The Effect of Fungicides, Essential Oils, and Heated Solutions on Citrus Black Spot Lesion Development After Harvest

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Overall Objective

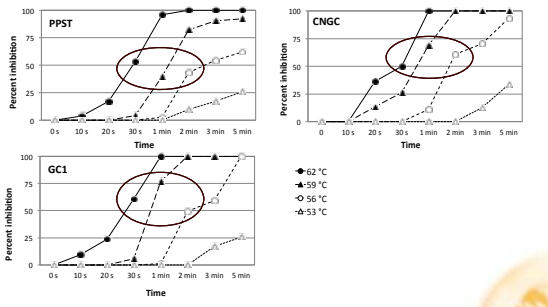
- Identify an effective method(s) to control or limit citrus black spot (CBS) development after harvest.

Objectives

- **Postharvest hot water dipping to control citrus black spot (CBS) on "Valencia" orange fruit.**
- Postharvest (heated) fungicide treatment to control citrus black spot (CBS) on "Valencia" orange fruit.
- Postharvest essential oil treatment (dipping or waxing) to control citrus black spot (CBS) on "Valencia" orange fruit.

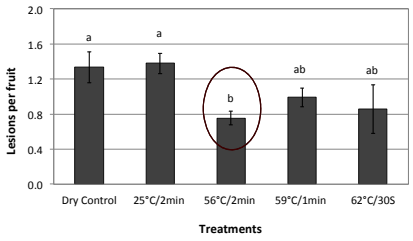
Hot water to inhibit mycelium growth

Effects of hot water on mycelium growth of three isolates



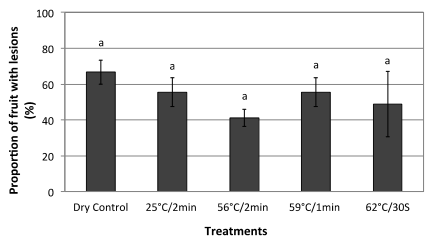
Hot water dipping on CBS development

Effects of hot water dipping on **lesion development** on **asymptomatic** fruit.



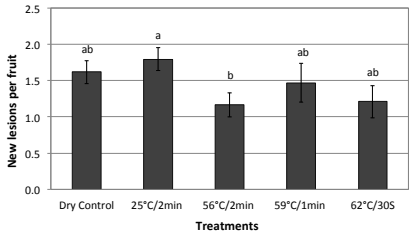
Hot water dipping on CBS development

Effects of hot water dipping on **disease incidence** of **asymptomatic** fruit.



Hot water dipping on CBS development

Effects of hot water dipping on **lesion development** on **symptomatic** fruit.



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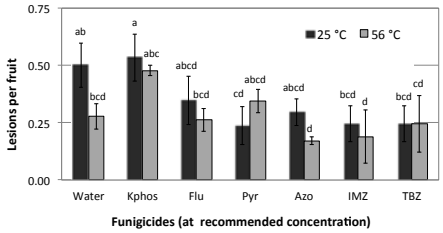
Fungicide treatment on CBS development

Effects of fungicides on **lesion development** on **asymptomatic** fruit.



Source	DF	Type I SS	Mean Square	F Value	Pr > F
Treat	6	0.3783	0.0630	2.90	0.0252
Temp	1	0.0421	0.0421	1.93	0.1752
Treat*Temp	6	0.0939	0.0156	0.72	0.6377

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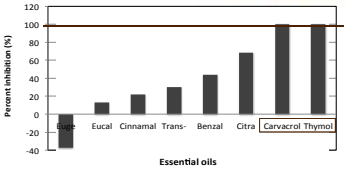
Essential oils to inhibit mycelium growth

Screening of essential oils for antifungal activity against mycelium growth of *Guignardia citricarpa*.



Isolates	EC_{50} (mg/ml) Carvacrol	Thymol	Combination (1:1)
CNGC	0.0596 ± 0.0019	0.0189 ± 0.0012	0.0289 ± 0.0007
PPST	0.0589 ± 0.0024	0.0149 ± 0.0001	0.0433 ± 0.0014
GC1	0.0677 ± 0.0024	0.0154 ± 0.0004	0.0394 ± 0.0010

Effective concentration of thymol and carvacrol to inhibit mycelium growth by 50% (EC_{50}) of three isolates

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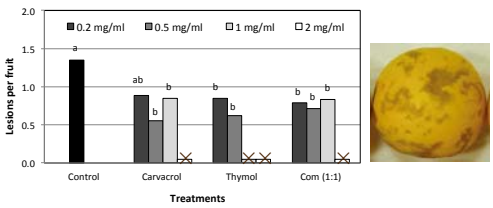
Essential oil solution dip on CBS development

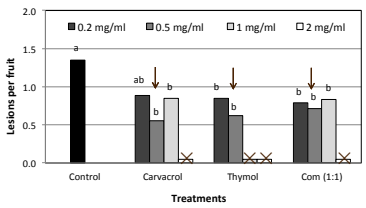
Effects of thymol and carvacrol dip on CBS lesion development on **asymptomatic** fruit.



- Thymol, carvacrol, and the combination (1:1) at 2 mg/ml resulted in phytotoxic peel injury, with the most severe damage caused by thymol which also caused peel injury at 1 mg/ml.

Essential oil solution dip on CBS development

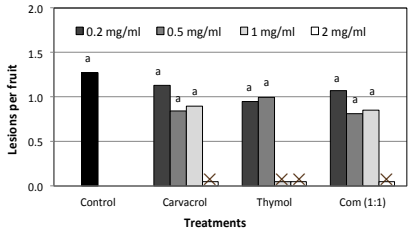
Effects of thymol and carvacrol dip on CBS lesion development on **asymptomatic** fruit.



- On fruit that were asymptomatic before treatment, dipping fruit in water with thymol, carvacrol, and the combination (1:1) reduced the number of lesions formed on fruit, but not in a concentration dependent manner. 0.5 mg/ml was the most effective concentration ($p<0.05$).

Essential oil solution dip on CBS development

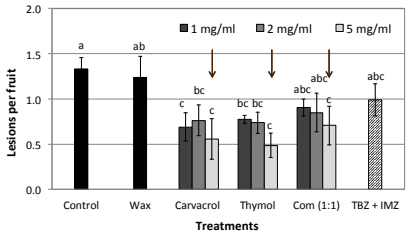
Effects of thymol and carvacrol dip on CBS lesion development on **symptomatic** fruit.



- None of the treatments significantly inhibited lesion development on fruit that were symptomatic prior to treatment.

Essential oil mixed in wax on CBS development

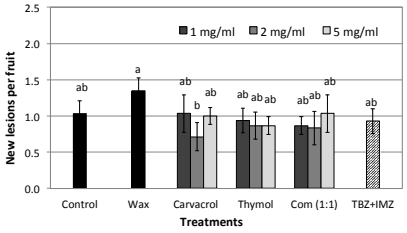
Effects of thymol and carvacrol mixed in wax on **lesion development** on **asymptomatic** fruit



- On fruit that were asymptomatic before treatment, coating with shellac containing 5 mg/ml of thymol, carvacrol, and the combination (1:1) reduced the number of lesions formed on fruit significantly ($p<0.05$)

Essential oil mixed in wax on CBS development

Fig 14. Effects of thymol and carvacrol mixed in wax on **lesion development** on **symptomatic** fruit



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Thank you!

Question?