

Biological Control in Brazil

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Biological Control Industry in Brazil

21

Companies produce
arthropod natural
enemies



19

Companies
produce fungi
and viruses



13

Companies produce
antagonistic



Commercialized Entomophagous Arthropods in Brazil



Parasitoid: *Cotesia flavipes*
Target: *Diatraea saccharalis*



Parasitoid: *Trichogramma galloi*
Target: *Diatraea saccharalis*



Parasitoid: *Trichogramma atopovirilia*
Target: *Spodoptera frugiperda*



Parasitoid: *Trichogramma pretiosum*
Targets: *Spodoptera frugiperda*,
Tuta absoluta, *Pseudoplusia includens*,
Plutella xylostella



Predator: *Neoseiulus californicus*
Targets: *Panonychus ulmi*,
Tetranychus urticae,
Polyphagotarsonemus latus



Predator: *Phytoseiulus macropilis*
Target: *Tetranychus urticae*



Predator: *Phytoseiulus longipes*
Targets: *Tetranychus urticae*,
Tetranychus evansi



Predator: *Stratiolaelaps scimitus*
Targets: *Bradysia* spp.,
Collembola, soil mites, thrips
(pupae)



Predator: *Podisus nigrispinus*
Target: forest defoliators



Predator: *Orius insidiosus*
Target: thrips



Predator: *Cryptolaemus montrouzieri*
Target: armored scales

Most important commercial natural enemy: *Cotesia flavipes*

- Sugarcane area: around 9 million of hectares (2007/2008)
Parasitoid *Cotesia flavipes* - most important program in Brazil.
- *C. flavipes* are released annually in an area approximately 2 million ha of sugarcane, at a rate of 6,000 parasitoids/ha.
- Brazil has several private companies producing *C. flavipes* and laboratories operating in sugar and alcohol production plants.

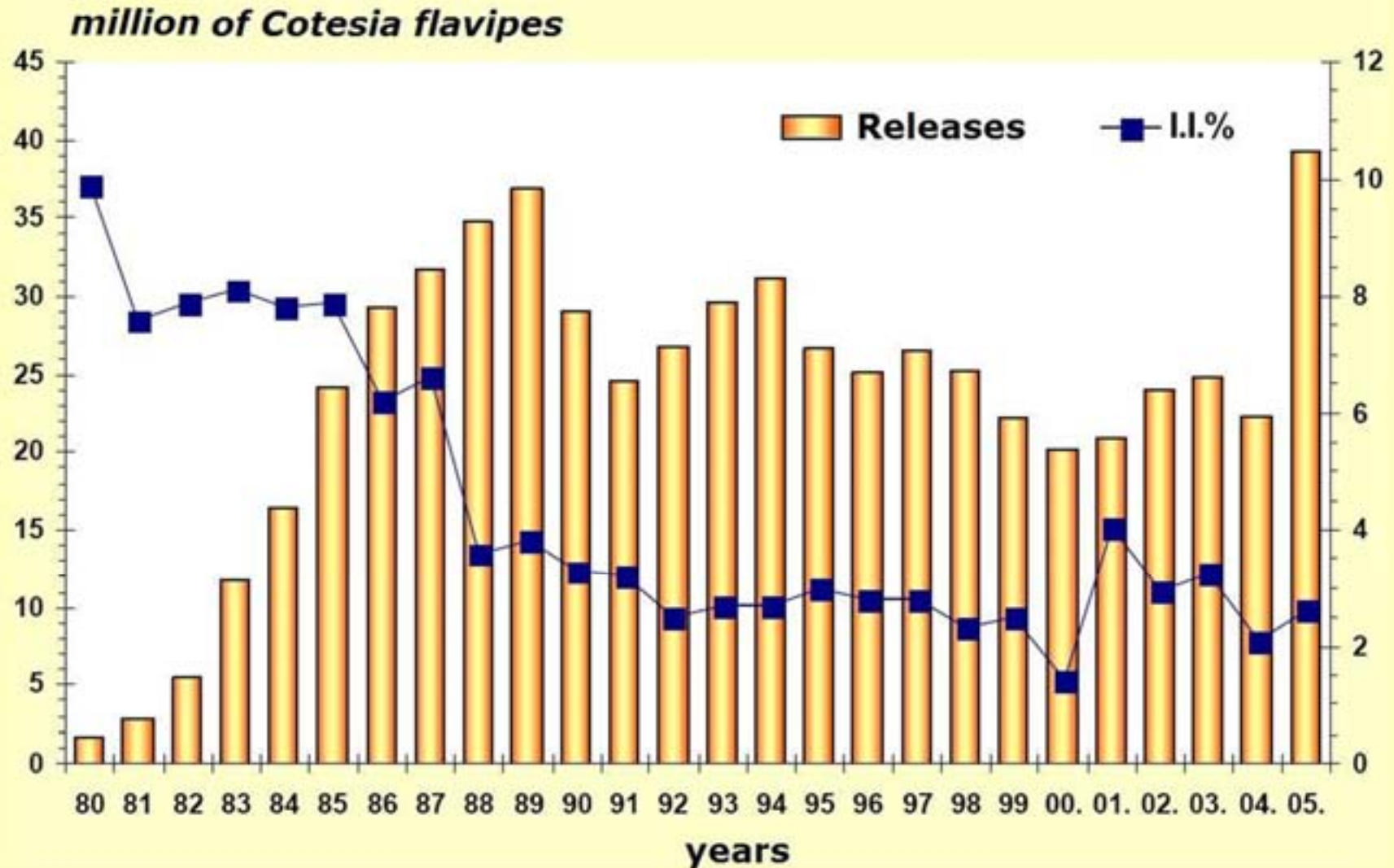


Results from Biological Control of Sugarcane Borer using *Cotesia flavipes* from 1980 to 2005 (Center of Sugarcane Technology - Brazil)

1. Reduction of Infestation Level of *D. saccharalis* from 11% to 2,6%.
2. Release 16.90 billion of *C. flavipes* adults;
3. Release on 3.17 million of hectares;
4. Save: US\$ 57 million or 951,000 liters of insecticides;
5. Costs of Biological Control: US\$ 12.1 million;
6. Average costs/ ha of Biological Control: US\$ 4.2



Release Program of *Cotesia flavipes*



Second important natural enemy: *Trichogramma* spp.

Production of 15 – 20 billion per year



T. galloi > 400,000 ha sugarcane
(*Diatraea saccharalis*)

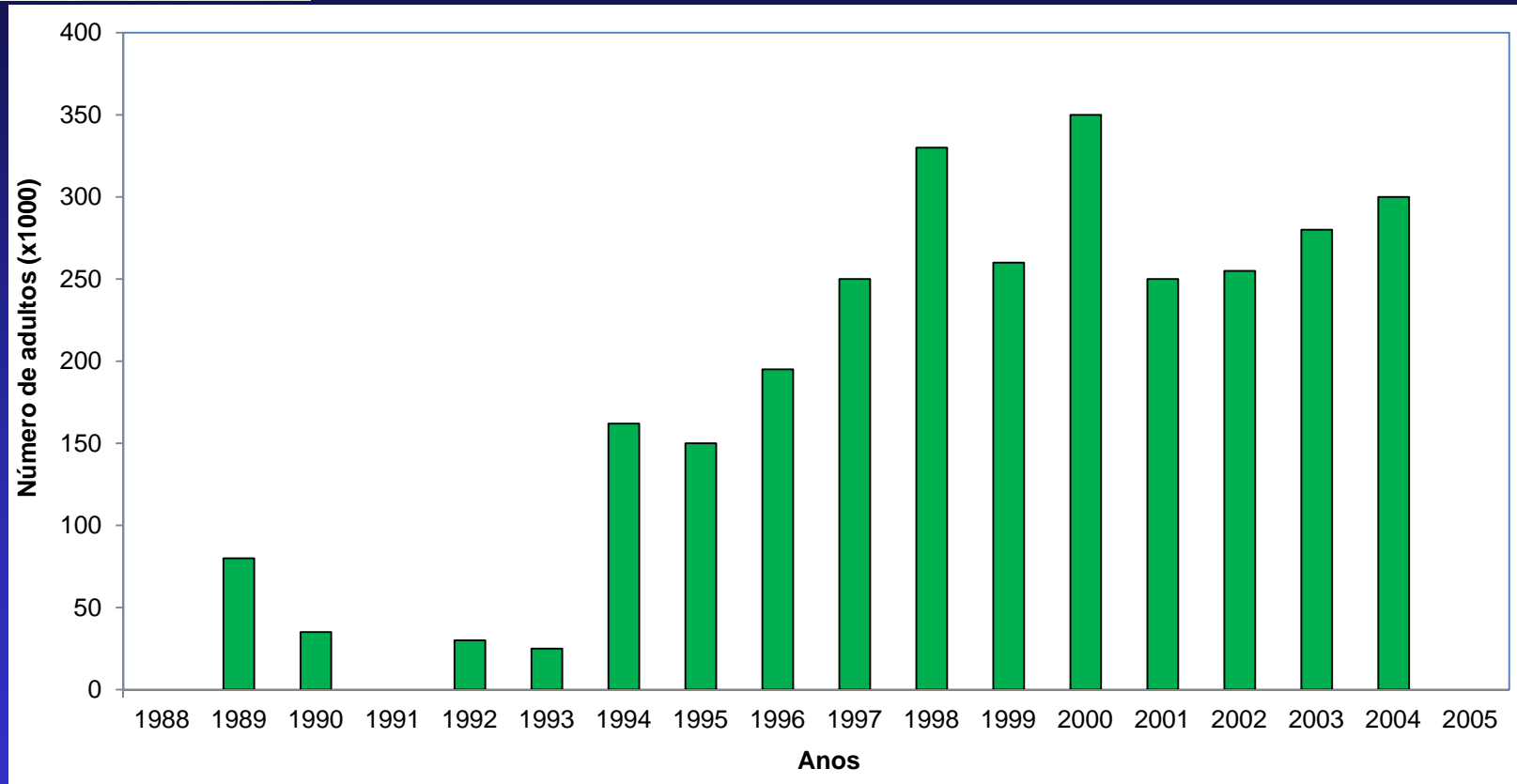
T. atopovirilia > 50,000 ha corn
(*Spodoptera frugiperda*)

T. pretiosum – tomato (small area)
(*Tuta absoluta*)

500,000 ha



Small scale use Predatory stink bugs : ~ 95 ha



Number of *Podisus nigrispinus* adults released by V & M Florestal from 1989 to 2004 (in *Eucalyptus* spp.). (1989-2005: released 3,076,683 predatory stinkbug adults)

Small scale use:
Neoseiulus californicus
apple orchards against the red mite
Panonychus ulmi



Mass-rearing of the predatory mite by
Cooperatives:
Agrícola Fraiburgo, Fischer Fraiburgo,
Pomifrai Fruticultura and Renar Maças

Area treated

2001/2002 – 600 ha
2003 – 1,600 ha
2005 - 6,600 ha
2008 - 7,200 ha



Small scale use: (greenhouse)

1. *Neoseiulus californicus*
ornamentals, strawberry
against *Tetranychus urticae*



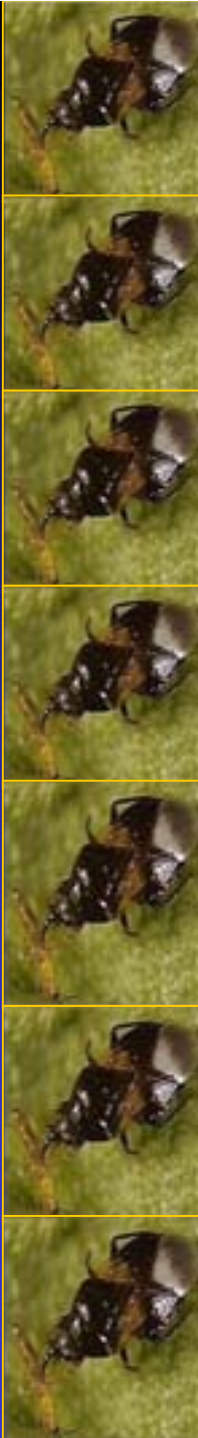
2. *Stratiolaelaps scimitus*
ornamentals, champignon
against fungus gnats



Fungus gnats



Greenhouse - *Orius insidiosus* - good control of thrips - chrysanthemum, potted gerbera, roses, strawberry (very small scale)



Commercialized Entomopathogenic Organisms in Brazil

Fungi:

1. *Metarhizium anisopliae* (75% of market value)

Target: Spittlebugs, Crops: sugarcane, pasture grass

2. *Beauveria bassiana*

Target: banana weevil, *T. uricae*, rubber-tree lace bug; Crops: banana, papaya, rubber-tree

3. “*Sporothrix insectorum*”

Target: rubber-tree lace bug, Crops: rubber-tree

Virus:

Baculovirus anticarsiae

Target: soybean caterpillar, Crop: soybean

Bacteria:

Bacillus thuringiensis – based products

Target: Lepidoptera, Diptera

Metarhizium anisopliae against Spittlebugs



1,000,000 hectares



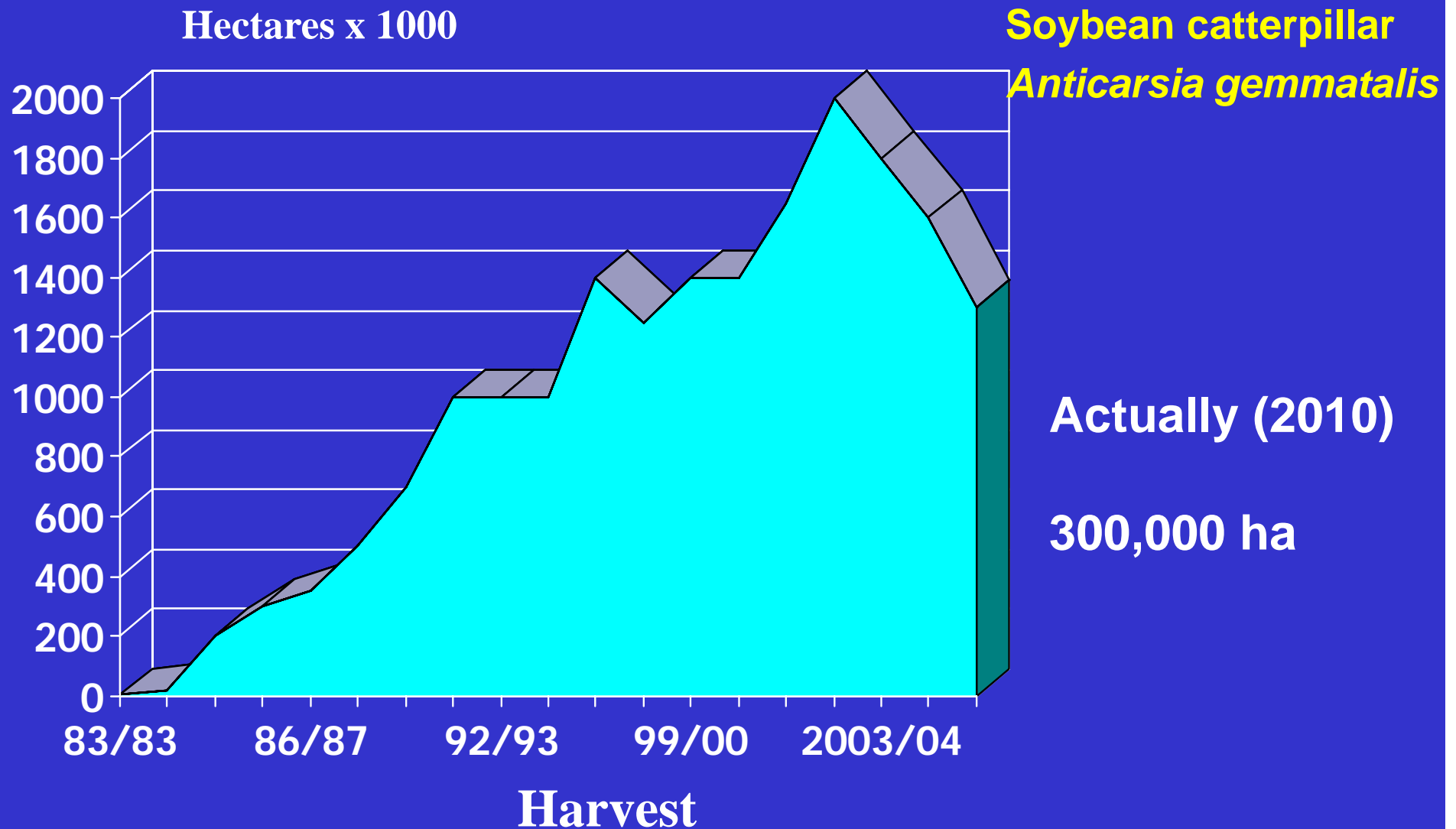
Mahanarva posticata
leafhopper



Mahanarva fimbriolata
frog hopper



Evolution of the use of *Baculovirus anticarsiae* in Brazil



Trichoderma in Brazil

500,000 ha



T. asperellum*, *T. harzianum*, *T. stromaticum*, *T. viride

Targets: *Fusarium*, *Pythium*, *Rhizoctonia*, *Macrophomina*, *Sclerotinia*, *Sclerotium*, *Botrytis*, *Crinipellis perniciosa*

Crops: Bean, Soybean, Cotton, Tobacco, Strawberry, Tomato, Onion, Garlic, Ornamentals, Cacao



Trichoderma asperellum
CONTROL OF SOILBORNE PATHOGENS

Crops: Soybean, Bean, Cotton (25,000 ha)

Targets: *Sclerotinia*, *Fusarium*, *Rhizoctonia* e *Macrophomina*



Use: seed and soil treatments, spraying by tractor, airplane and pivot
Cost: \$30.00/ha *Trichoderma*, while fungicides cost \$75.00/ha

Bacillus subtilis* and *Bacillus lechiformis

**Targets: *Meloidogyne incognita*, *M. javanica*,
Pratylenchus brachyurus and *P. coffeae***

Crops: Potato and Carrots



2008 – commercialized more than 12,000 kg of *Bacillus* spp. (2×10^{10}) for nematode control in potato and carrot crops.

***Bacillus* were applied by irrigation and seed treatment (5 to 10 kg/ha)
Cost: US\$160-300/ha**

Future of Biological Control Market in Brazil

NEEDED:

1. Critical analyses of possibilities for biological control
2. More critical government approach
3. More professional industry approach

Enormous possibilities for biological control, but seriously frustrated by chemical pesticides lobby and total lack of governmental support

Most realistic possibilities for growth:

1. Sugar cane – 7 million ha available, simple system
2. Soybean – millions ha available, simple system
3. Corn , cotton, fruit orchards, greenhouse crops, more complicate systems

