ECONOMIC IMPACT OF LEPROSIS IN BRAZIL

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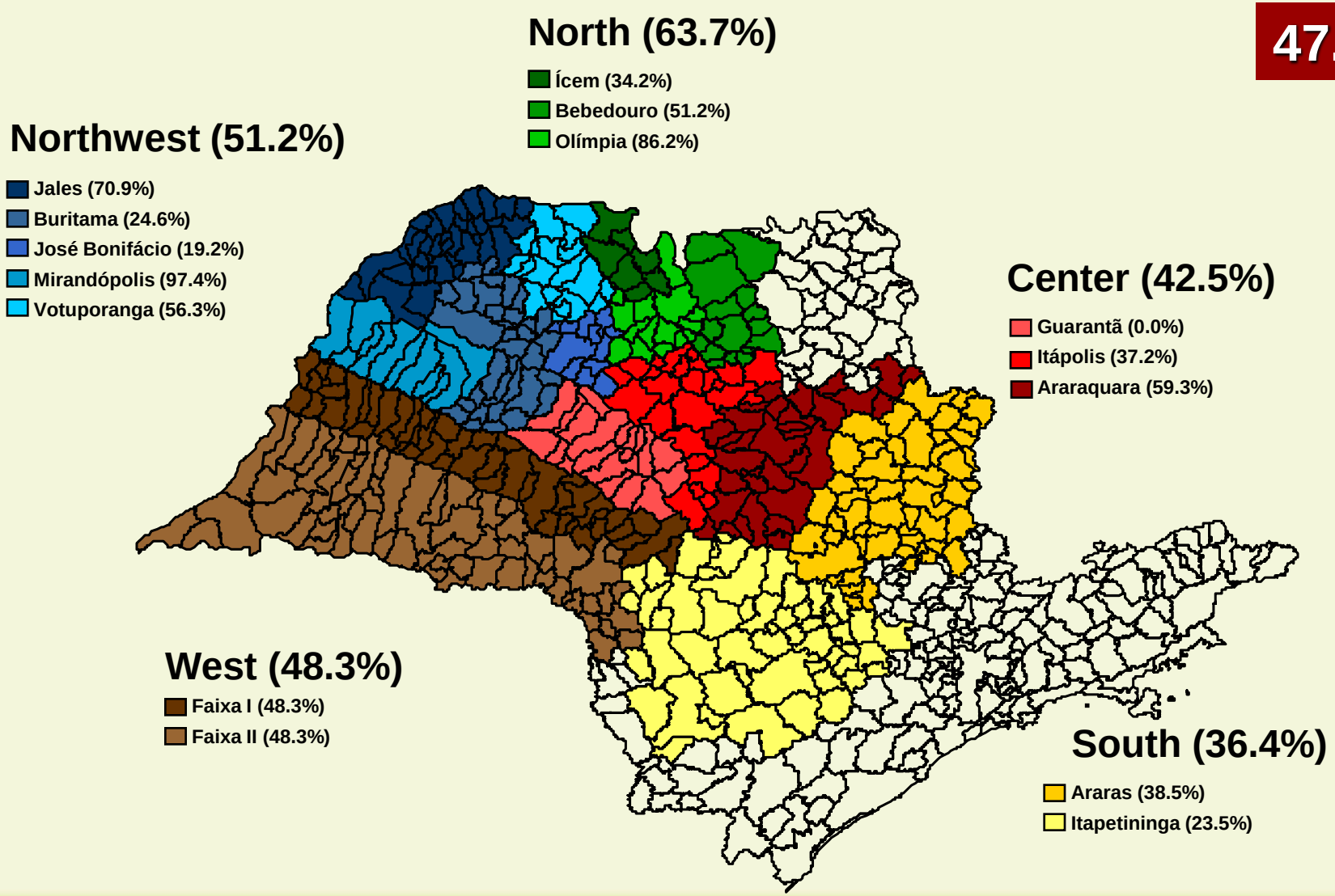
Citrus leprosis: Disease distribution in Brazil

Citrus leprosis: Disease distribution in São Paulo State

Incidence of trees with leprosis symptoms on old and/or young shoots

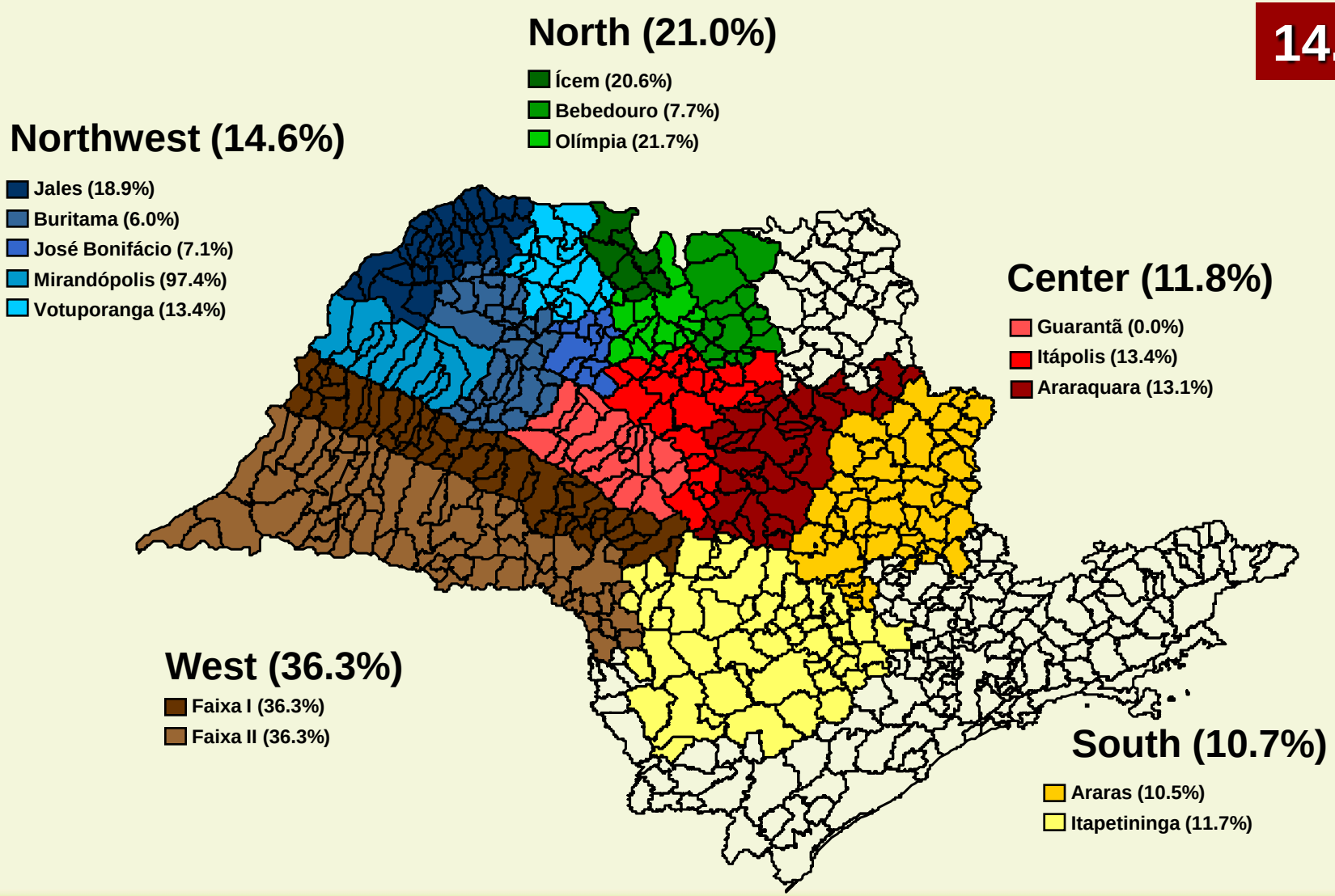
47.5%



Citrus leprosis: Disease distribution in São Paulo State

Incidence of trees with leprosis symptoms on young shoots

14.5%



Citrus leprosis: Symptoms

Local symptoms on leaves

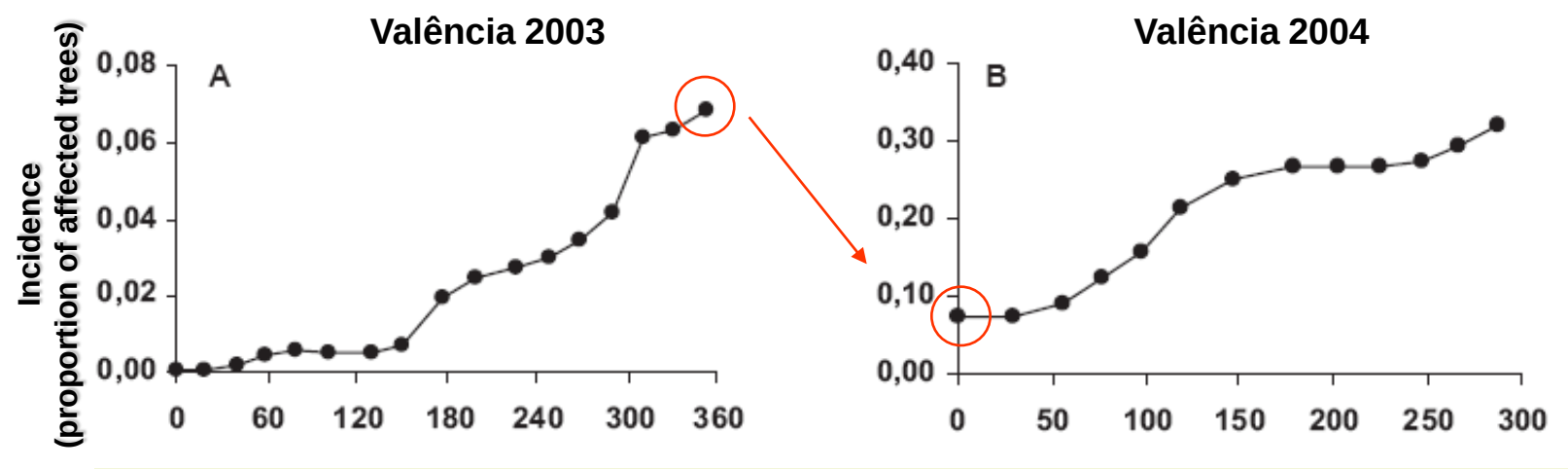
Citrus leprosis: Symptoms

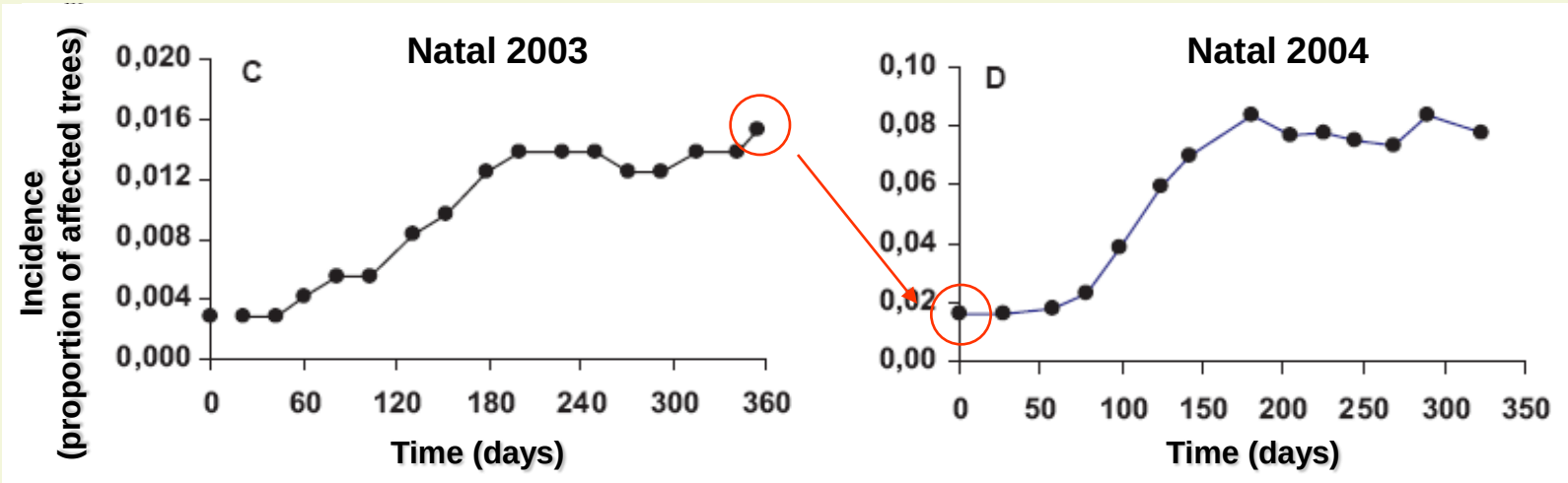
Local symptoms on twigs and branches

Citrus leprosis: Symptoms

Local symptoms on fruit

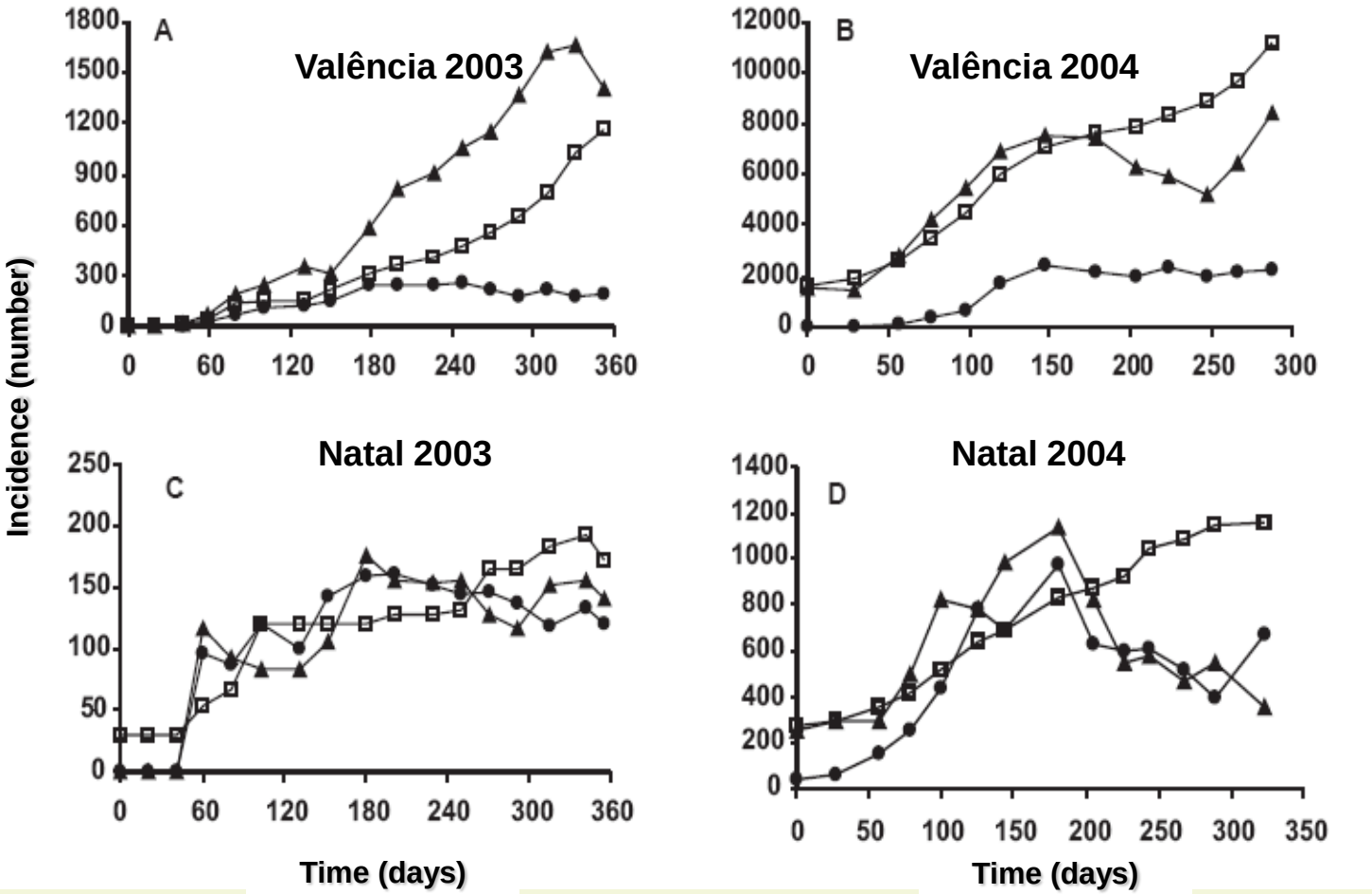
Citrus leprosis: Polyetic disease (multiyear)





Diseased trees incidence increases every cycle

Citrus leprosis: Cumulative disease



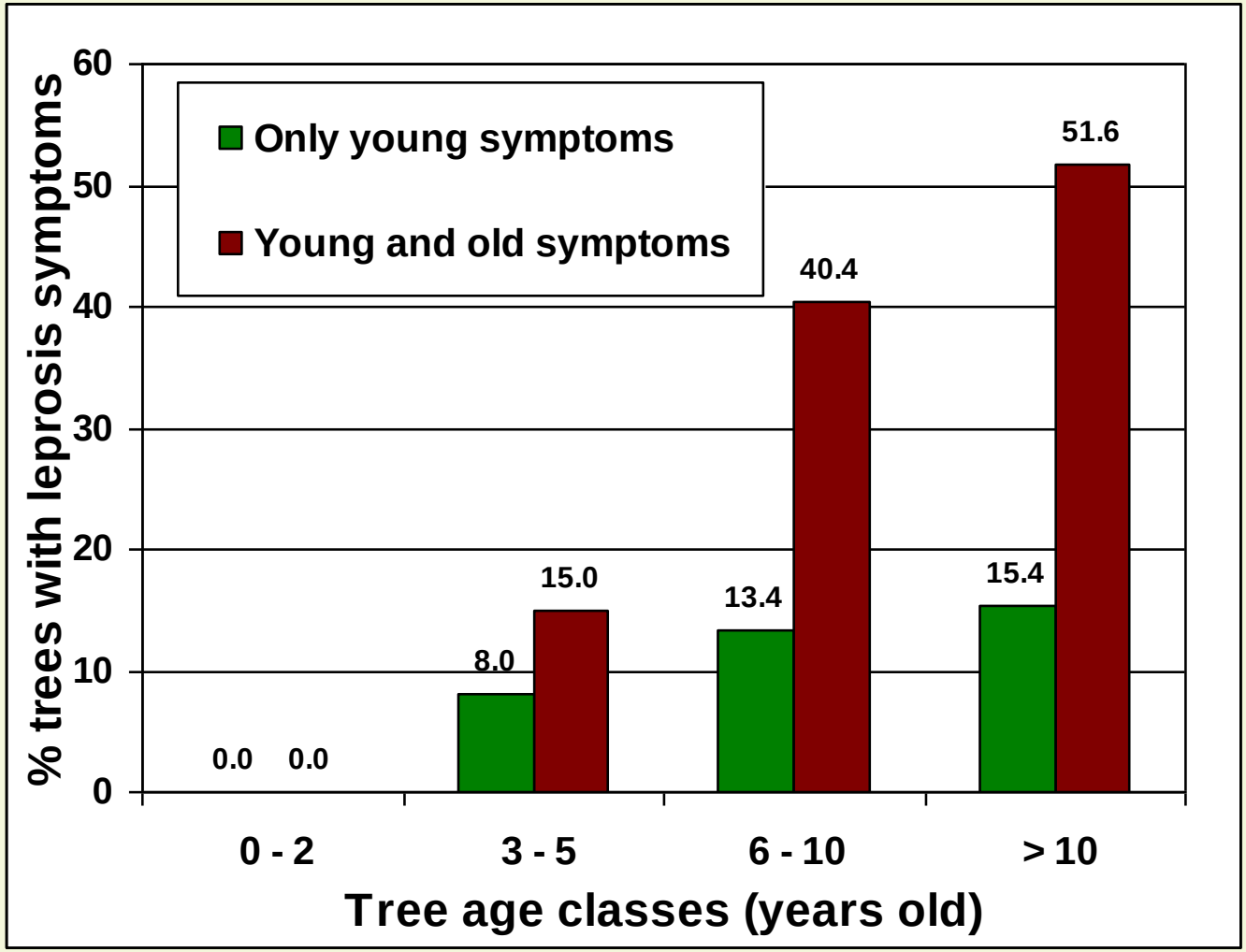
Symptomatic fruit usually decrease at the end of cycle (harvest);

Initial incidence of symptomatic shoots and leaves increase between cycles;

Final incidence of symptomatic shoots, leaves and fruit increase every cycle.

Citrus leprosis: Cumulative disease

Incidence of trees with leprosis symptoms as function of tree age



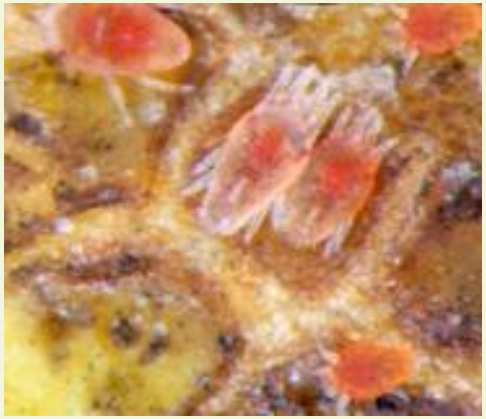
Citrus leprosis: Economic impact

Economic Impact of Leprosis
=
Disease damages
+
Cost of control

Citrus leprosis: Damages

	Pearson coeficient
Yield damage x Leprosis severity	0.93 *
Yield damage x Mite infestation	0.57 *
Leprosis severity x Mite infestation	0.76 *

*** Significant *P* < 0.05**

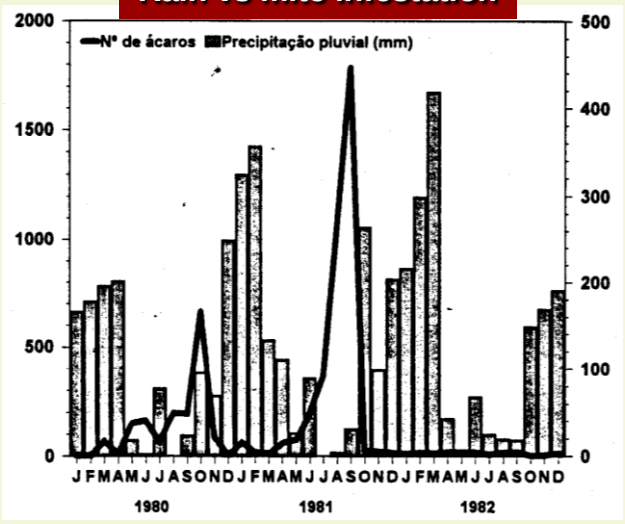


-Cost of control vs fruit price
-Weather conditions
-Citrus varieties

Citrus leprosis: Damages

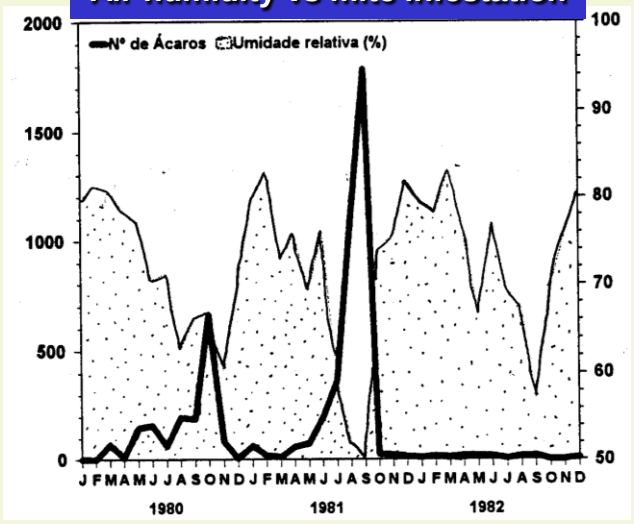
-Weather conditions

Rain vs mite infestation



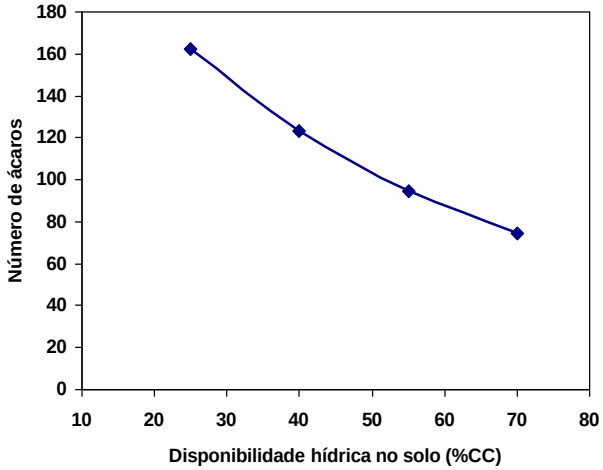
(Oliveira, 1986)

Air humidity vs mite infestation



(Oliveira, 1986)

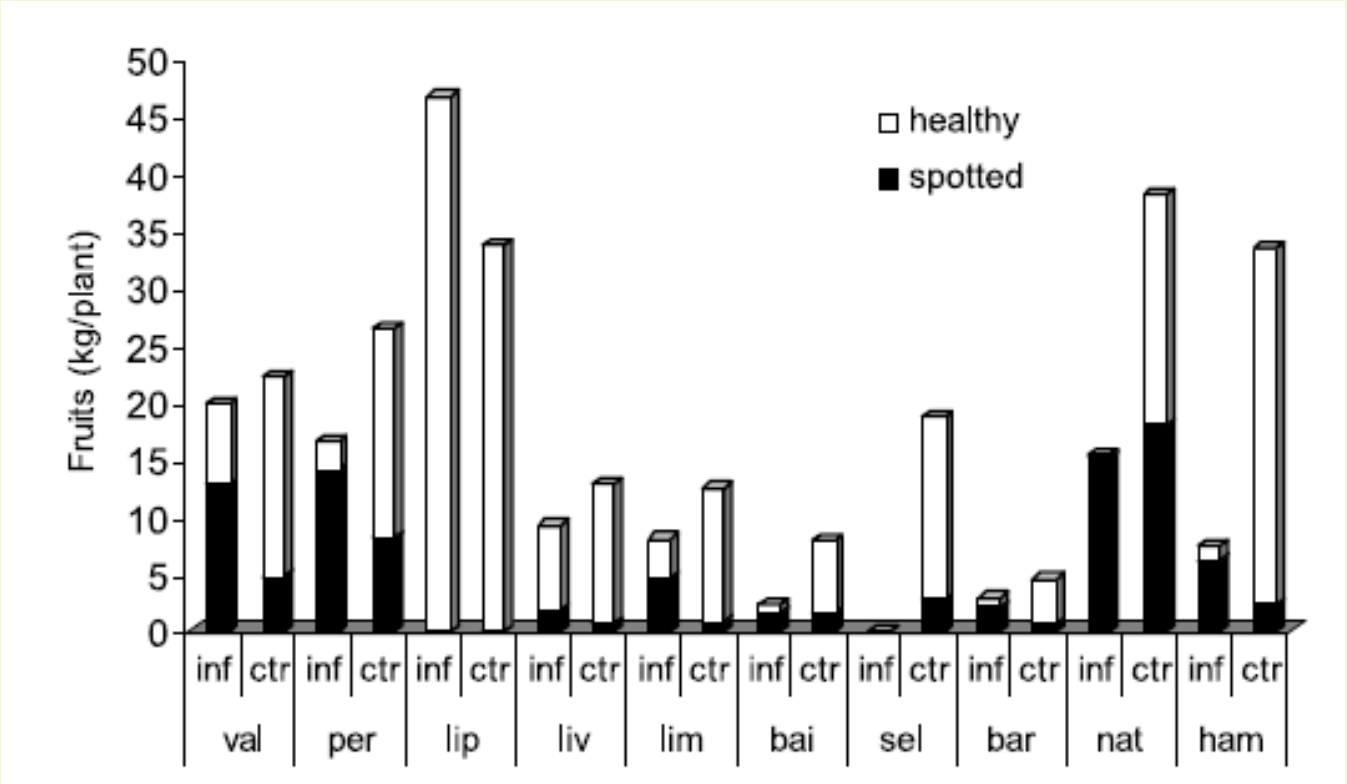
Water availability vs mite infestation



(Falconi, 2007)

Citrus leprosis: Damages

-Citrus varieties



Comparative fruit production of different citrus cultivars (val=Valencia, per=Pera, lip=Lima da Persia, liv=Lima verde, lim=Lima, bai=Bahia, sel=Seleta, bar=Barao, nat=Natal and ham=Hamlin) that were 4 years old and averaged six plants per treatment. Trees (inf) at 18 months age were infested with viruliferous mites. Control non-infested trees (ctr) remained under multiple mitecide sprays each year in Piracicaba, São Paulo State.

Rodrigues et al., 2003

Citrus leprosis: Damages

Lesions on fruit – depreciation for fresh market

Citrus leprosis: Damages

Lesions on fruit – reduction on fruit weight related to the number of lesions per fruit

No changes on fruit Brix, acidity and ratio

Rodrigues et al., 2000

Citrus leprosis: Damages

Lesions on fruit – early fruit drop

Yield reduction of 20 to 100%

Rodrigues et al., 2000

Citrus leprosis: Damages

Lesions on leaves

– decrease on photosynthetic rate

- defoliation

- reduction on yield (present and future)

Citrus leprosis: Damages

Lesions on twigs and branches
– defoliation and die back

Citrus leprosis: Damages

Lesions on twigs and branches

- reduction on yield (present and future)

- reduction of tree economic life span

Citrus leprosis: Damages

Lesions on twigs and branches

- reduction on yield (present and future)

- reduction of tree economic life span

Citrus leprosis: Cost of control

- Recovery of tree healthy
(pruning of affected tissues or tree reset)

- Reduction of leprosis inoculum
(systematic pruning)

- Control of vector mite
(mitecide application)

Citrus leprosis: Cost of control

Recovery of severe affected tree

- elimination of symptomatic branches

Recovery of severe affected tree - drastic pruning

Recovery of severe affected tree
- drastic pruning

Recovery of severe affected tree
- drastic pruning

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Recovery of severe affected tree
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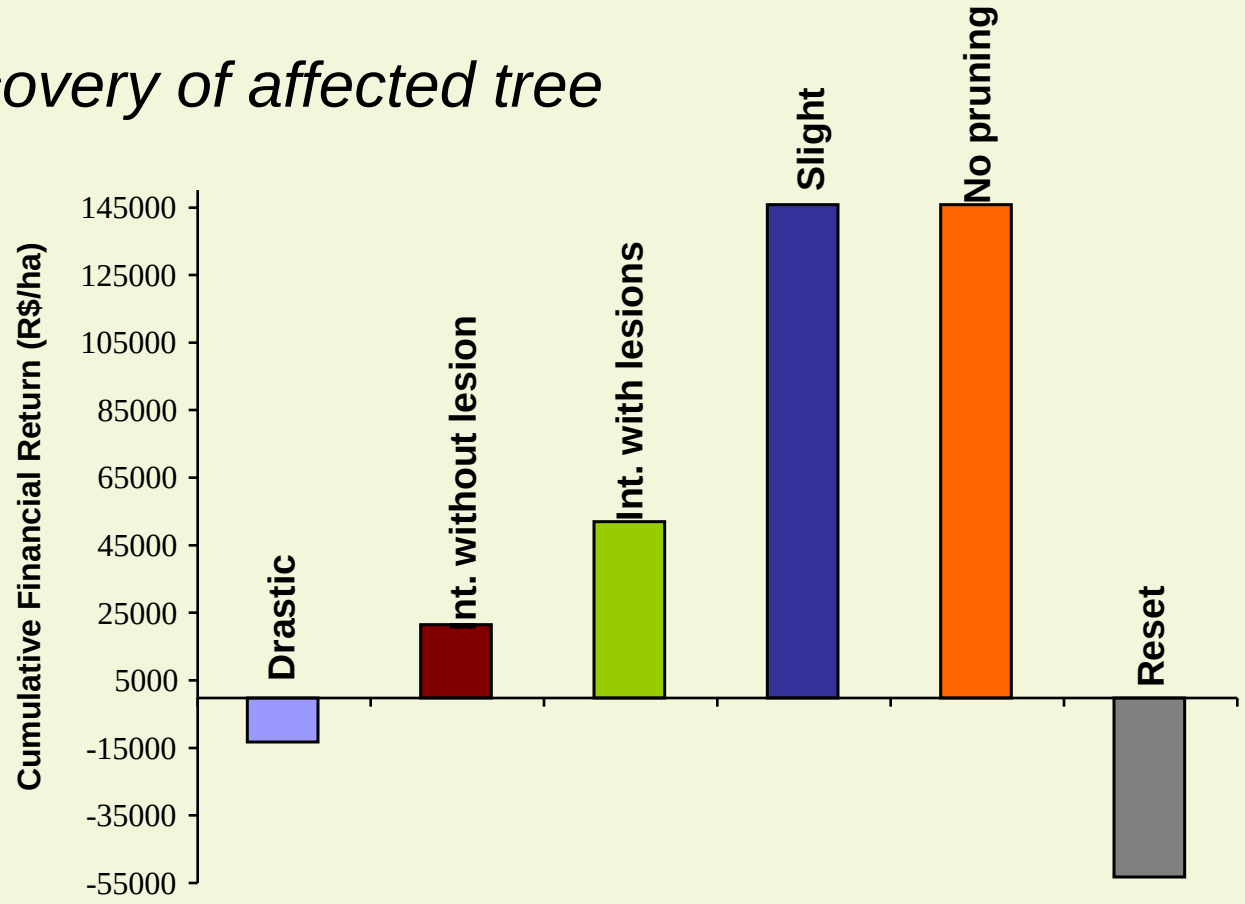
At least 2 years to recovery the yield
Mitecide spray as complementary measure

Citrus leprosis: Cost of control

Sanity recovery of affected tree



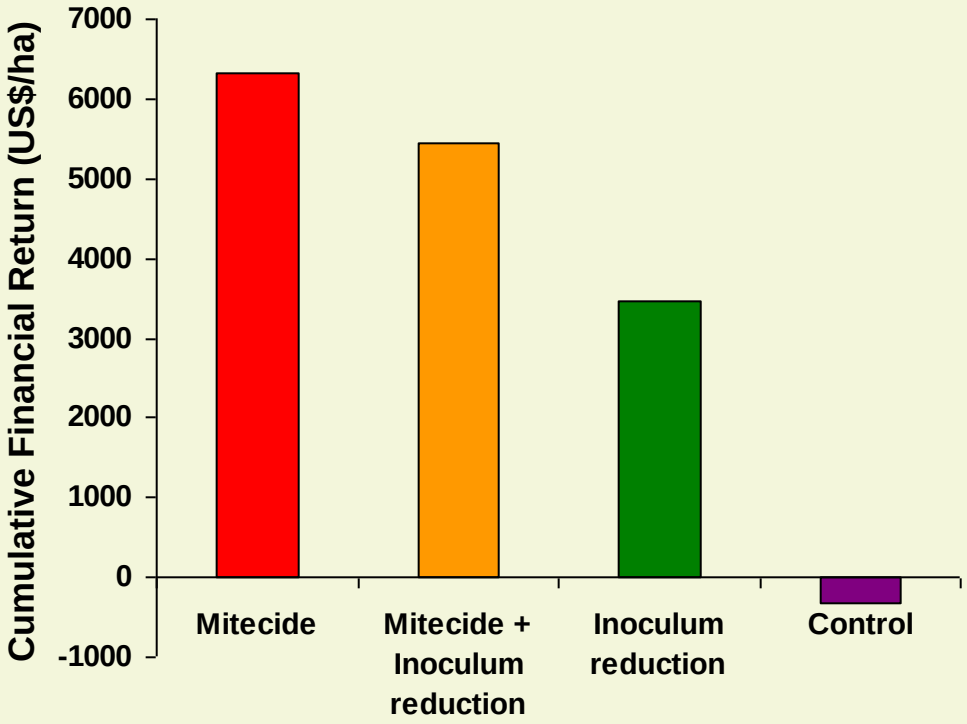
Cumulative financial return of several practices to recover the healthy of severe affected adult trees after 4 year after pruning

****all treatments were followed by systematic mitecide applications**

Pattaro et al., 2007

Citrus leprosis: Cost of control

Systematic removal of affected shoots and fruits



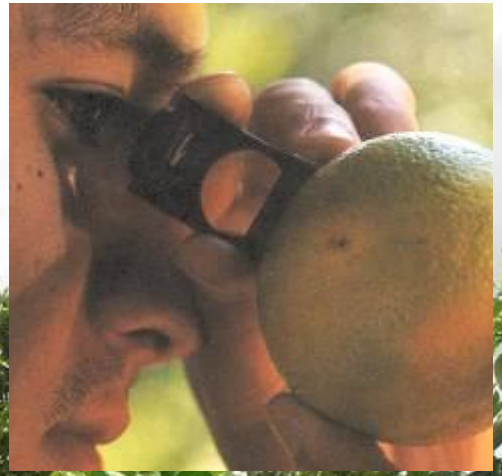
Cumulative financial return of several practices to control leprosis after 2 years

- **Miticide treatments consisted of spraying with spirodiclofen or cyhexatin (AI >10%)**
- **Inoculum reduction consisted of monthly removal of every affected tissues**

(its cost is positively related to leprosis incidence)

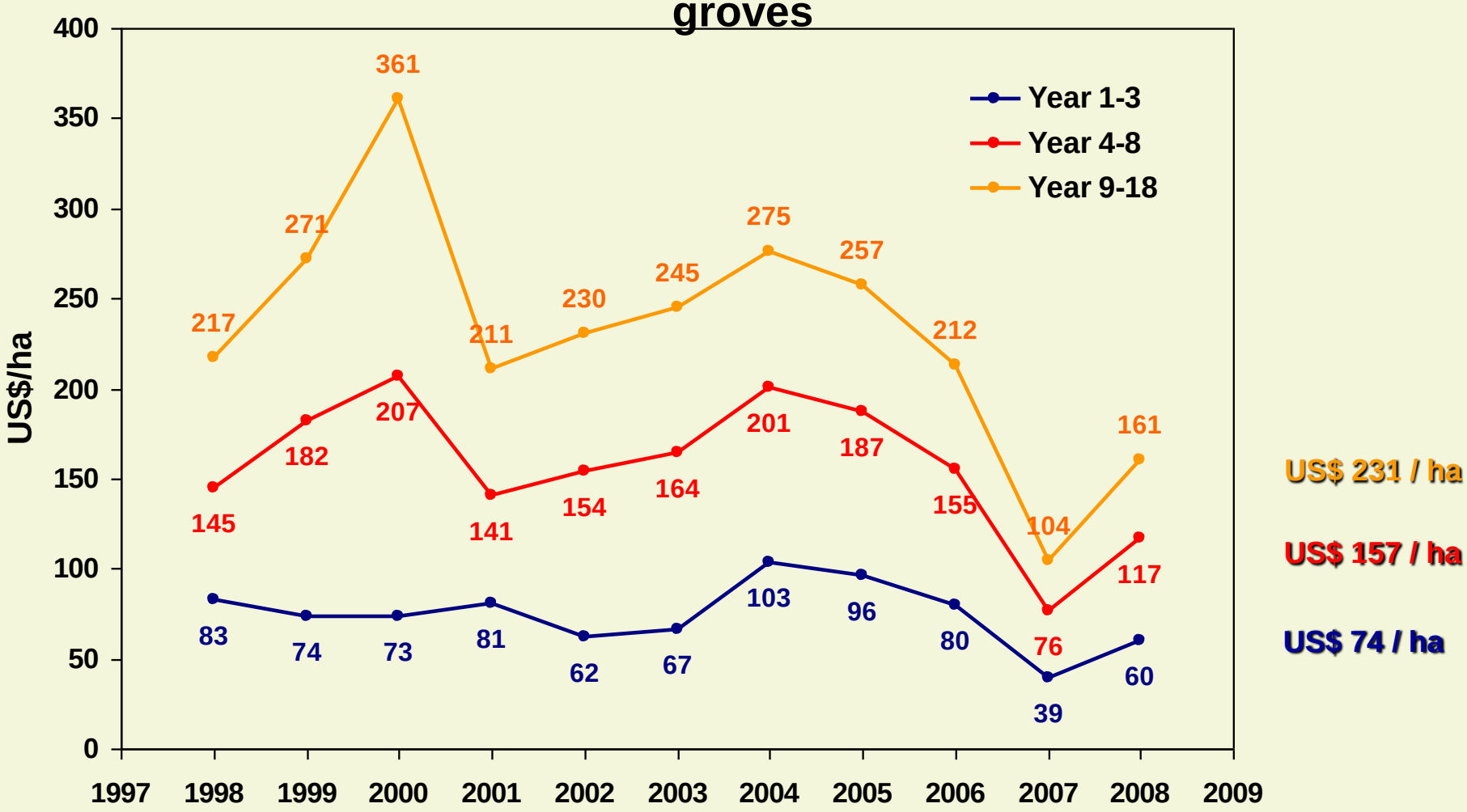
Oliveira et al., 2009

Citrus leprosis: Cost of control



US$ 70 – 80 million per year with mitecide
US$ 40 – 50 million per year with spraying operation (2x)

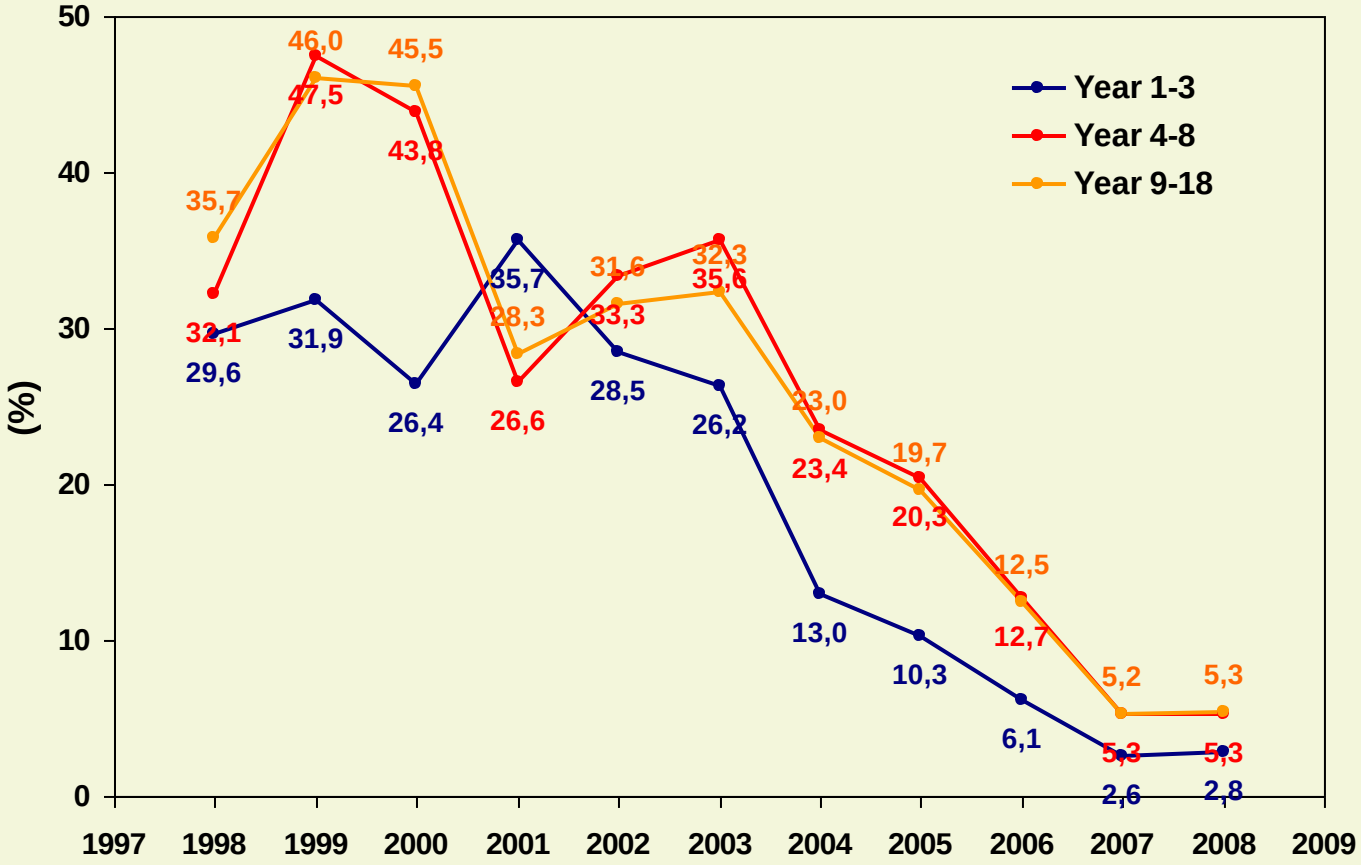
Miticide cost per hectare of non bearing (year 1-3), increasing yield bearing (year 4-8) and stable yield bearing (year 9-18) sweet orange groves



Region of Araraquara-SP
Spacing 7.0 x 3.5 m
408 trees/ha

Source: Compiled from Agrianual 1999 to 2009 (iFNP) by R. B. Bassanezi

Participation of mitecide costs on phytossanitary cost of non bearing (year 1-3), increasing yield bearing (year 4-8) and stable yield bearing (year 9-18) sweet orange groves



Phytossanitary costs: mechanical spray operation, manual spray operation, pruning, pest and disease scouting, mitecide, insecticide, fungicides, and mineral oil.

Region of Araraquara-SP
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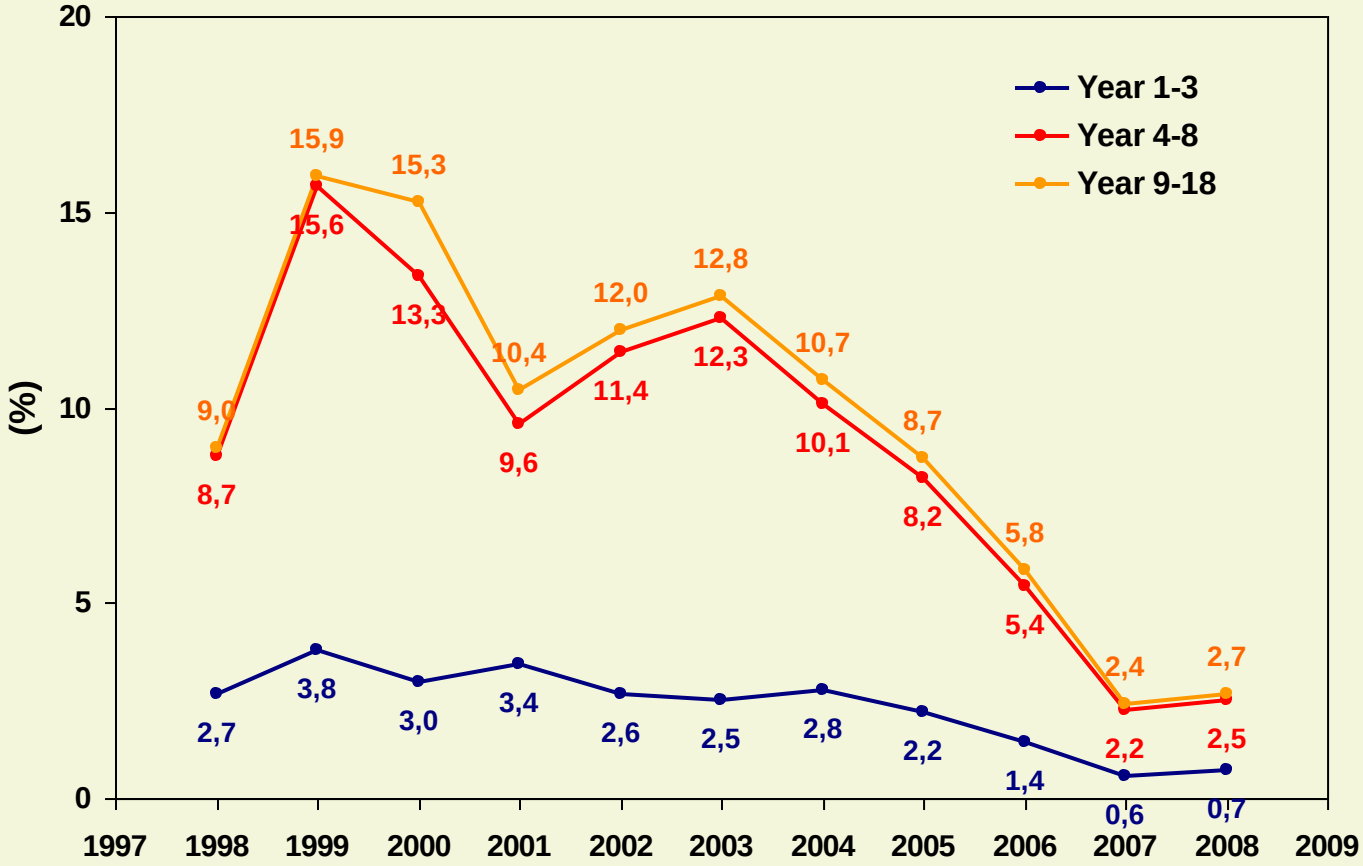
Participation of mitecide costs on total production cost of non bearing (year 1-3), increasing yield bearing (year 4-8) and stable yield bearing (year 9-18) sweet orange groves



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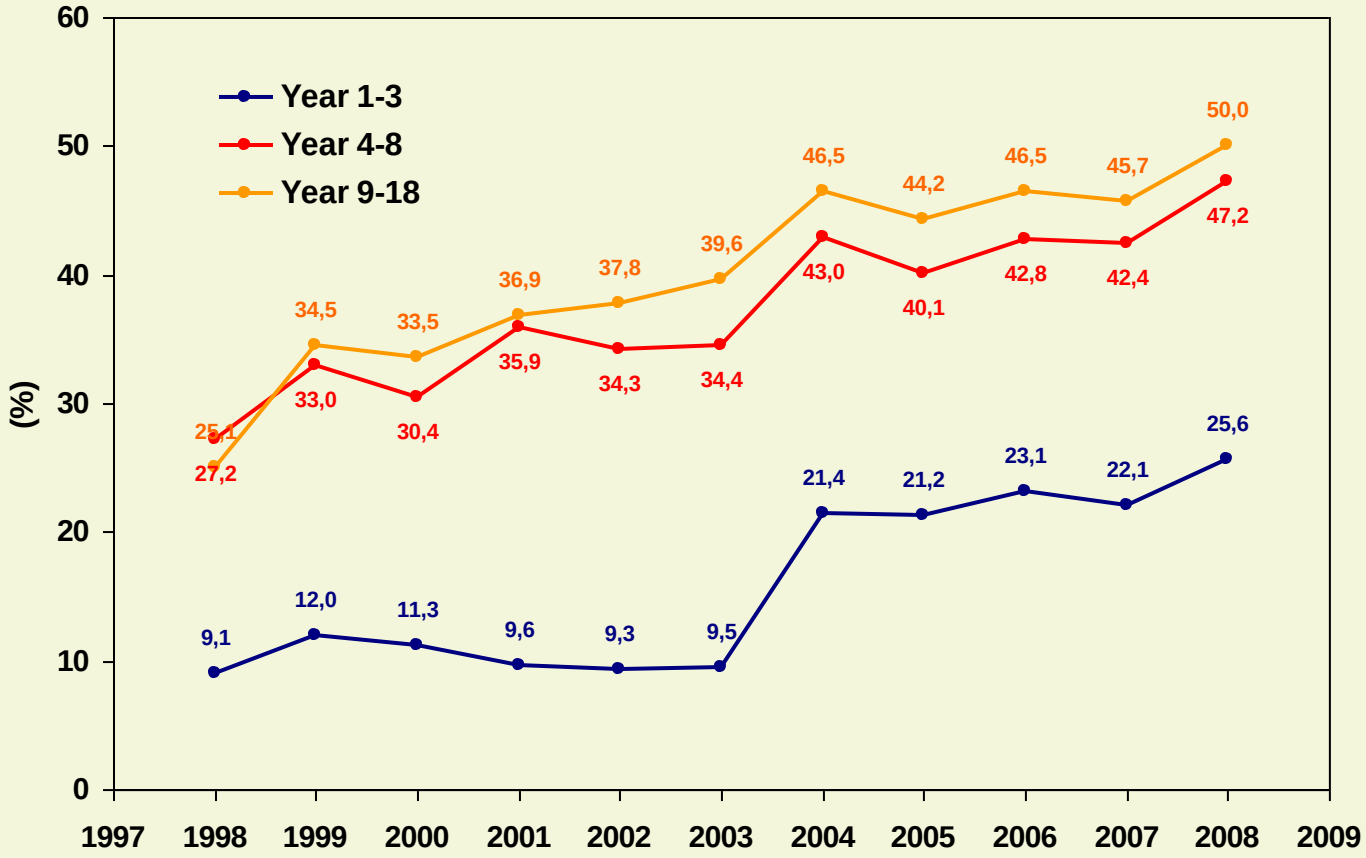

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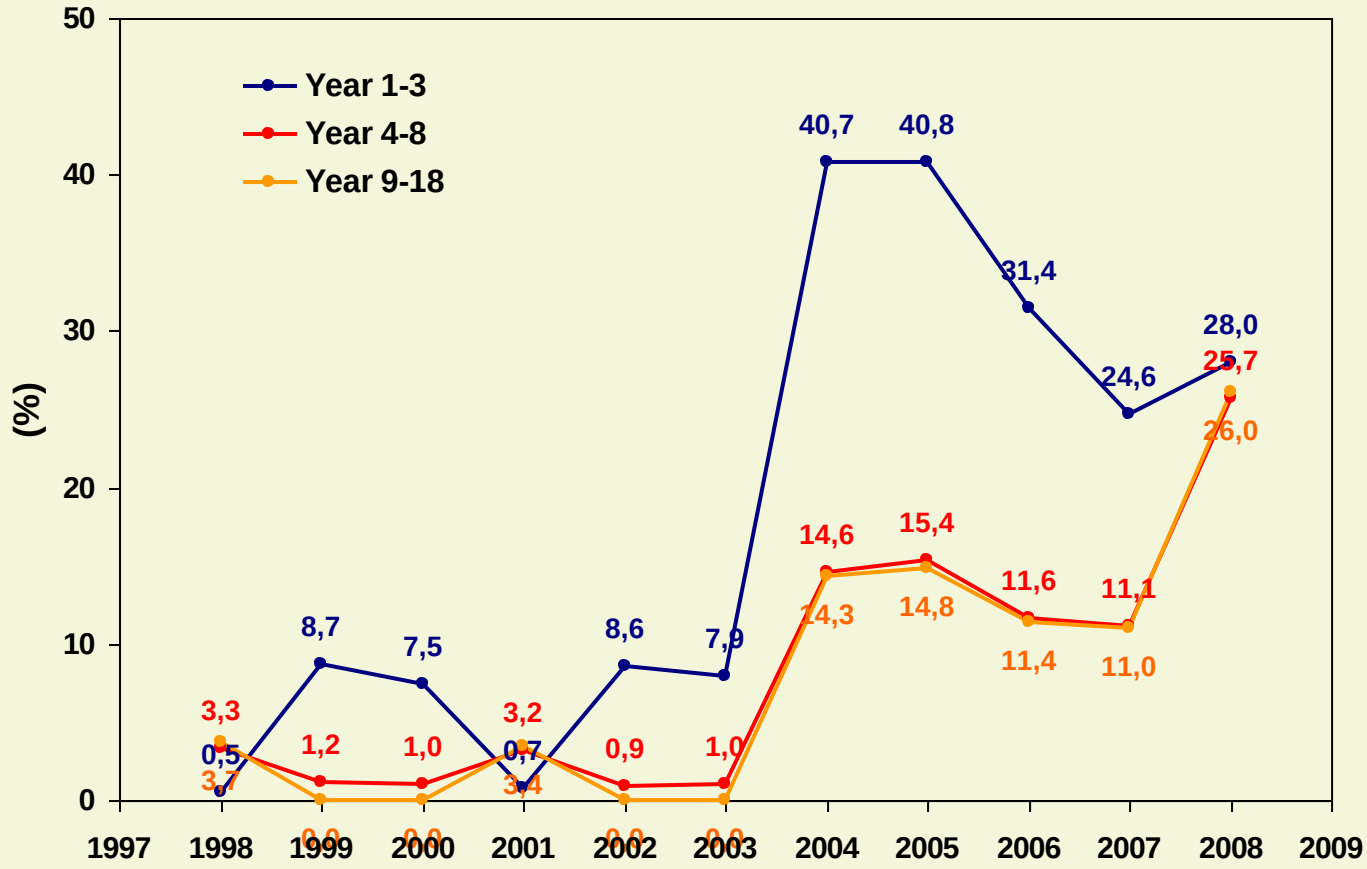
Participation of insecticide costs on phytossanitary cost of non bearing (year 1-3), increasing yield bearing (year 4-8) and stable yield bearing (year 9-18) sweet orange groves



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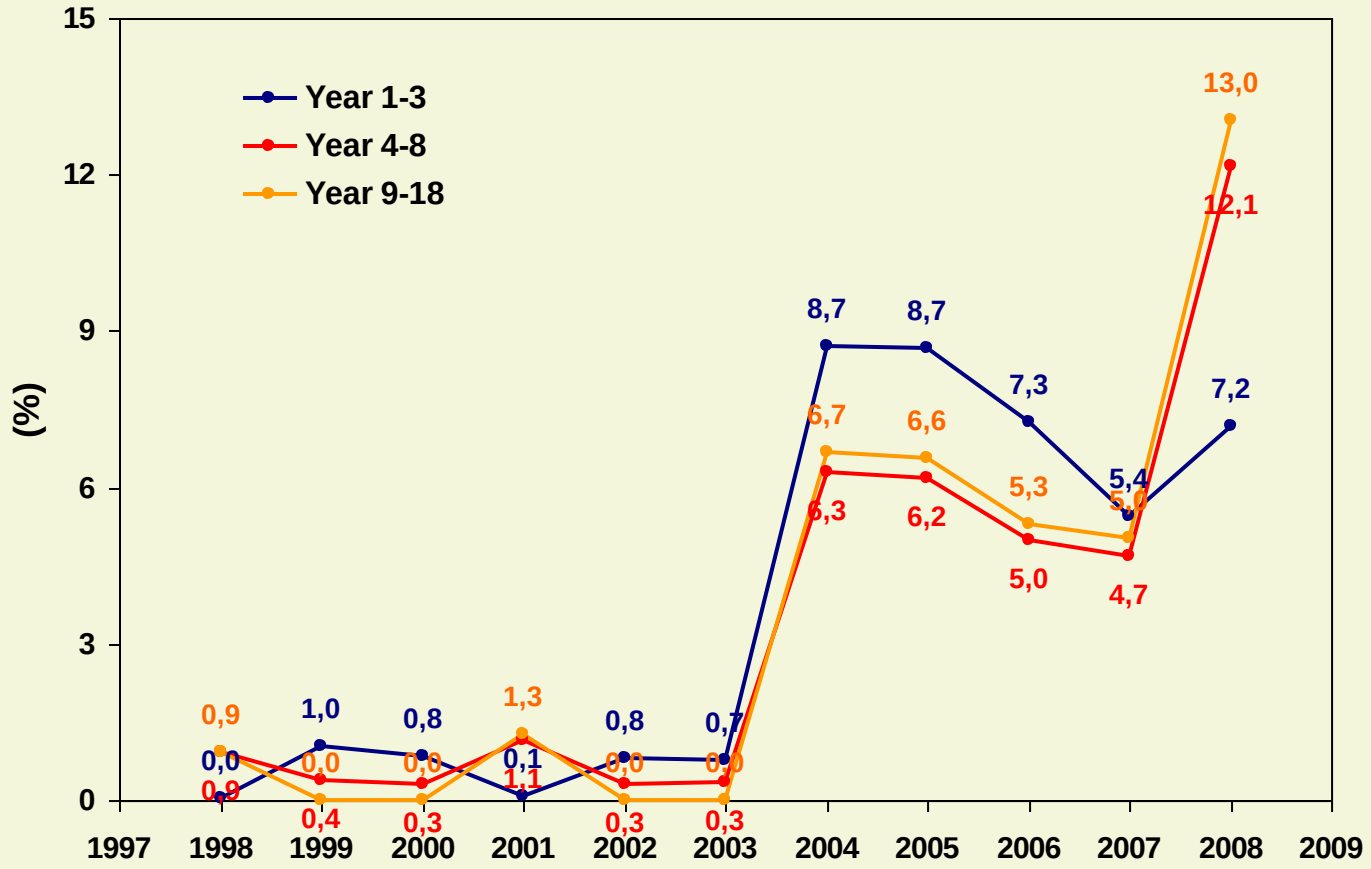

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PREVENTIVE CONTROL COSTS OF CITRUS DISEASES IN SÃO PAULO STATE (Million US$ / year)

CVC + HLB	173.3	Insecticide application (~6x) + inspection (~6x - 40%)
Leprosis	123.5	Mitecide application (~2x – 100%)
Black spot	69.9	Fungicide application (~4x – 47%)
Citrus canker	40.0	Inspection and eradication (Fundecitrus+growers)
PBFD	27.5	Fungicide application (~2x – 56%)
TOTAL	434.2	


Thank you
Gracias