



*Reducing environmental
load of copper by employing
biological products*

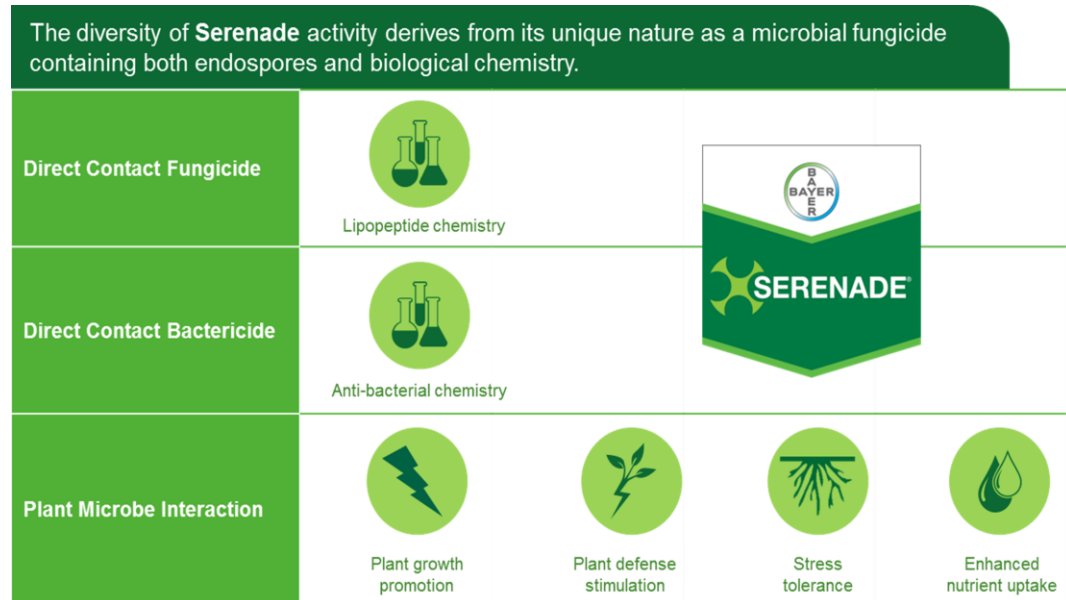
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ABIM, 19 October 2020



Serenade, an alternative to reduce Copper input

- In Agriculture, Copper (Cu) is used in fertilizers and fungicides to improve crop health and yield
- The overuse of Cu may result in Cu load and toxicity leading to lower diversity of the soil microbiome as well as reduced crop health and yield.



Here we show that Serenade[®], when used in rotation with Cu, can increase disease control, crop health and yield while reducing the number of Cu applications in the field in Citrus and Avocado trees .

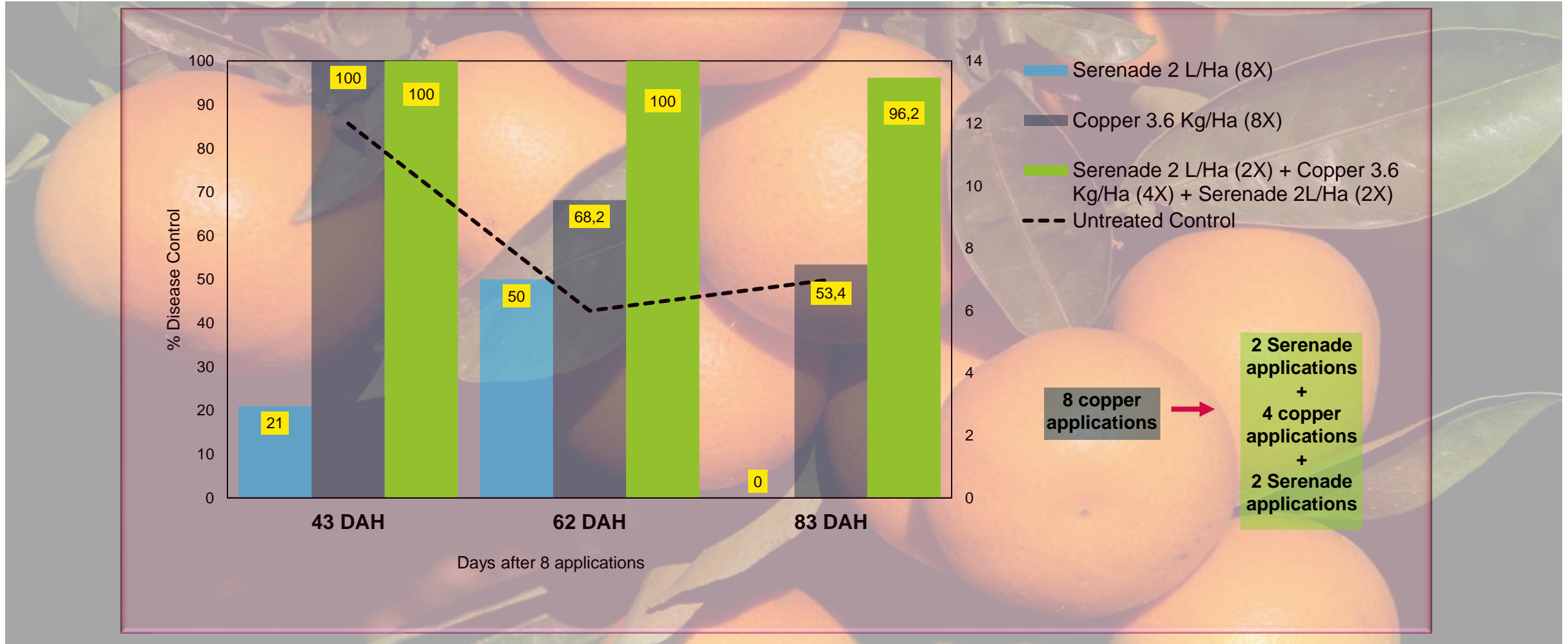
Use of Copper to control citrus canker in Brazil

Changes to legislation on canker (*Xanthomonas citri*) infected trees

- Ten years ago, trees identified with canker = mandatory removal.
 - Disease incidence was 0.2%
- Today, tree removal is no longer legislated
 - Disease incidence is ~15%
 - >200,000 ha of citrus get 8-9 copper applications/year
- Copper toxicity symptoms are developing in trees and reducing yields.



Serenade in rotation with Copper improves citrus canker control



Serenade in rotation with copper improves tree health and increases fruit harvest and growers profitability

Healthier trees



Control

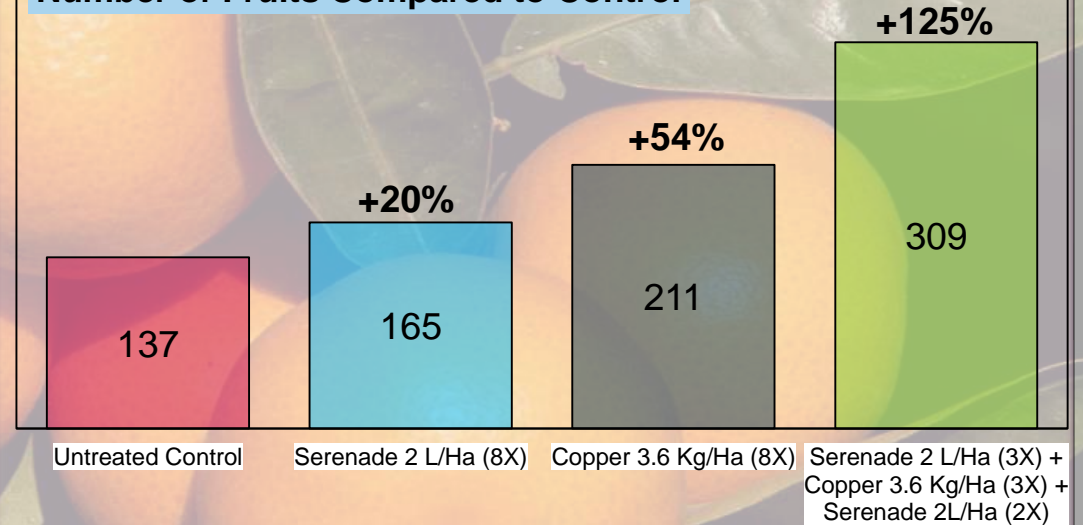


More foliage

Serenade 2,0 (2x) /
Copper 3,6 (4x) /
Serenade 2,0 (2x)

More fruits

Number of Fruits Compared to Control

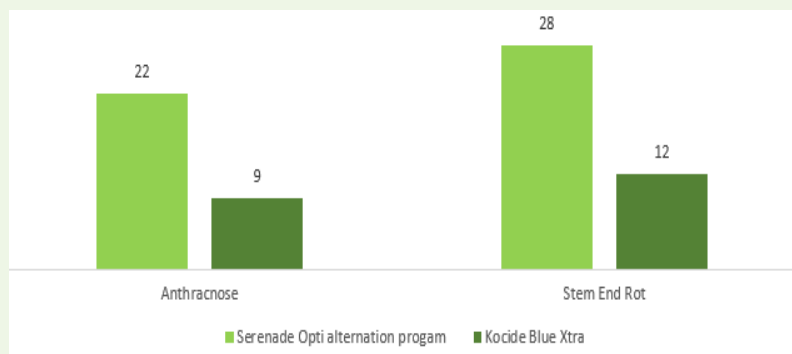


**More fruits with
a 63% copper
reduction**

Avocado: Increased disease control and fruit quality

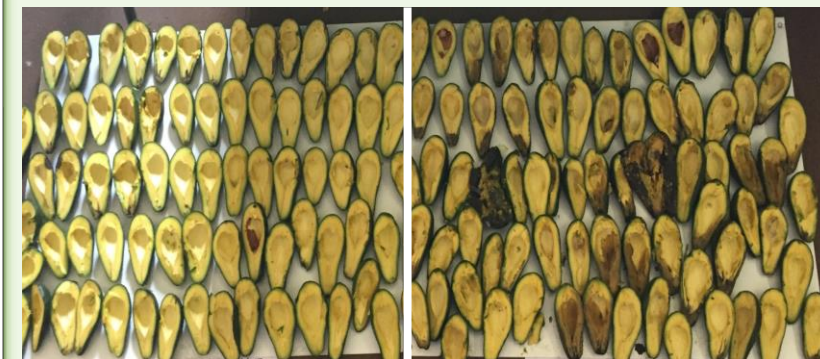


Increased anthracnose and stem end rot control in rotation programs (% control)



Serenade Opti in an alternation program provided superior control of anthracnose and stem end rot when compared to Kocide Blue Xtra across two trials.
Trials: QA1718 and QB0918

Increased fruit quality at 12 days after harvest at ambient temperature



Serenade Opti in an alternation program

Kocide Blue Xtra



Benefits of using Serenade in rotation with Copper

- Improves disease control and contribute to higher production or fruit quality.
- Reduces the reliance on copper alone to control some diseases.
- Minimizes risk of resistance development
- Maximizes returns for growers





Thank you

