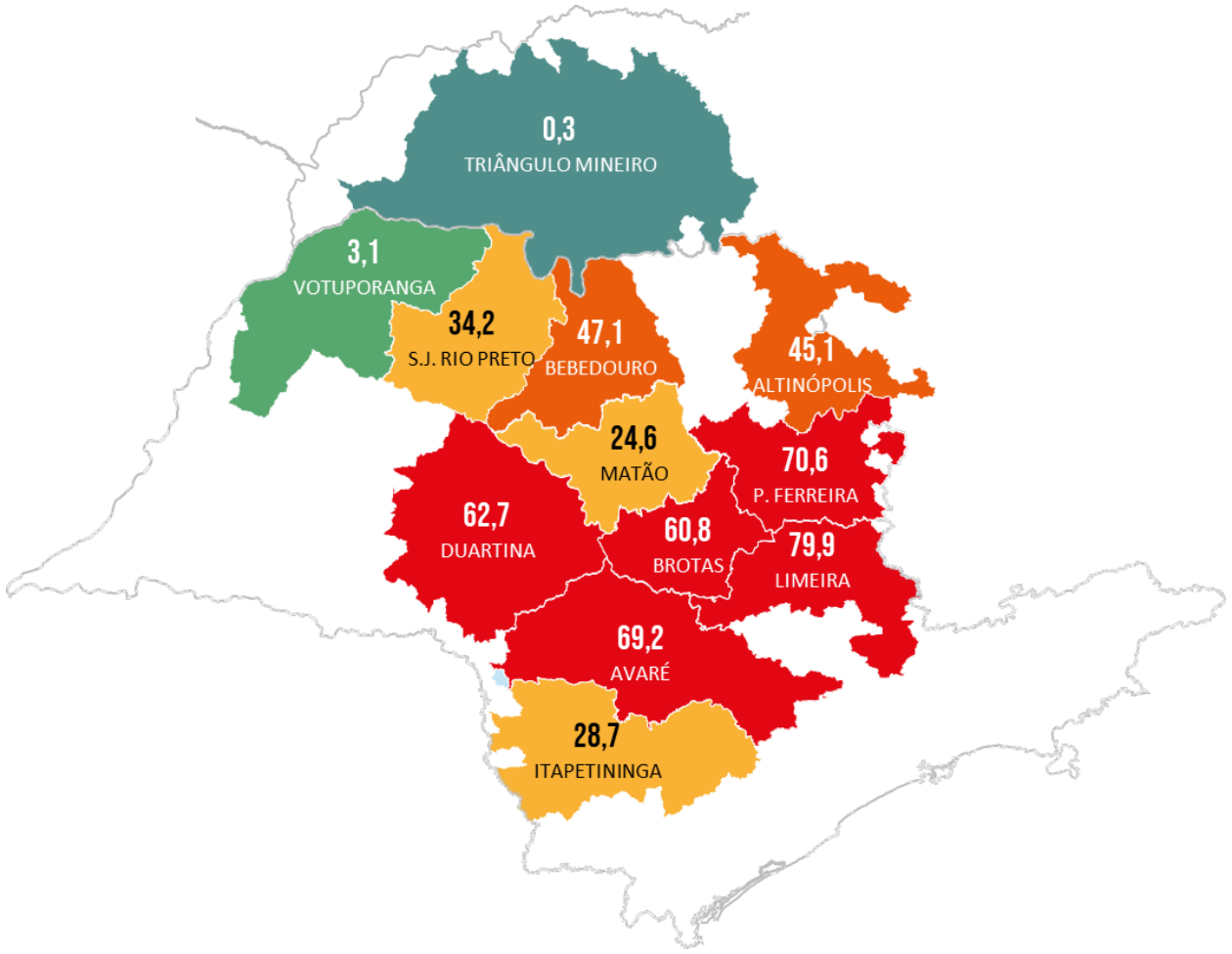


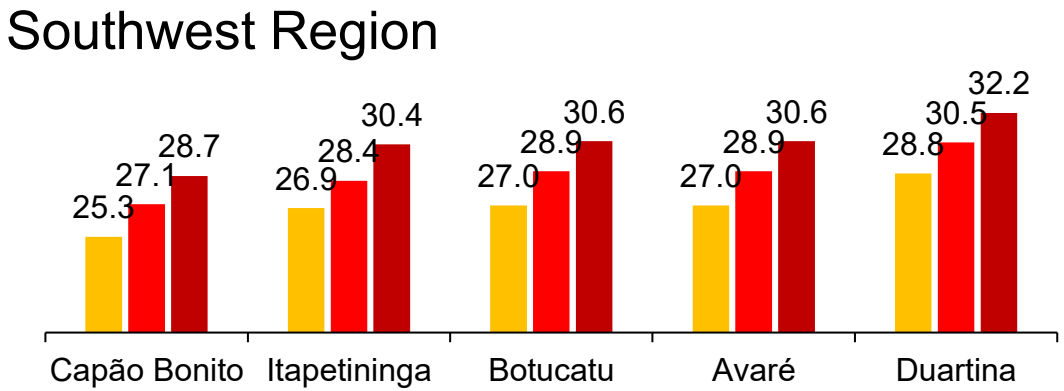
Source: Clima Tempo





REGIONAL HLB INCIDENCE



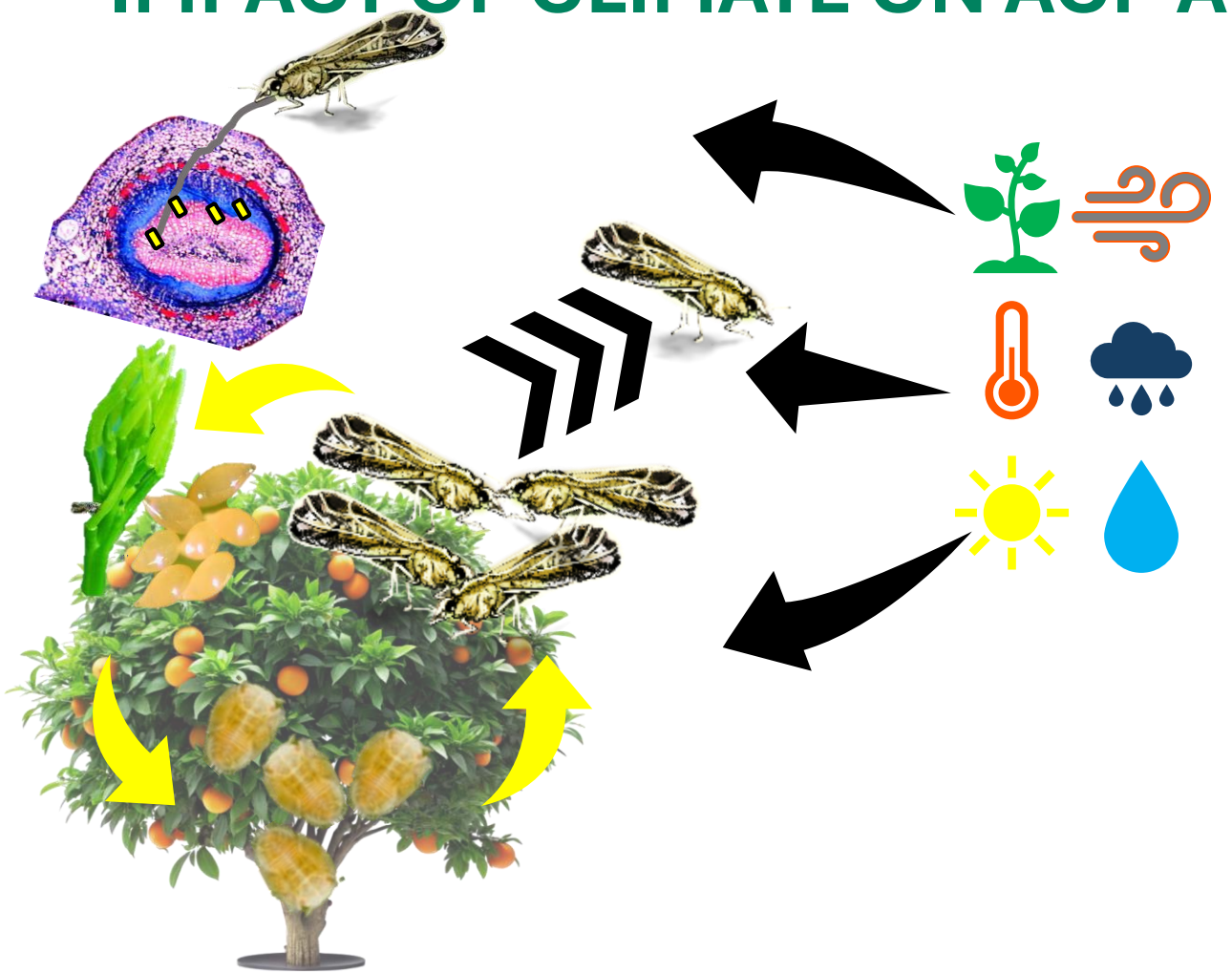


Historical mean– Climatological normal (1991 – 2020)

Source: NASA POWER

Fundecitrus

IMPACT OF CLIMATE ON ACP AND SPREAD OF HLB



ACP

- Optimal temperature – 26-28 ºC
- High temperature (>32 ºC) – negative effect on biology and dispersal
- Seasonal occurrence (July-November)
- Young shoots – important factor

***Ca.* Liberibacter asiaticus**

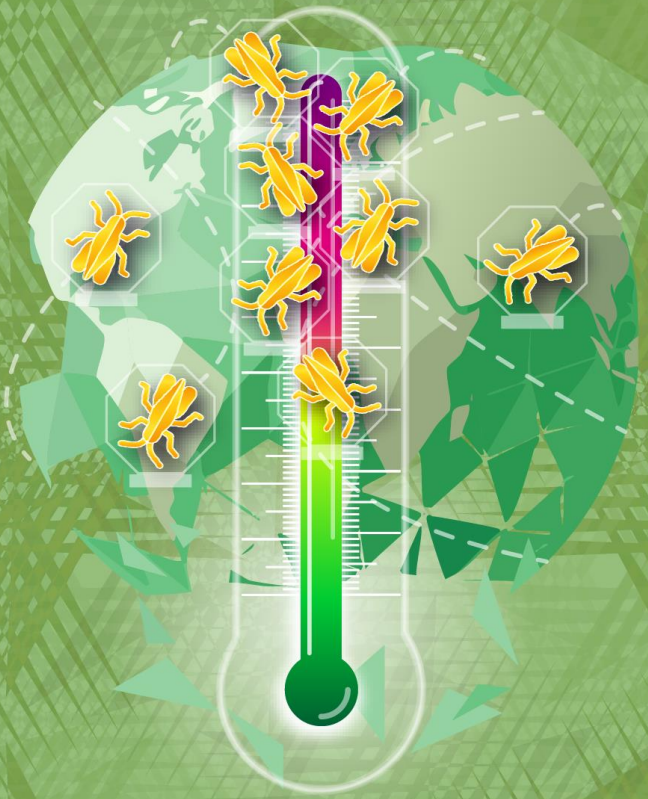
- Optimal temperature – 24-28 ºC
- High Temperature (>32 ºC) – negative effect, reduces bacterial concentration
- Acquisition depends on the bacterial concentration
- Young shoots – higher transmission efficiency

Fundecitrus

IPPC Webinar Series

Climate Change and Phytosanitary Issues

1–2 October 2025 | 14:00–16:00 CET



Thank you

www.**fundecitrus**.com.br

Av. Dr. Adhemar Pereira de Barros, 201
Araraquara/SP | CEP 14807-040

+55 16 3301 7000 | 0800 110 2155

@fundecitrus /fundecitrus /fundecitrus /fundecitrus +55 16 99629 2471

Fundecitrus

CIÊNCIA E SUSTENTABILIDADE PARA A CITRICULTURA