



Food and Agriculture
Organization of the
United Nations

FAW Biological Control in the global south: Latin America



Global Forum on Biological Control and Training Workshop on biological control for fall armyworm

Dates: June 26 –30, 2023 - Venue: *icipe*, Nairobi, Kenya

Biocontrol Forum

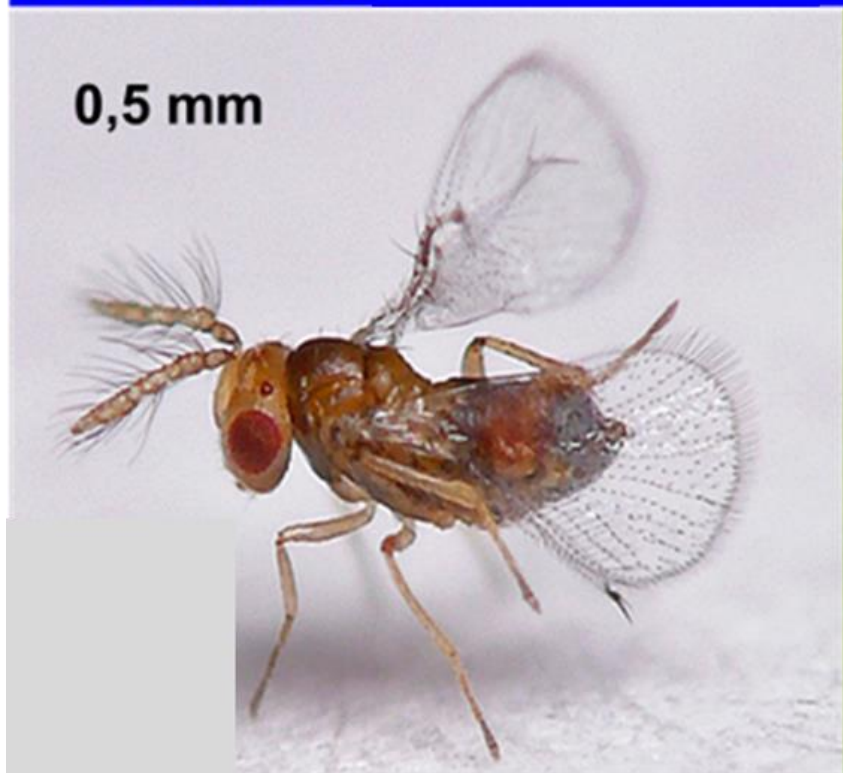
FAW Biological Control in the global south: Latin America

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Trichogramma



Podisus



Baculovirus





WHY IS IT SO DIFFICULT TO CONTROL *Spodoptera frugiperda*

- Prefers to feed on corn and can survive well on several other host plants, both cultivated and uncultivated.
- **The moths are caught in a trap (pheromone) practically every day of the year**
- The larva feeds at virtually every stage of plant development

Pheromone Trap installation before corn planting

A trap for 5 ha

1 meter
above the
ground
surface

EIL - Accumulated three
moths per trap

WHAT SHOULD BE DONE involving the community?

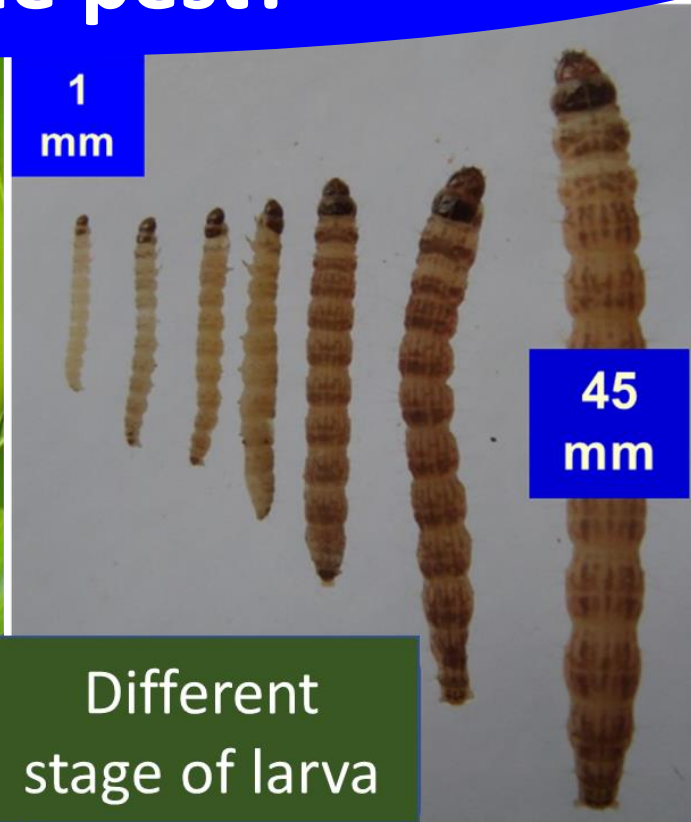
- Know well the pest and its natural enemies
- Historical construction map: determine the occurrence of moths and natural enemies throughout the year
- Establishment of factory (egg parasitoids and predators)
- Factory for collective use of farmers

Training (farmers and extension workers) and Connect (WhatsApp) all actors in the production chain

What do we need to know about the pest?



Egg mass



Different
stage of larva



Pupa
(20 mm)

Climatic conditions and abundance of food favor the pest

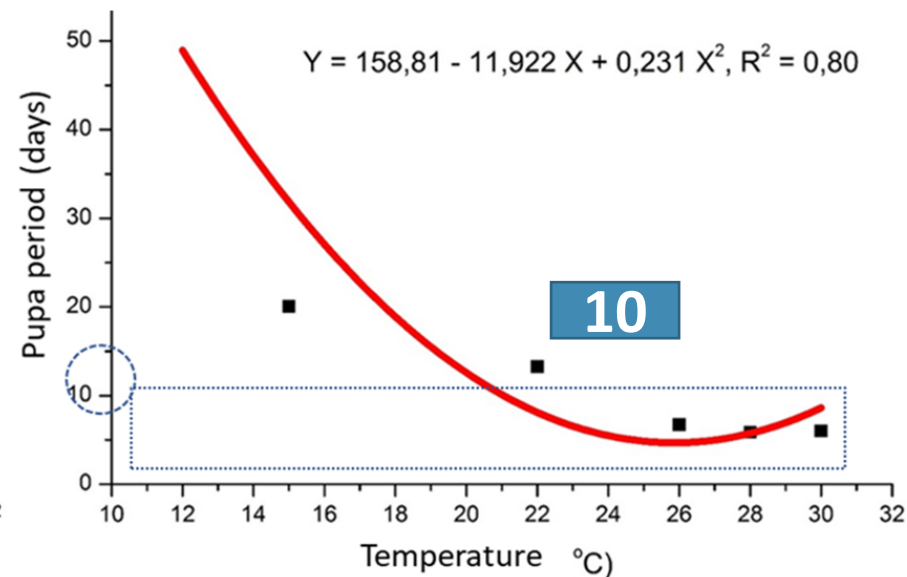
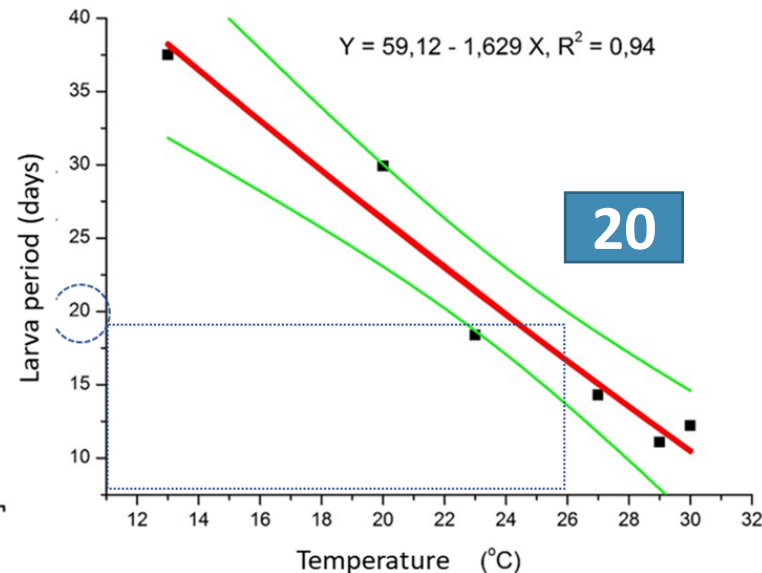
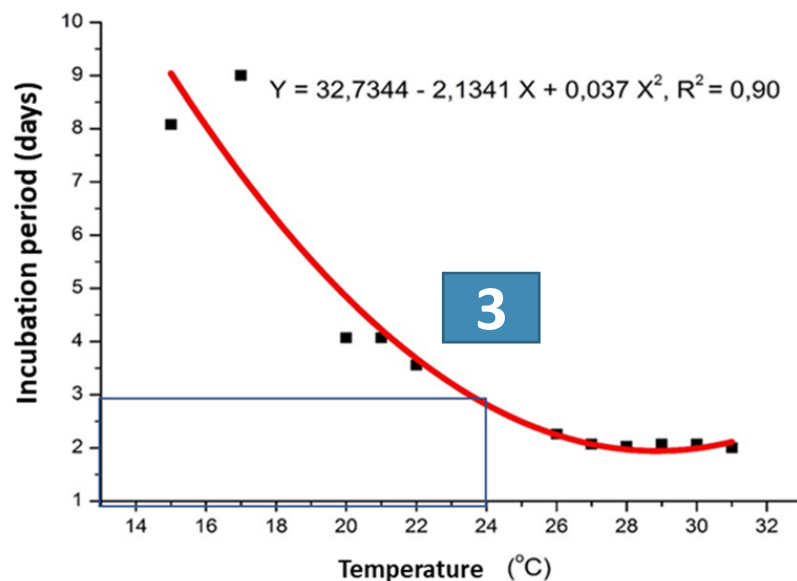


Hatching of larvae: In the field the average number of eggs per mass is around 150 and a moth lays about 1000 eggs during its lifetime!





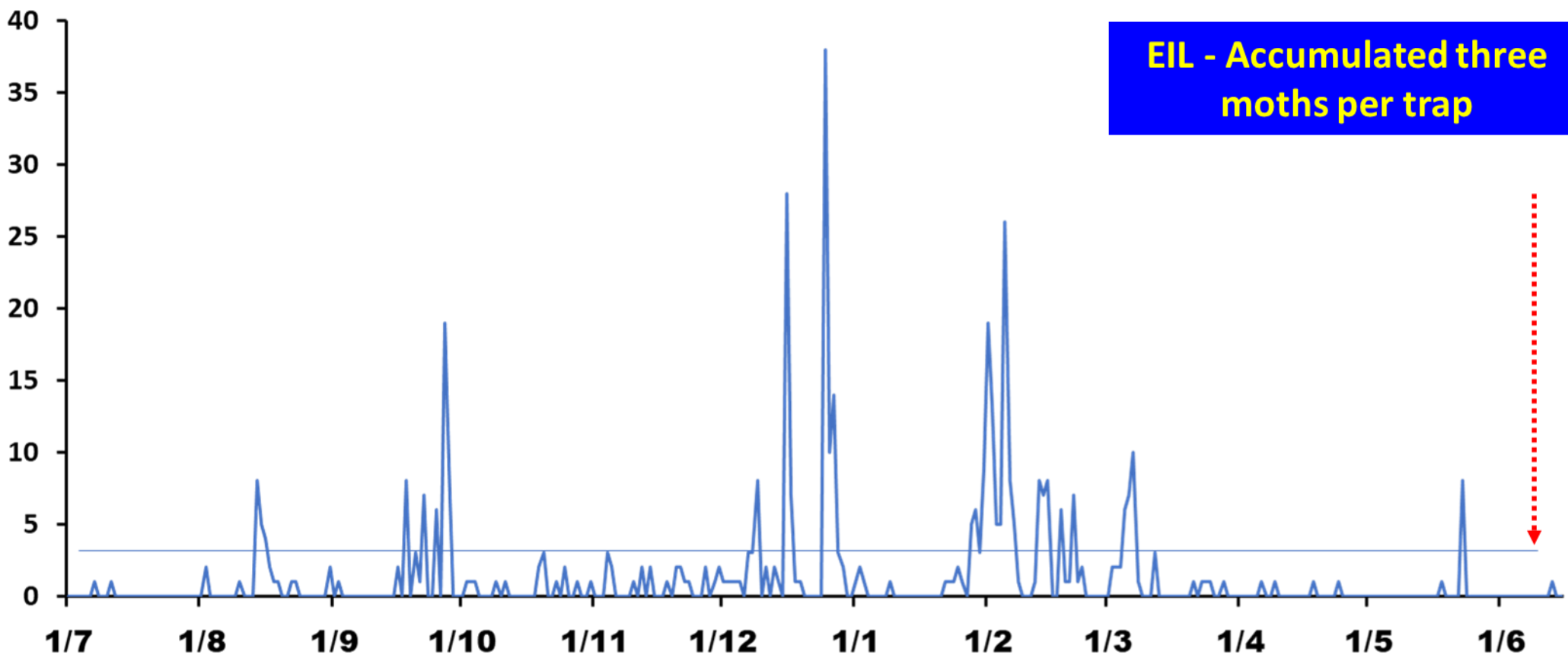
Newborn larvae: migration to other plants



Temperature-dependent life cycle: 33 days in summer



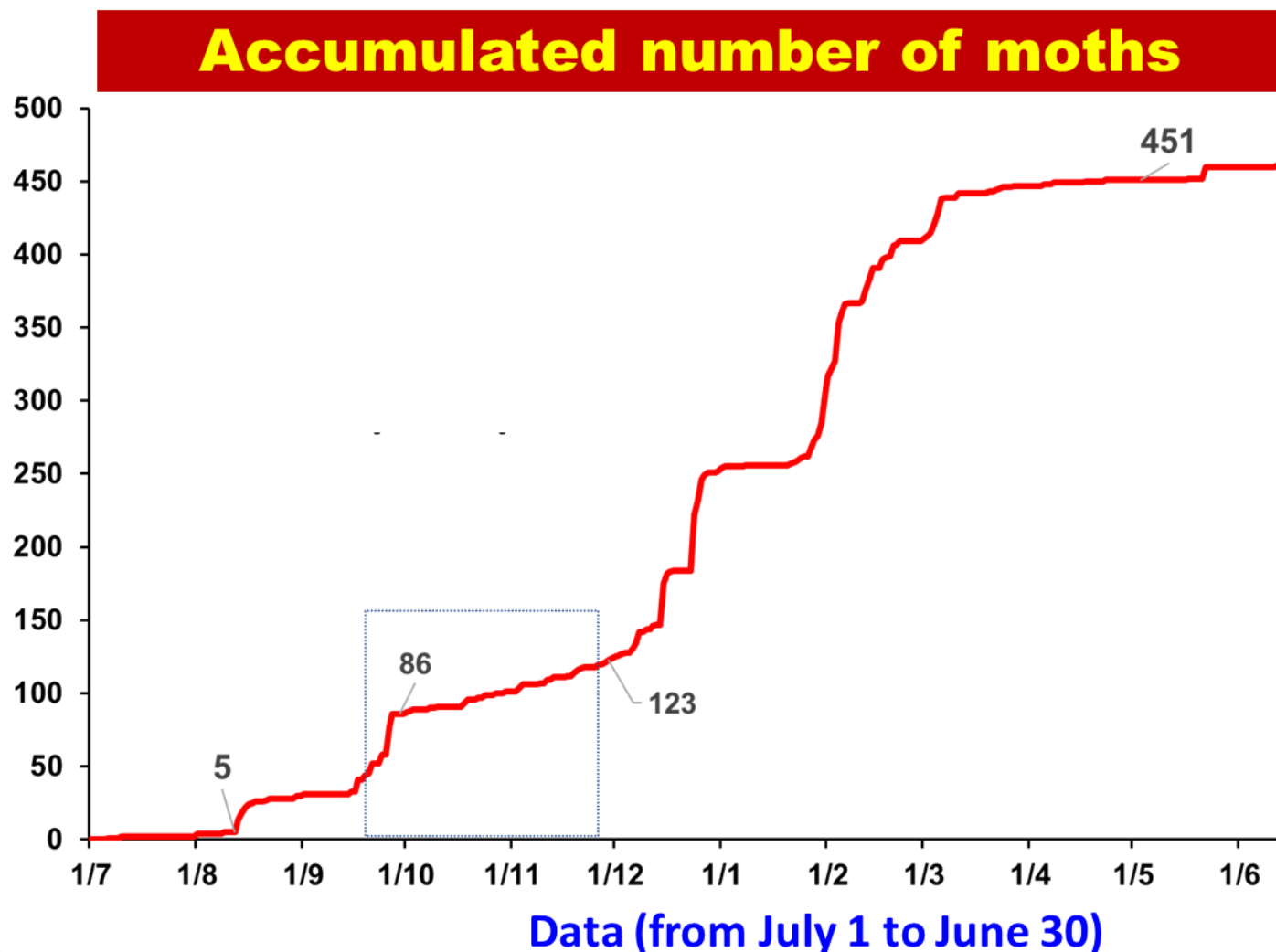
Number of moths captured per day



Data (from July 1 to June 30)

***S. frugiperda*: continuous and overlapping generations!**

Spodoptera frugiperda: continuous and overlapping generations!



For reflection!!

- How many control measures would be required throughout the year?
- What would be the loss in income if the insect is not properly controlled?

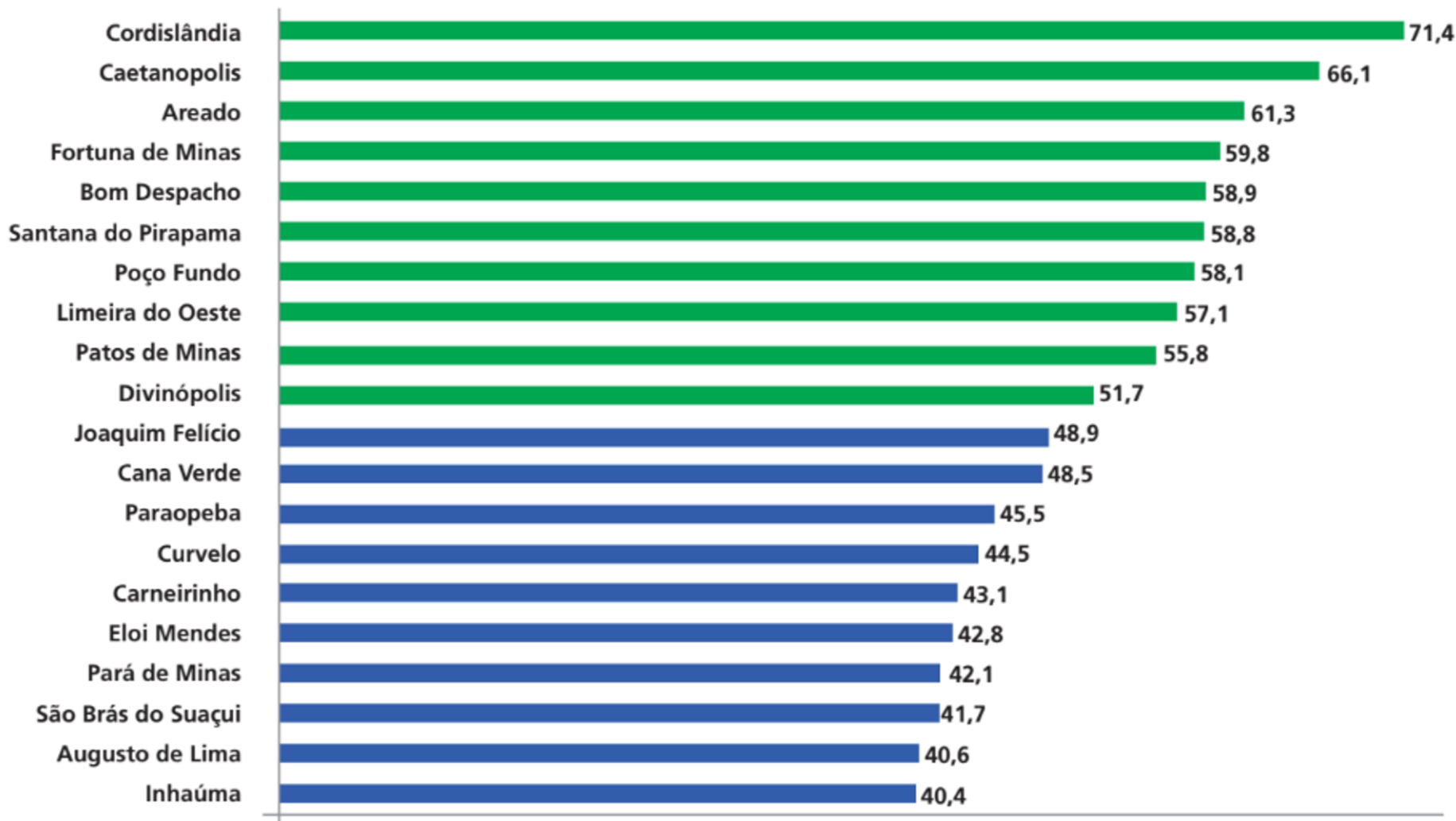


Natural enemies: What do we need to know about the natural enemies?

- **All are important** but the focus should be on those species that consume eggs and small larvae of *S. frugiperda* and avoid injury to the plant.
- Know, at least, the number of individual consumed.



Cities of the State of Minas Gerais



Parasitism above 40% obtained from larvae of *S. frugiperda*

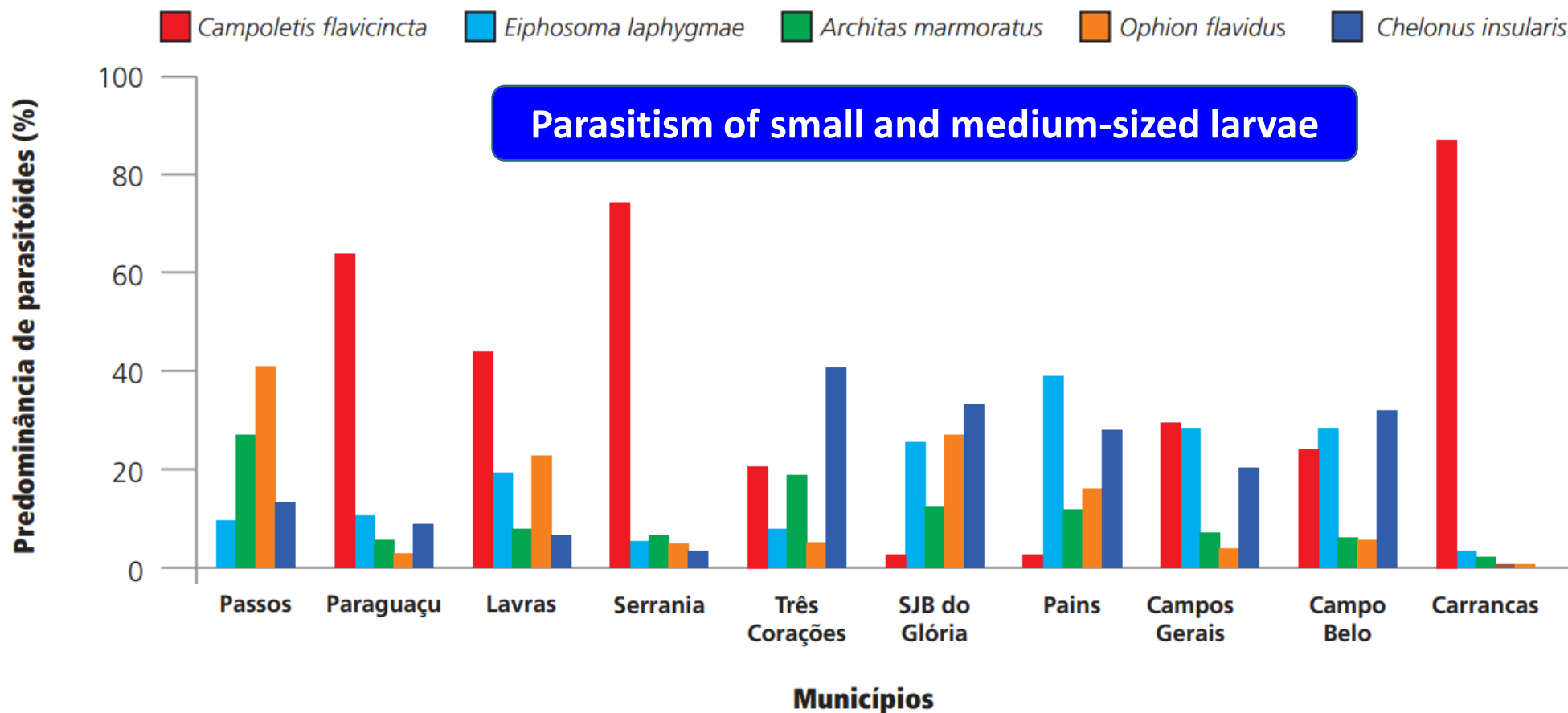
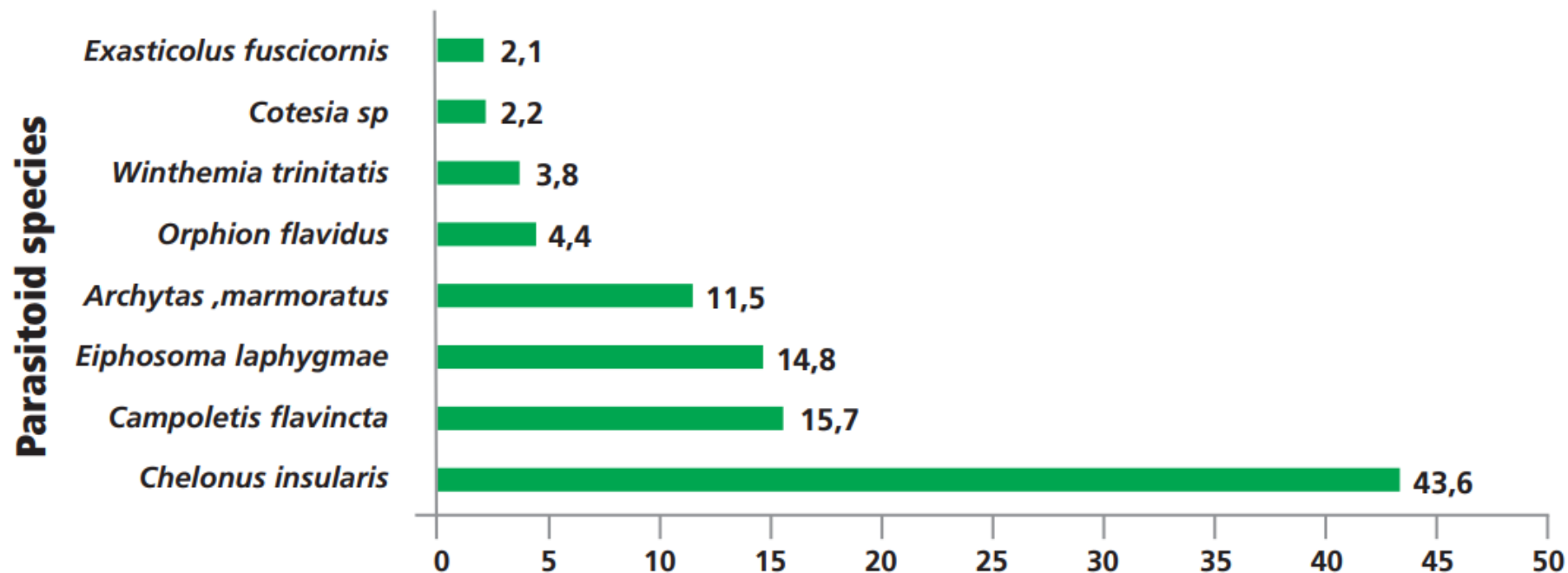


Figure 12. Predominance of *S. frugiperda* larvae parasitoids in some municipalities of Minas Gerais, Brazil.

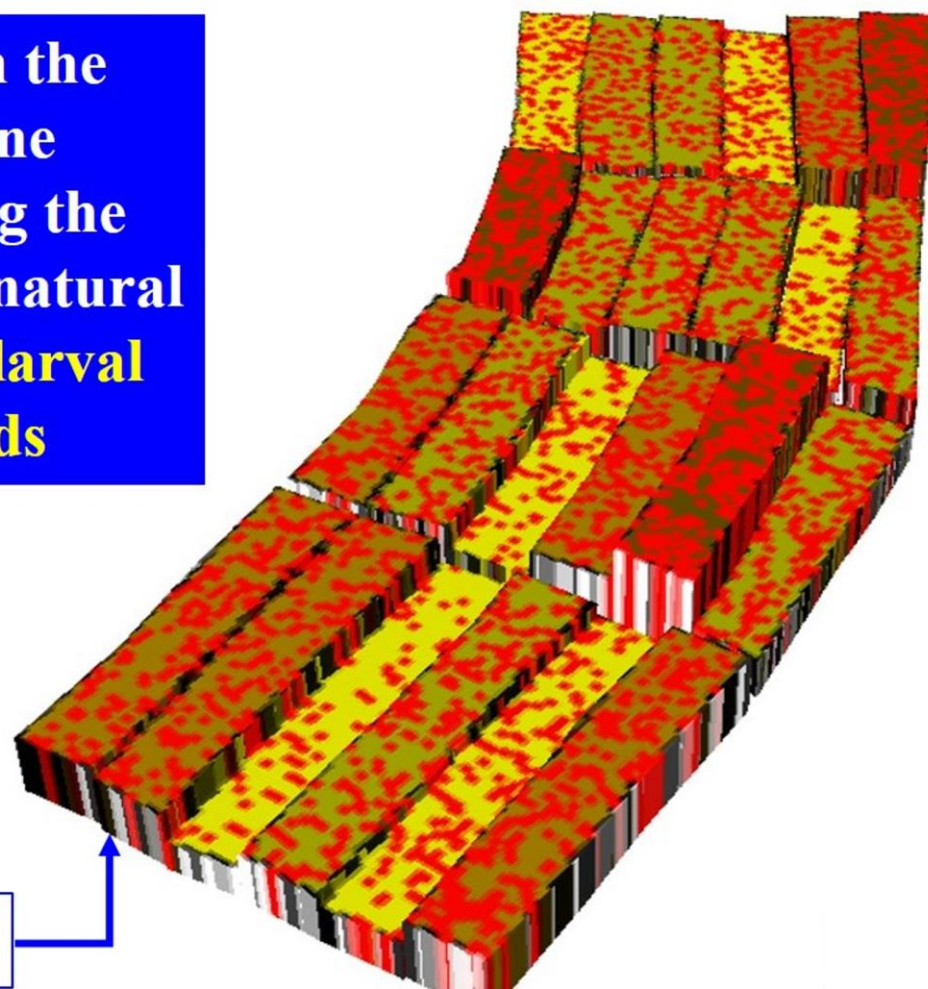


Predominance (%) among parasitoid species from *S. frugiperda* larvae

Figure 2. Average individual contribution of *S. frugiperda* larvae parasitoids. verified in maize, in Minas Gerais municipalities for a period of seven years

Parasitoids of larvae ●

Red dots on the
cobblestone
(representing the
pest) indicate natural
incidence of **larval
parasitoids**



BCA

16 DAE

Insect pest



Agricultural Processes: **Previous knowledge**

1. Economic Injury Level based **on moth's capture**
2. Target: **egg masses**
3. Monitoring (initial arrival and flow throughout the cultivation cycle) using pheromone trap
4. Traps, one meter high, placed in the field on the day of planting (a trap for 12 acres)
5. Decision-making: **accumulation of three moths caught by trap**
6. **Construction of a history of the capture of the moth**

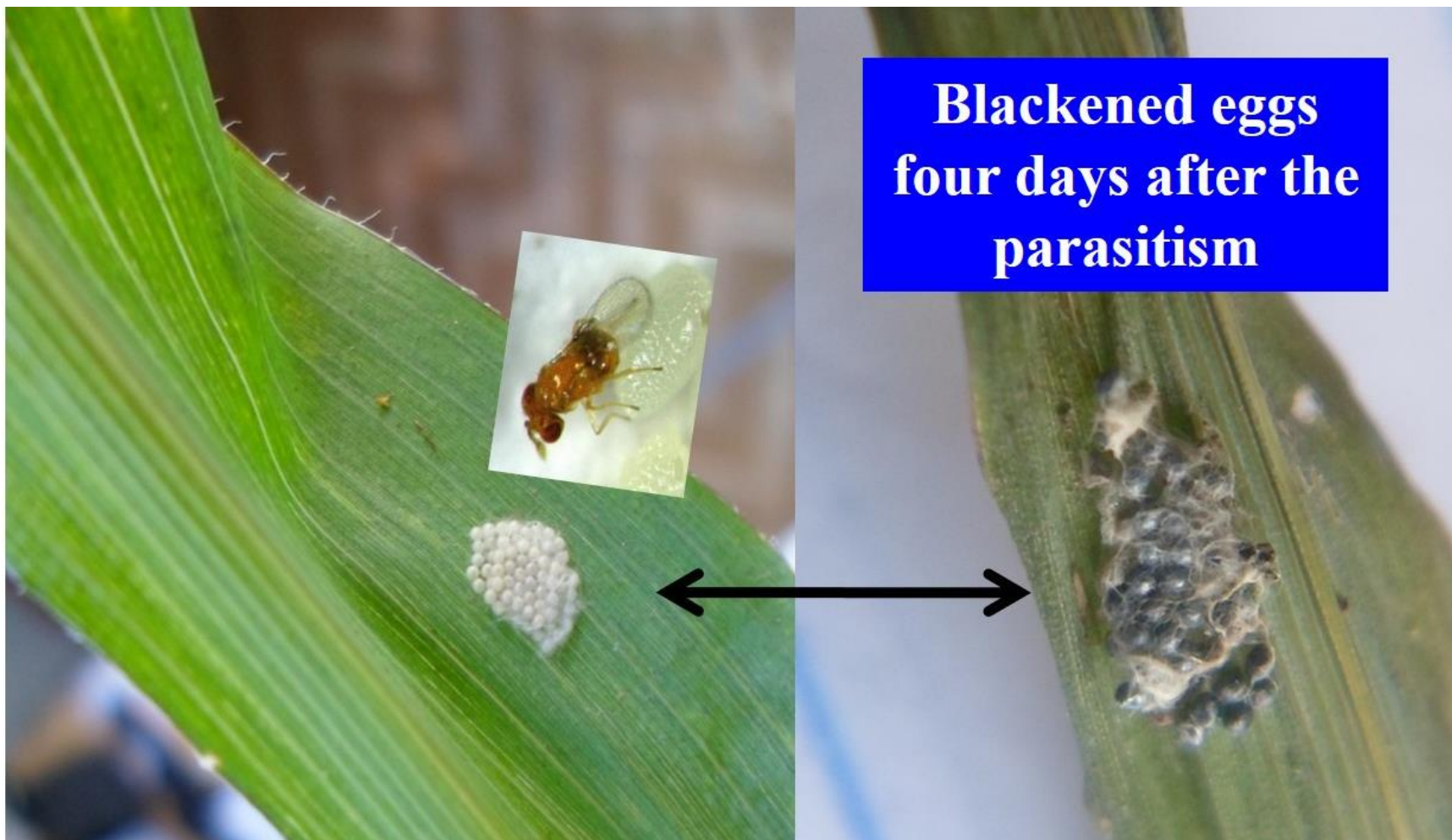
Main target: *Spodoptera frugiperda*

Focus: Applied Biological Control

Eggs: Parasitoids such as *Trichogramma* sp. or *Telenomus remus*

Biological control applied with *Telenomus remus* or *Trichogramma*





Use of *Trichogramma* in corn

Generation: parasitoid/pest 3 : 1

Parasitized
egg

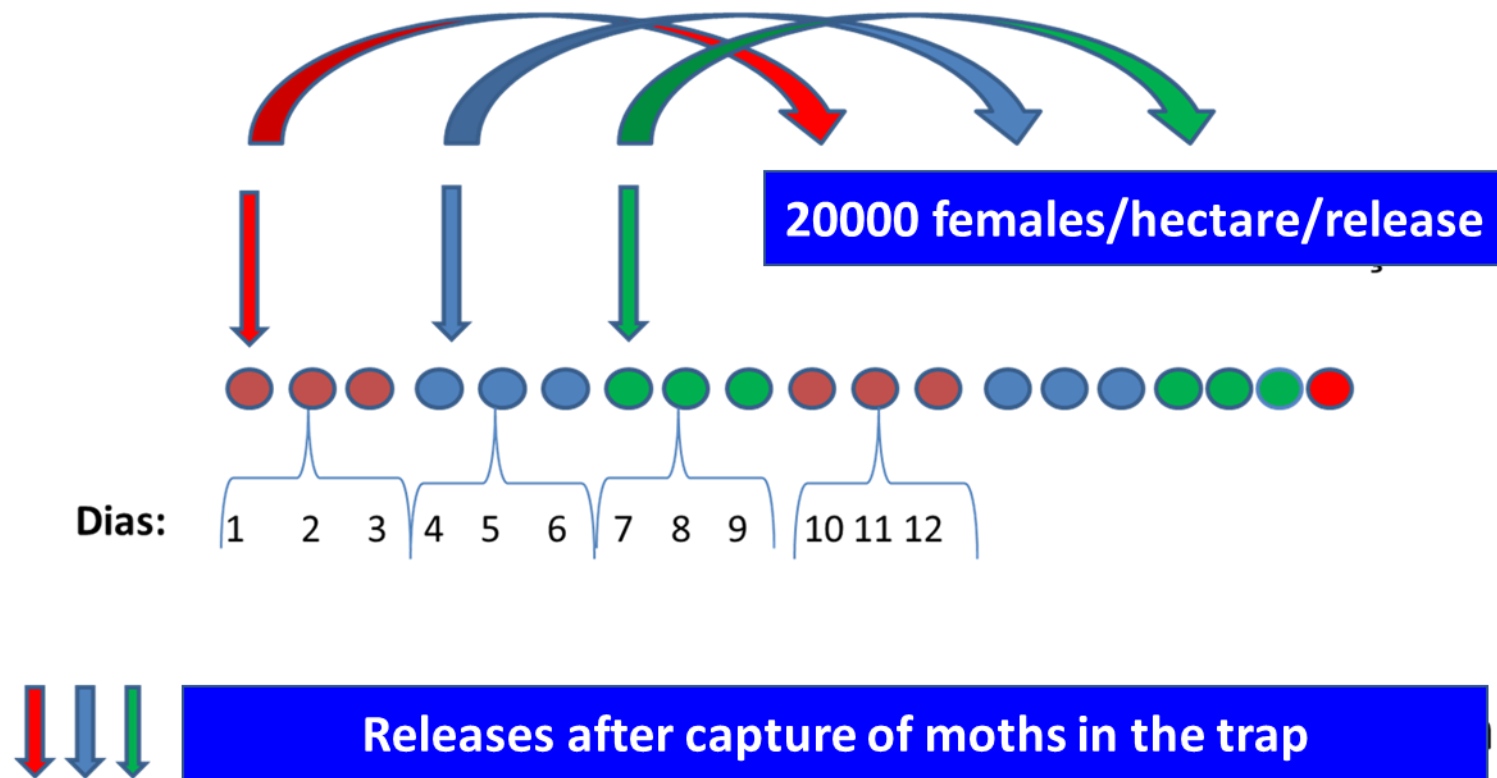
10 days

New generation



Only ONE release can favor the hatching of larvae originated from eggs not yet parasitized

Portioning of the dose released in the field



Trichogramma female
parasitism capacity = 60
eggs



Potential number of
parasitized eggs/ha

1.200.000 parasitized
eggs/release or

A total of 3.600.000



Days of initial female release			New females from initial release		
1	4	7	10	13	16
Parasitoid adult females					
20000	200000	200000	648000	648000	648000
Total females: 60.000			Total females: 1.944.000		
Potential parasitized eggs					
1.200.000	1.200.000	1.200.000	38.880.000	38.880.000	38.880.000
Total: 3.600.000			Total: 116.640.000		
Potential <i>S. frugiperda</i> parasitized number of egg mass					
8000	8000	8000	259200	259200	259200

Sampling measurement of the safety of the release of *Trichogramma* females with the ability to parasitize 60 eggs

Fêmeas liberadas /hectare	NOP*	Eggs/plant	Egg/masses	
			/ha	/100 plantas
20.000	1.200.000	24	4000	8
40.000	2.400.000	48	8000	16
60.000	3.600.000	72	12000	24

*NOP - Potential number of parasitized eggs



Main target: *Spodoptera frugiperda*

Focus: Applied Biological Control

Larva: **Predator** such as *Podisus maculiventris*

Predator such as *Podisus maculiventris*

***Podisus* an
excellent
predator of
*Spodoptera
frugiperda***



Biofactory candidates: PREDATORS

Podisus production to control *S. frugiperda*



Biofactory for *Podisus* production



***Tenebrio molitor*: food source for predator *Podisus* sp**





Main target: *Spodoptera frugiperda*

Secondary focus: Natural Biological Control

All stages of development of the pest

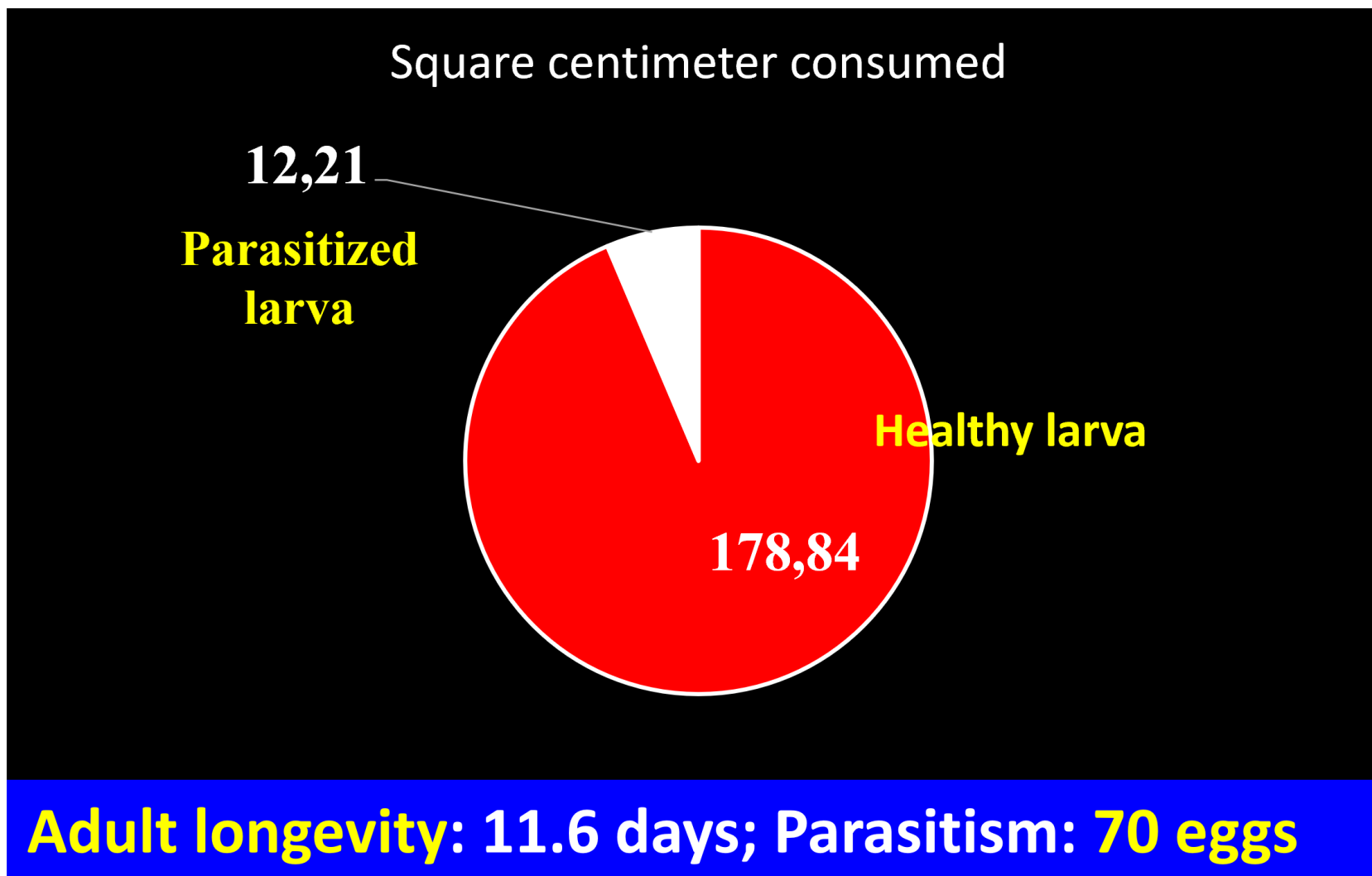
Secondary focus: Natural Biological Control



Chelonus insularis



- **Eggs:** reduced size, with rounded ends, and lasting 1.8 days.
- **Larva:** 17 to 23 days (average 20.4 days)
- **Pupa:** 6.2 days.
- **Total cycle** (egg - adult birth): 28.6 days.
- **Pupation:** soil

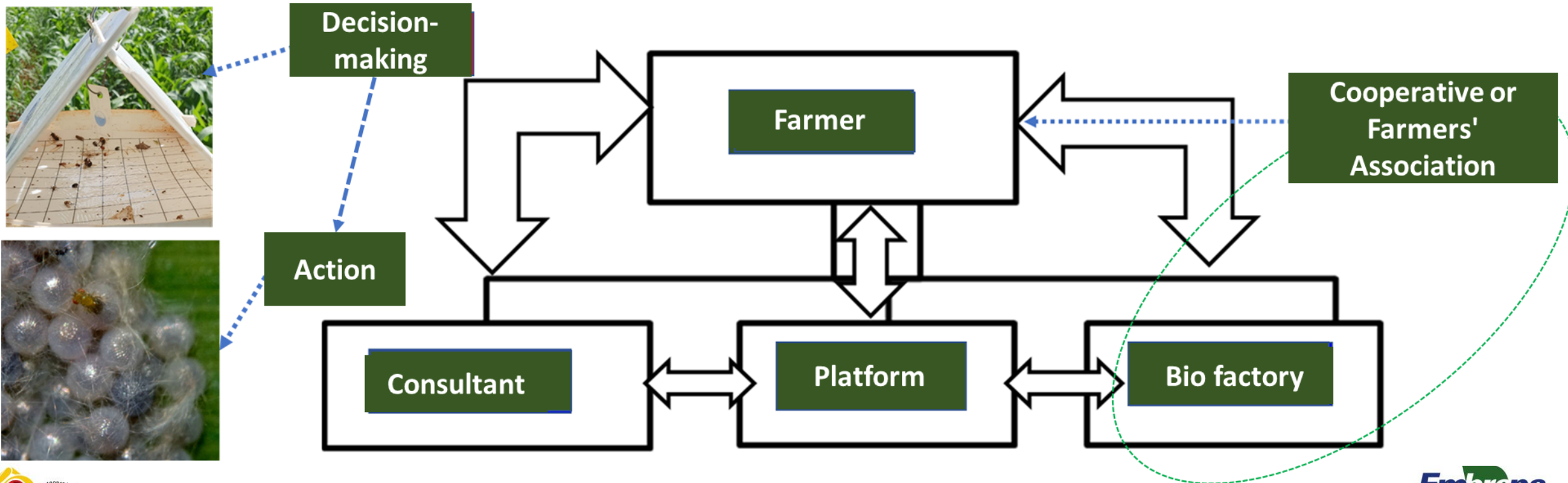




Potential Biological Control (1 Female = 200 larvas/females)	Number of females of <i>C. flavicincta</i> / hectare in the field				
	100	200	300	400	500
Number of eliminated <i>S. frugiperda</i>	20000	40000	60000	80.000	100000
Number of egg masses/hectare					
Number of egg masses/100 m ²					

Network connection for fast information sharing: actors VERY WELL TRAINED and benefited in the set

FOCUS ON A REGION AND PEST COMPLEX





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Thank you!

IVAN CRUZ

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