Biological Control of *Tuta absoluta* Meyrick (Lepidoptera: Gelechiidae)

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TOMATO PESTS IN BRAZIL

- *Neoleucinodes elegantalis* (Guenée, 1854)
- *Helicoverpa zea* (Boddie, 1850)
- *Tuta absoluta* (Meyrick, 1917)
- *Phthorimaea operculella* (Zeller, 1873)
- *Frankliniella schultzei* Trybon, 1920
- *Bemisia tabaci* (Genn., 1889)
- *Myzus persicae* (Sulzer, 1776)
- *Liriomyza* sp.
- Mites

Gallo et al. (2002)

Tuta absoluta was referred in Brazil in 1980, in the State of São Paulo (MOREIRA et al., 1981).

After the first record, it was reported in Minas Gerais (1982), Paraná (1982), Bahia (1982), Espírito Santo (1983), Rio de Janeiro (1983)...

South America

There are records since the 1960´s in Chile, Argentina and Peru.

Europe

2006 – Spain

2009 – Turkey

Tuta absoluta LIFE CYCLE

Egg ***Trichogramma pretiosum***

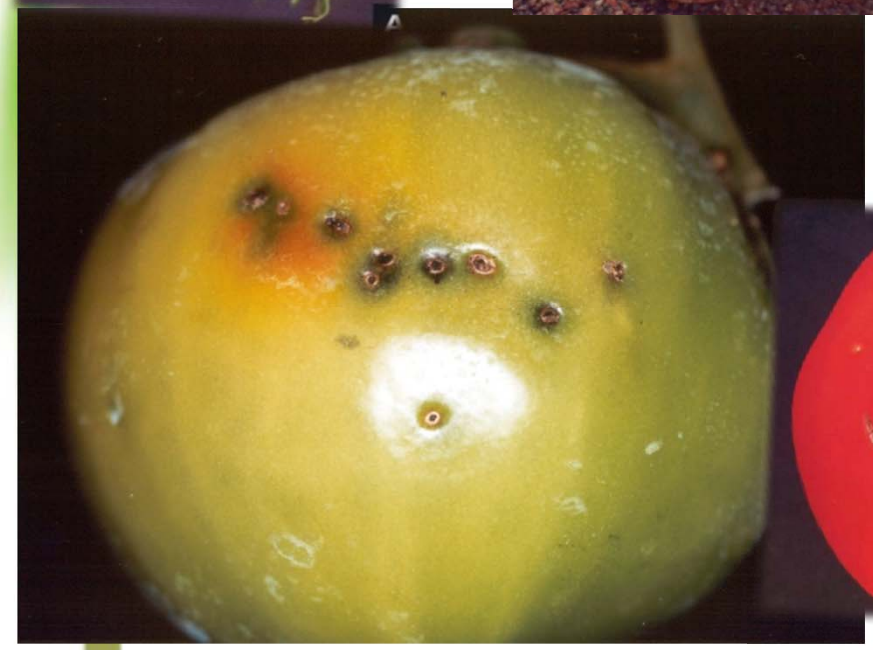
Larva
Apanteles gelechiidivoris

Pupa

Adult

Tuta absoluta DAMAGE

In some conditions, damage may range from 80 to 100%. It appears early in the crop cycle.

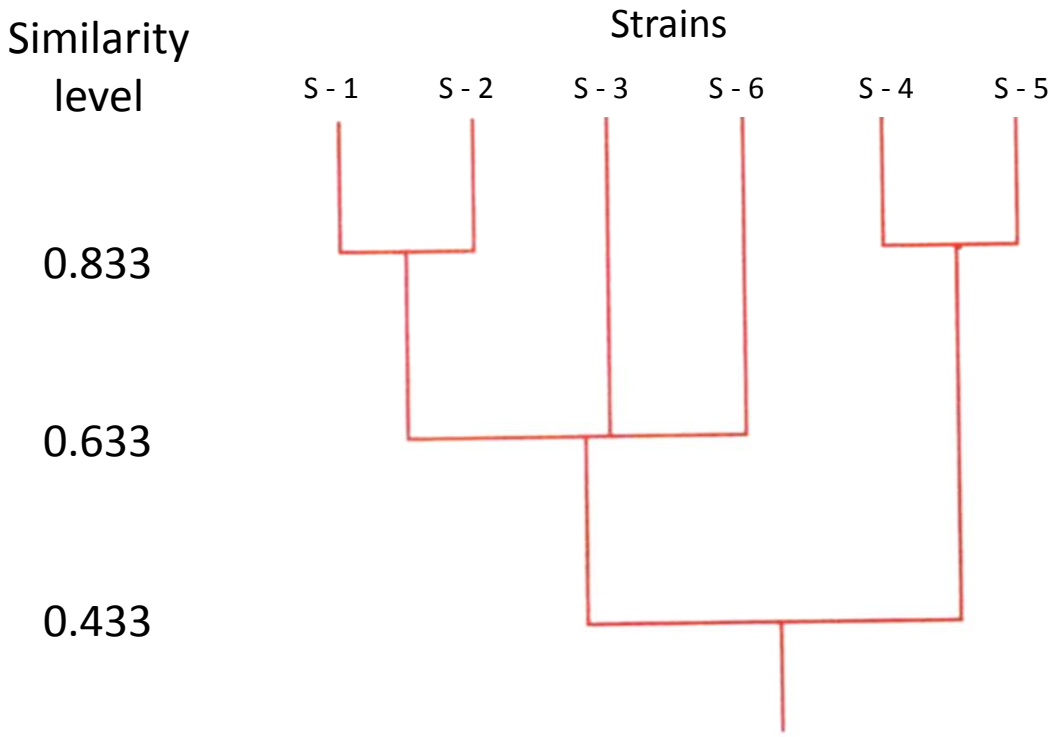


Souza & Reis (2000)

Tuta absoluta HOSTS

- Tomato
- Potato
- Tobacco
- *Solanum* spp.
- *Datura stramonium*

Tuta absoluta SELECTION OF *Trichogramma pretiosum* STRAINS



Pratissoli (1995)

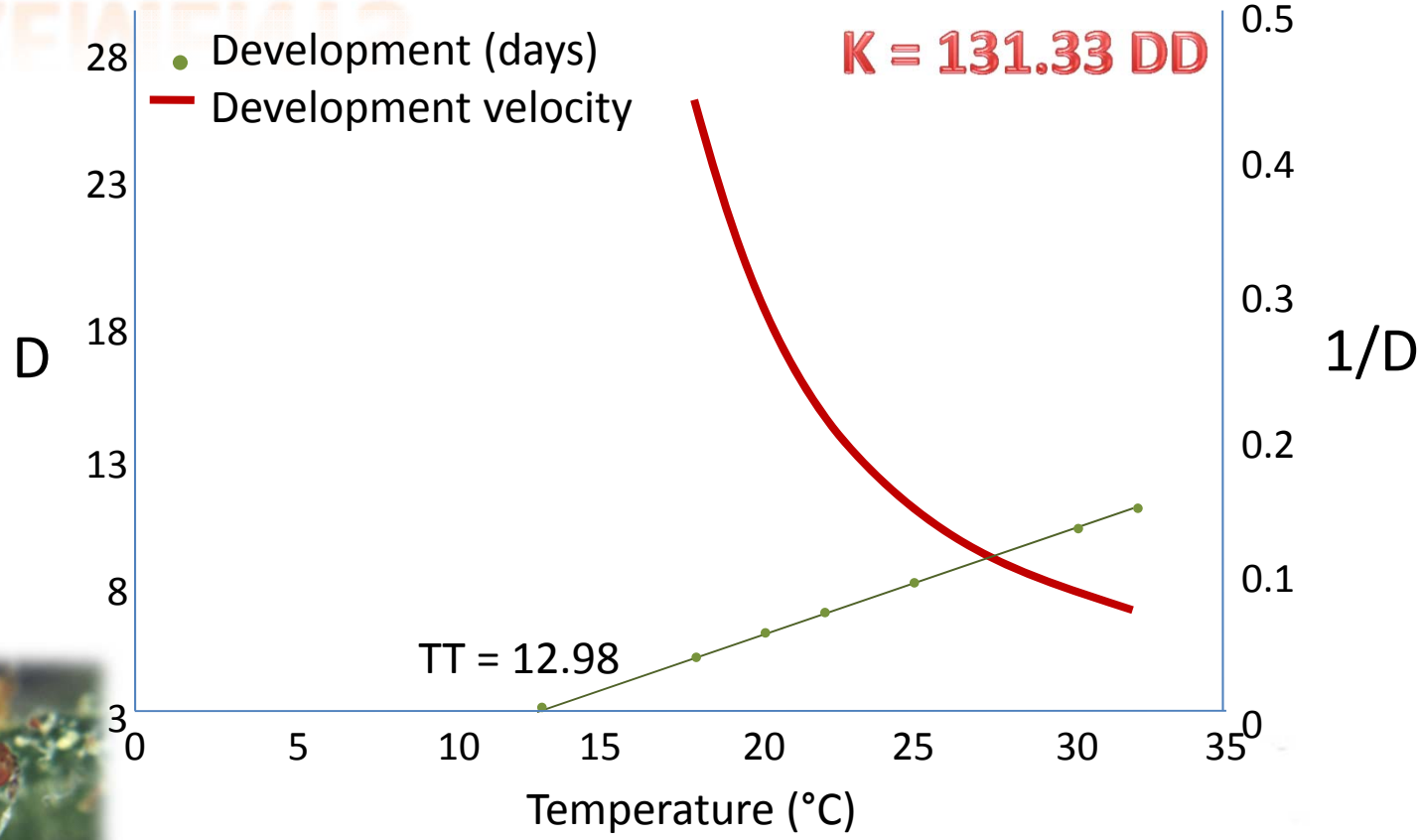
Tuta absoluta
DEVELOPMENT OF *T. pretiosum*

Temperature (°C)	Duration (days)	Viability (%)
18	26.47 a	79.80 d
20	17.78 b	86.12 bcd
22	16.32 c	94.34 ab
25	10.30 d	96.24 a
30	7.50 e	88.97 abc
32	7.11 f	83.37 cd

Tukey, $p \leq 0.05$

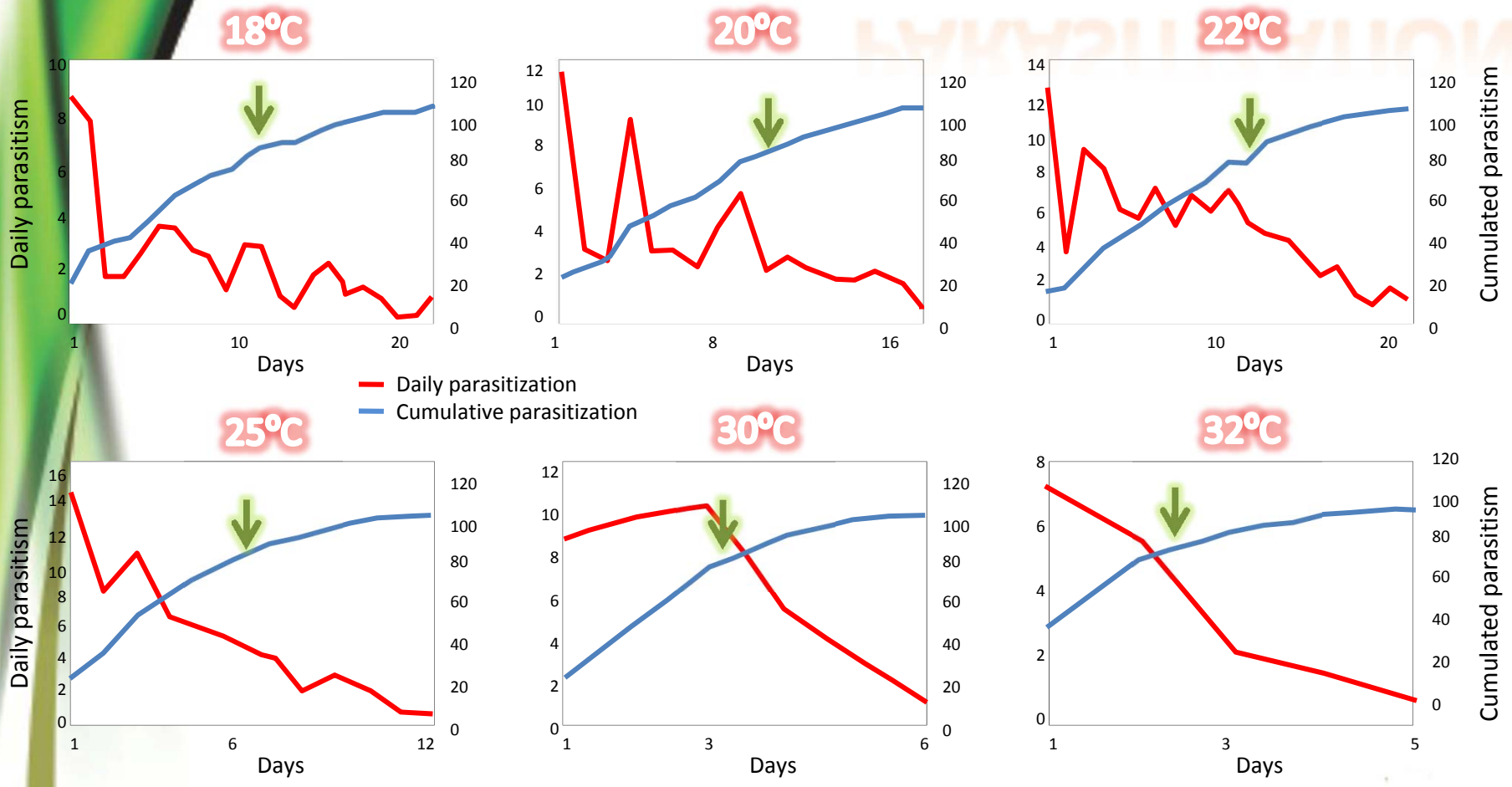
Pratissoli & Parra (2000)

Tuta absoluta
T. pretiosum THERMAL REQUIREMENTS



Pratissoli & Parra (2000)

Tuta absoluta
T. pretiosum DAILY AND TOTAL PARASITIZATION



80% of parasitization

Pratissoli & Parra (2000)

Tuta absoluta *T. pretiosum* PARASITIZATION AT DIFFERENT TEMPERATURES

Temperature (ºC)	Parasitization capacity
18	36.95 a
20	54.57 bc
22	70.25 a
25	60.32 ab
30	45.57 cd
32	11.07 e

Tukey, p≤ 0.05

Pratissoli & Parra (2000)

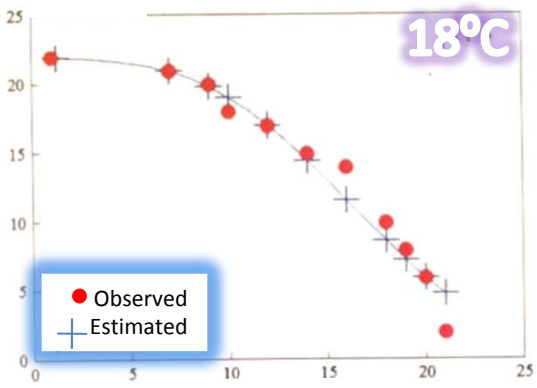
Tuta absoluta
T. pretiosum LONGEVITY

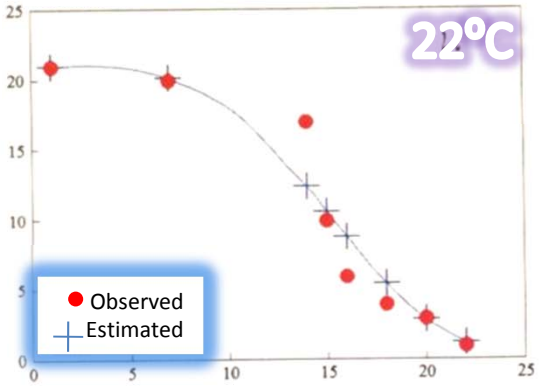
Temperature (ºC)	Longevity (days)
18	16.00 a
20	16.95 a
22	15.04 a
25	9.83 b
30	5.72 c
32	5.05 c

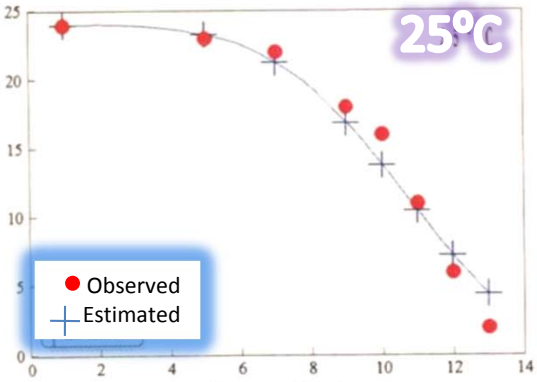
Tukey, p≤ 0.05

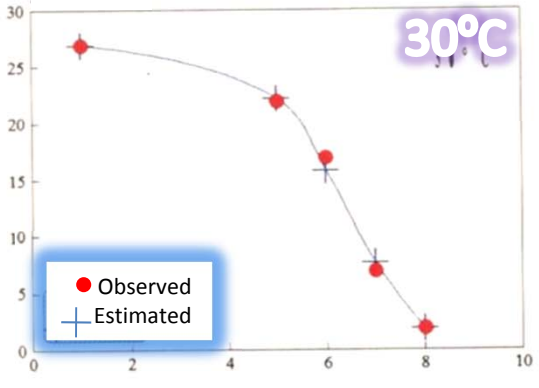
Pratissoli & Parra (2000)

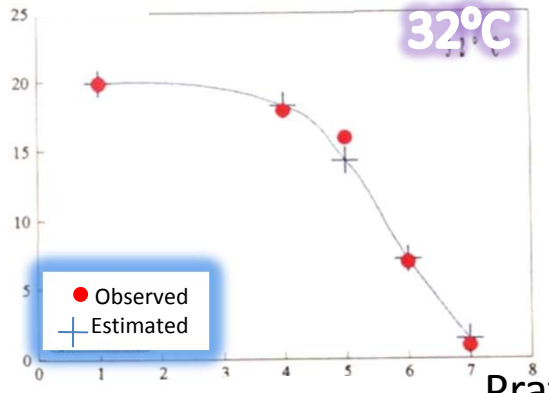
Tuta absoluta
T. pretiosum
SURVIVAL











Pratissoli (1995)

Tuta absoluta
T. pretiosum PARASITIZATION
2 strains of the parasitoid

Temperature (°C)	S_1	S_2
18	14.60 a	19.54 a
20	16.62 a	19.54 a
22	15.53 a	15.53 a
25	16.64 a	17.11 a
30	14.01 a	16.05 a
32	13.99 b	22.88 a

Tukey, p≤ 0.05

from Alegre, Espírito Santo State

from Petrolina, Pernambuco State

Pratissoli & Parra (2000)

Tuta absoluta CONTROL LEVEL

Survey

(2 times/week)

60 plants/ha
stacked tomato

10 plants/ha
industrial tomato

25% of plant upper part with larvae or eggs
25% of leaves with larvae
5% of tomatoes (cluster) with eggs
45 ± 19.5 (25.5 to 64.5) adults/pheromone trap

Benvenga et al. (2007)

Tuta absoluta CONTROL

1990 - 1991

São Francisco Valley, Petrolina, Pernambuco State

Damage reduction (tomatoes) after *T. pretiosum* release (400.000/ha)

	Small areas		Large areas	
	Parasitization (%)	Damage (%)	Parasitization (%)	Damage (%)
1990	19.5	31.0	20.7 to 41.8	13.0
1991	48.5	8.6	30.3	1.4

Haji et al.(2002)

Tuta absoluta X T. pretiosum
CONCLUSIONS

Industrial tomato

9 releases during the tomato development

1 release/week

32% of parasitization

82% of control

Stacked tomato

10 releases during the tomato development

1 release/week

35% of parasitization

85% of control

Papa (1998)

Tuta absoluta X *T. pretiosum*
CONCLUSIONS

Commercial recomendation

9 releases during the tomato development

2 release/week

INCREASE CONTROL

Tuta absoluta X *A. gelechiidivoris*

- First trials in lab. conditions
- Research collaborations established
- Latin America
- Association to *Trichogramma* and conventional control (chemicals)
- *Tuta* diet improvement

Tuta absoluta
ARTIFICIAL DIET

Ingredient	Amount*
White bean	75.0 g
Wheat germ	60.0 g
Soybean flour	30.0 g
Casein	37.5 g
Yeast	37.5 g
Ascorbic acid	3.6 g
Sorbic acid	1.8 g
Methyl-p-hydroxybenzoate	3.0 g
Tetracycline	113.0 mg
Formadehyde	3.6 mL
Vitaminic mixture	9.0 mL
Agar	23.0 g
Water	1,200.0 mL

Mihsfeldt & Parra (1999)

* Add tomato leaves powder (5%)

Modified from Greene et al. (1976)

Tuta absoluta DEVELOPMENT ON ARTIFICIAL AND NATURAL DIET

Diet	Sex ratio	Pupal weight (mg)	Fecundity (egg/female)	Longevity (days)
Natural*	0.59	3.46 a	183.35 a	11.41 a
Artificial	0.54	3.48 a	47.27 b	7.70 b

* 'Santa Clara' leaves.

Tukey, $p \leq 0.05$

Mihsfeldt & Parra (1999)

thanks

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