

Packhouse Day & The
Indian River Postharvest Workshop

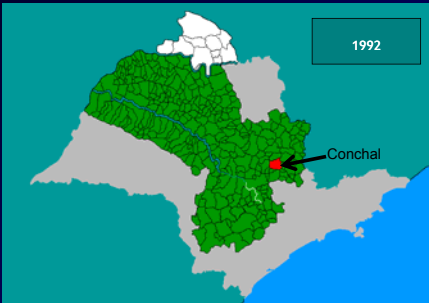


Citrus Black Spot and its management in Brazil

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Citrus Black Spot

First occurrence in São Paulo



1992
Conchal

Citrus Black Spot



Host List

Citrus spp.:
Lemons
Sweet oranges
Mandarins & Tangerines
Tangelos
Tangors
Hybrids

Never found in Persian (Tahiti) lime

Resistant Genotypes:
Chinotto mandarin (*C.myrtifolia*)
Poncirus trifoliata
Kumquat (*Fortunella* spp.)
Severinia buxifolia


(Aguilar-Vildoso et al., 2002)

Citrus Black Spot

(*Guignardia citricarpa*)

Importance

Reduction of fruit value in the fresh fruit market



Florida: "...CBS causes early fruit drop, reduces crop yield and renders the highly blemished fruit unmarketable" (USDA, 2010).

Citrus Black Spot

(*Guignardia citricarpa*)

Importance

Sweet orange fresh fruit market

Reduction fruit value due to CBS: 20 – 30%



CEAGESP, June 2010

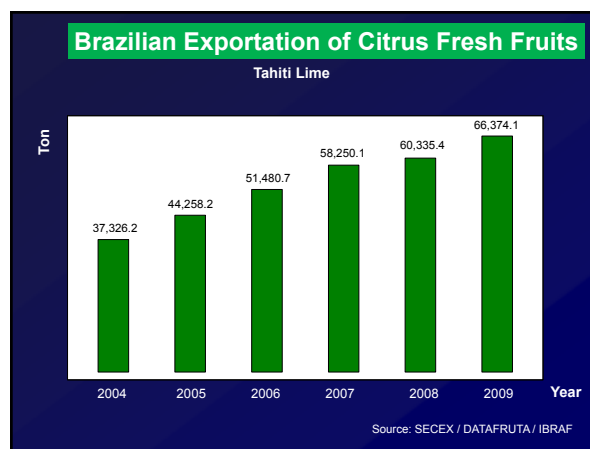
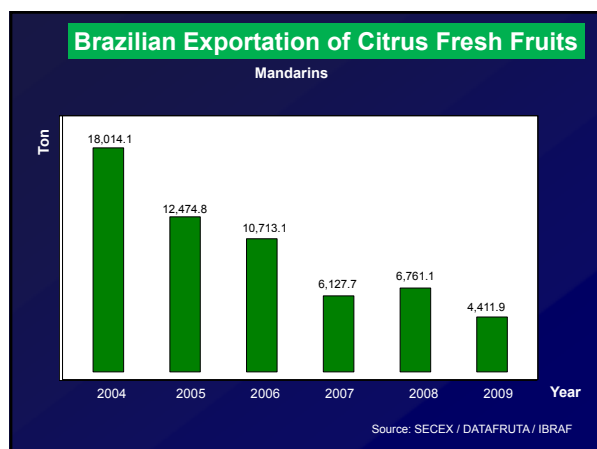
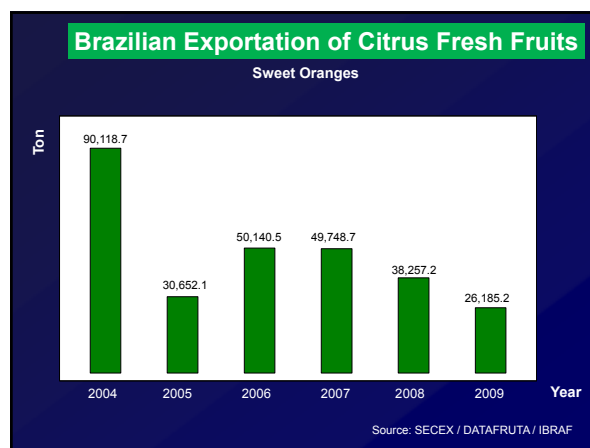
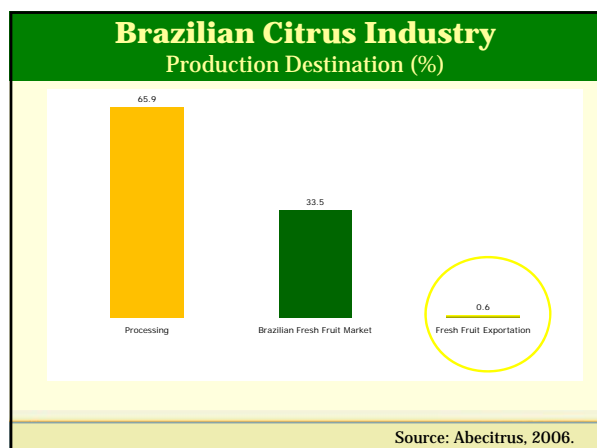
Citrus Black Spot

(*Guignardia citricarpa*)

Importance

To restrict exportation of fresh fruits
(mostly to European countries)





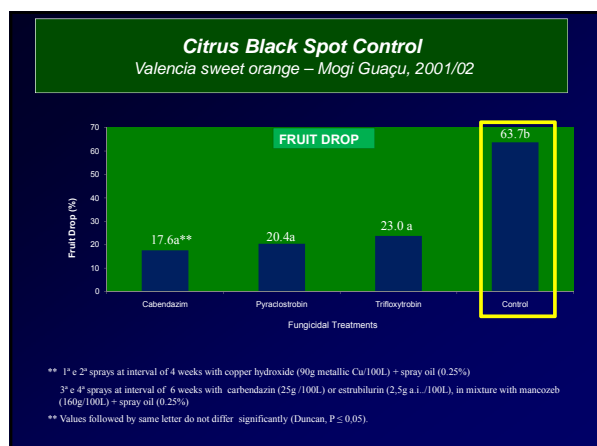
Citrus Black Spot

(*Guignardia citricarpa*)

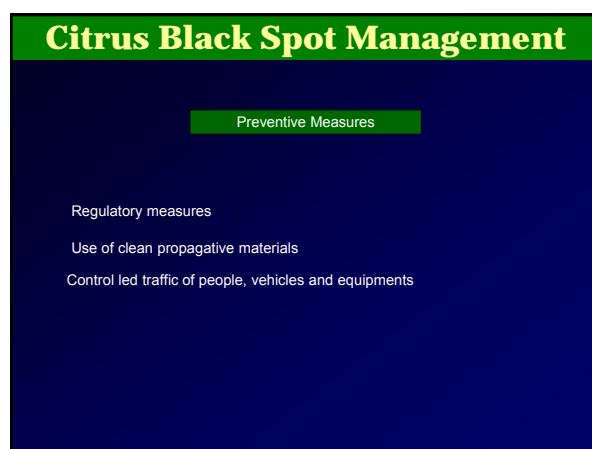
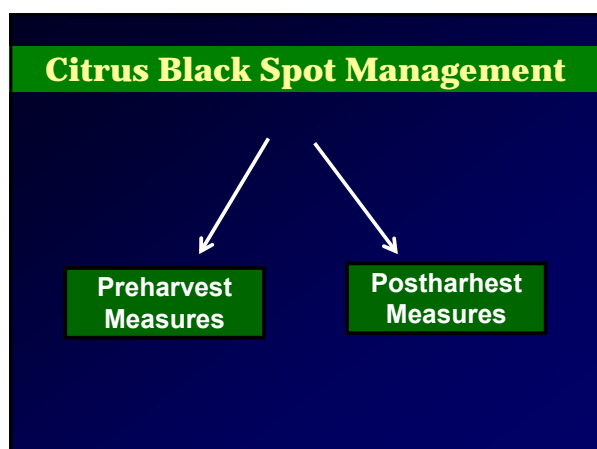
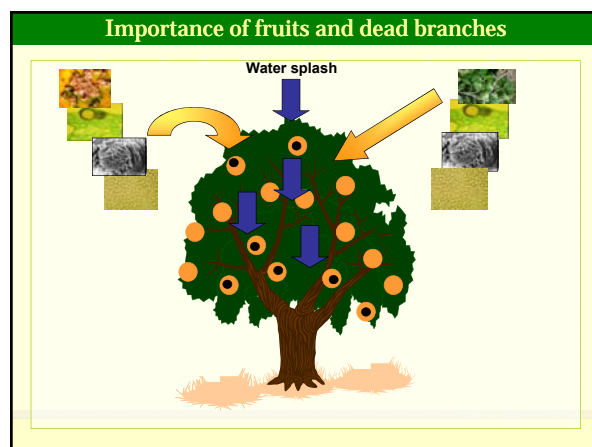
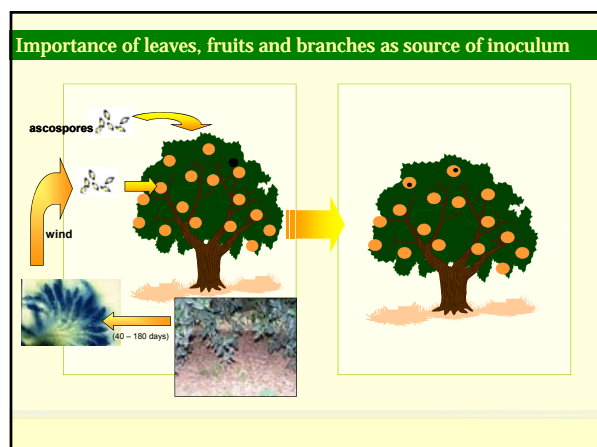
Importance

Premature fruit drop reducing yield





Citrus Black Spot Disease Cycle



Regulatory Measures

Interstate trade of fresh fruits with leaves is forbidden in Brazil.



Exportation of Citrus Fresh Fruits to European Countries

Requirements

1. Registration of Orchards plots
(up to 3 months before harvesting)
2. Registration of Packinghouses
(January 1st to April 30th.)
3. Field inspection for CBS detection
(State Regulatory Office inspectors)
4. Fruit Sampling for Lab Test to accelerate fruit symptom development
(Sampling date must be informed to the State Regulatory Office at least 7 days in advance)

Sampling fruits for the Lab Test to accelerate CBS symptom development.

- at least 30 days before harvesting;
- in declining trees;
- in the lower canopy;
- in the face of the tree most exposed to sun light;
- mature fruits or fruits that have reached final size;
- in 1% of the trees (samples must have at least 20 fruits)



Citrus Black Spot

(*Guignardia citricarpa*)

Test to accelerate fruit symptom development

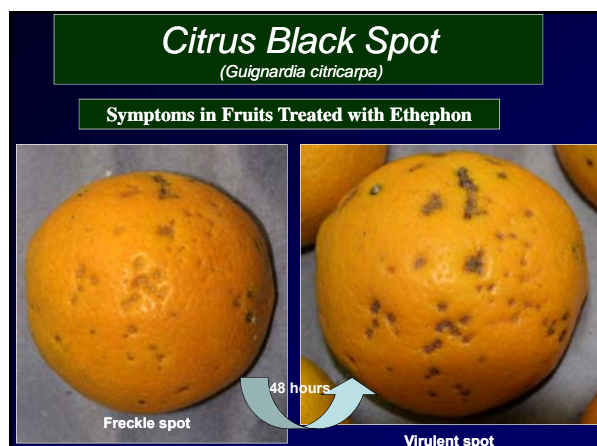
- Deep fruits in ethephon solution (750 ppm) for 5 minutes;

Citrus Black Spot

(*Guignardia citricarpa*)

Test to accelerate fruit symptoms development

- Deep fruits in ethephon solution (750 ppm) for 5 minutes
- Incubation of fruits at temperatures $\geq 25^{\circ}\text{C}$, under continuous light, during 28 days;
- Microscopic and visual observations of fruits for CBS symptoms;



Citrus Black Spot (*Guignardia citricarpa*)

Test to accelerate fruit symptoms development

- Deep fruits in ethephon solution (750 ppm) for 5 minutes;
- Incubation treated fruits at temperatures $\geq 25^{\circ}\text{C}$, under continuous light, during 28 days;
- Microscopic and visual observations of fruits for CBS symptoms;
- Diagnosis confirmation by isolating *Guignardia citricarpa*;



Citrus Black Spot Preventive Measures

- Healthy nursery trees:





Citrus Black Spot Preventive Measures

- Healthy nursery trees:
- Controlled traffic of vehicles



Traffic Control During Harvest



Citrus Black Spot Management

Cutural Practices

Citrus Black Spot Management

Cutural Practices

Removal of fallen leaves from the orchard floor

Citrus Black Spot Management

Cultural Practices



Citrus Black Spot Management

Cultural Practices

Use of mulching over leaf litter;

Citrus Black Spot

Horticultural Practices for Citrus Health

- Weed Control



Citrus Black Spot Management

Forage interplanting for mulching production



Interplanting with Coastcross grass (*Cynodon dactylon* cv. coastcross) or Peanut (*Arachis pinto*)

Source: Bellotte, J.A.M. 2006

Citrus Black Spot Management


Forage interplanting for mulching production




Citrus Black Spot Management

Forage interplanting for mulching production

Comparison of Mowing Machines

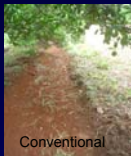


Conventional Mowing Machine




"Ecological" Mowing Machine

X



Conventional



Ecological

Reduction of disease severity by 23% to 46%

Source: F.A. Azevedo

Citrus Black Spot Management


Cultural Practices

Pruning and removal of dead branches;


Cultural practices to minimize CBS severity

'Murcott' Tangor. Casa Branca, 2004/05

Pruning and removal of dead branches



Without pruning



With pruning

NOZAKI(2007) – Positive correlation between dead branches and CBS severity (false melanose type symptom).

Citrus Black Spot Management


Cultural Practices

Irrigation management

Citrus Black Spot

Horticultural Practices for Citrus Health

- IRRIGATION
- to provide uniform and regular blossoming;
- to reduce water stress
- to reduce leaf fall during autumn and winter




Pseudothecium production favored by alternating leaf wetting and leaf dryness.

Citrus Black Spot

Irrigation Methods

Number of dead leaves with pseudothecia in the orchard floor

Year*	Number of Dead leaves with pseudothecia**		
	Microsprinkles	Drip Irrigation	Flood Irrigation
1995	20.8	2.75	0.50
1996	16.5	0	1.00
1997	13.0	0.25	2.75

* In October of each year

**Number of pseudothecia of *Guignardia citricarpa* in the orchard floor (0.25 m²), below the canopy of the trees.

Source: Alcoba et al, 1999.



Citrus Black Spot Management

Cultural Practices

Earlier harvesting.

Citrus Black Spot Management

Earlier harvesting



Citrus Black Spot Chemical management



Citrus Black Spot Chemical Management

COPPER FUNGICIDES	RATE (g metallic Cu/100L)
• Copper sulphate	90 - 100
• Copper hydroxide	90
• Cuprous oxide	75
• Copper oxychloride	90

Citrus Black Spot Chemical Management

Dithio-carbamates

Dithio-carbamates	Rate (g a.i./100L)
Mancozeb	110 – 160
Propineb	70

Citrus Black Spot Chemical Management

BENZIMIDAZOLES

	RATE (g a.i./100L)
• Benomyl	25
• Carbendazin	25
• Thiophanate-methyl	37.5

Citrus Black Spot Chemical Management

STROBILURINS

FUNGICIDES	Rates	
	(g a. i. / L)	Trade compound (g ou mL/ 2,000L)
Azoxystrobin	4 – 8	160 – 320g (320g)*
Pyraclostrobin	3.75	300mL (200-300mL)*
Trifloxystrobin	3.75	150g (200g)*

(*) Rates recommended by the Citrus Integrated Production Committee.

Citrus Black Spot Chemical control



Petal fall

Fruit Susceptibility (5 -6 months)

CITRUS BLACK SPOT CONTROL Fungicide Sprays at Low and High Volume Field Trials



Thank you

