

Brassinosteroids to improve citrus tree health and fruit quality under greening

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SWFREC

Young vs Mature Citrus Trees

Different biology, different requirements

Young trees

- Planted healthy, HLB-free
- They are not producing yet.

Mature trees

- Already affected by HLB.
- Declining production.

Desired goals

- Keep trees free from disease until they enter production age **or longer.**
- Maintain trees productive and improve their health.
- **Improve fruit yield and quality.**

RESEARCH ARTICLE

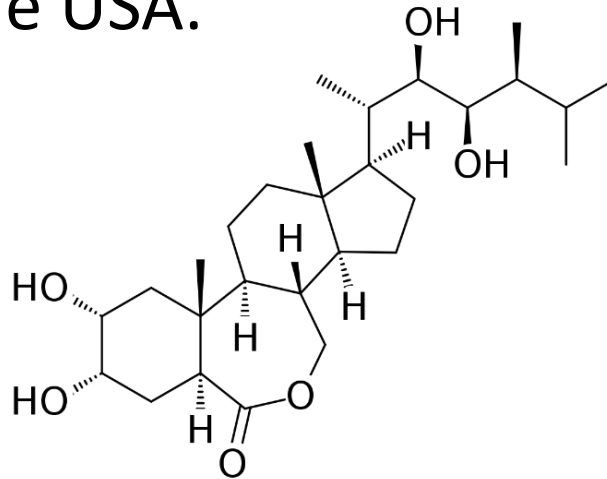
'Candidatus Liberibacter asiaticus', Causal Agent of Citrus Huanglongbing, Is Reduced by Treatment with Brassinosteroids

Eduardo Canales^{1☯}, Yamilet Coll^{2☯}, Ingrid Hernández¹, Roxana Portieles¹, Mayra Rodríguez García¹, Yunion López¹, Miguel Aranguren³, Eugenio Alonso⁴, Roger Delgado⁴, Maritza Luis³, Lochy Batista³, Camilo Paredes³, Meilyn Rodríguez¹, Merardo Pujol¹, María Elena Ochagavía¹, Viviana Falcón¹, Ryohei Terauchi⁵, Hideo Matsumura⁶, Camilo Ayra-Pardo¹, Raixa Llauger³, María del Carmen Pérez⁷, Mirian Núñez⁷, Melissa S. Borrusch⁸, Jonathan D. Walton⁸, Yussuan Silva⁹, Eulogio Pimentel¹, Carlos Borroto¹, Orlando Borrás-Hidalgo^{1*}

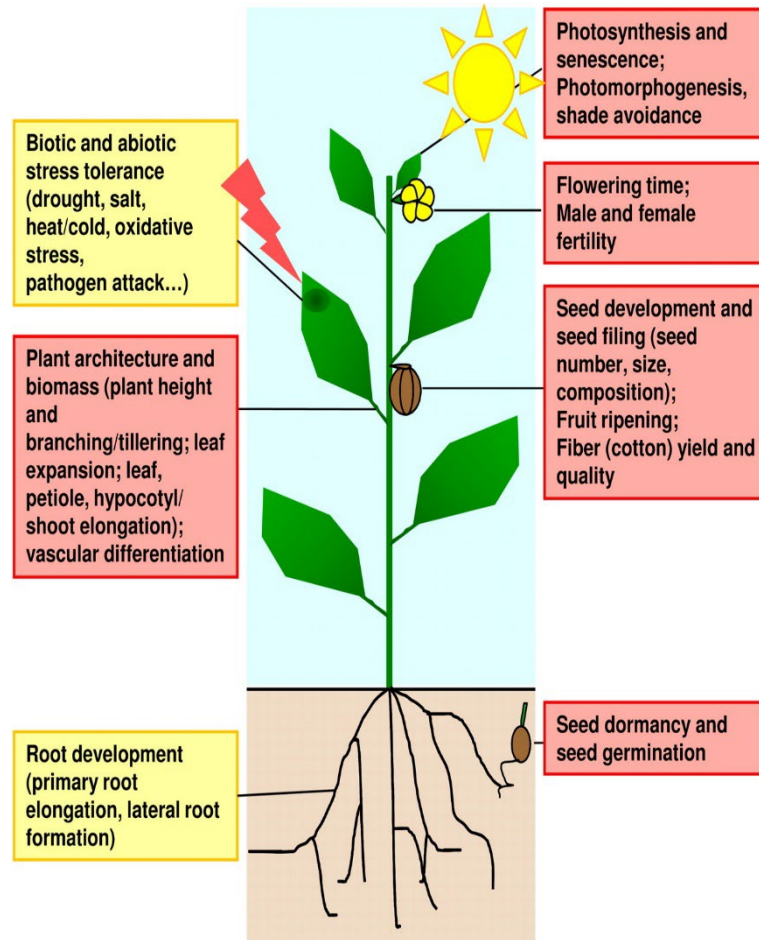


Brassinolides

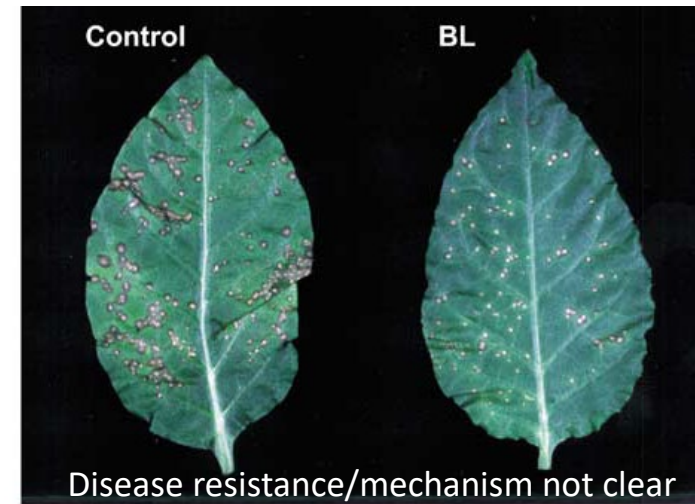
- Brassinolides (BRs) are a class of growth-promoting steroidal phytohormones.
- BRs control almost all aspects of plant growth and development, and also play significant role in plant adaptation to biotic and abiotic stresses.
- BR analogs (Epi and Homobrassinolide, HBr) are easy to produce and commercially available. HBr is available in the USA.



Effects on other crops

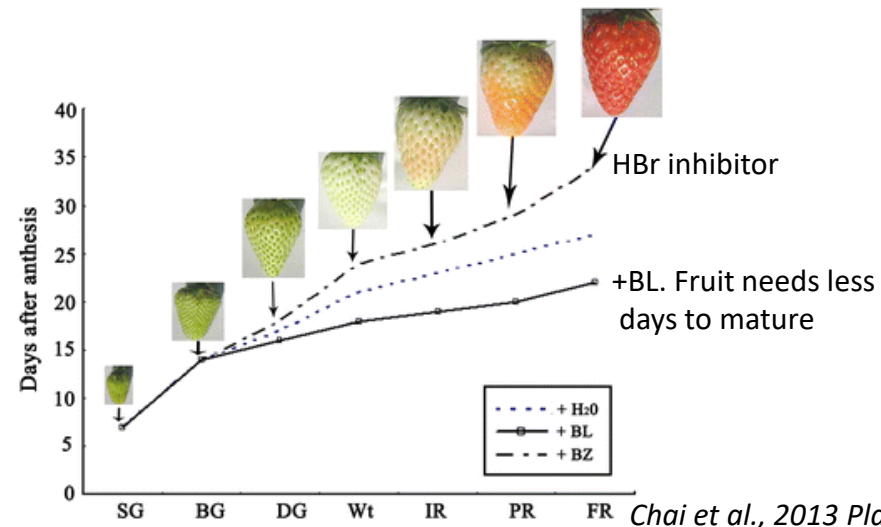


Vriet et al., 2012 Plant Cell



Nakashita et al., 2003 Plant Journal

Advances maturation in strawberry

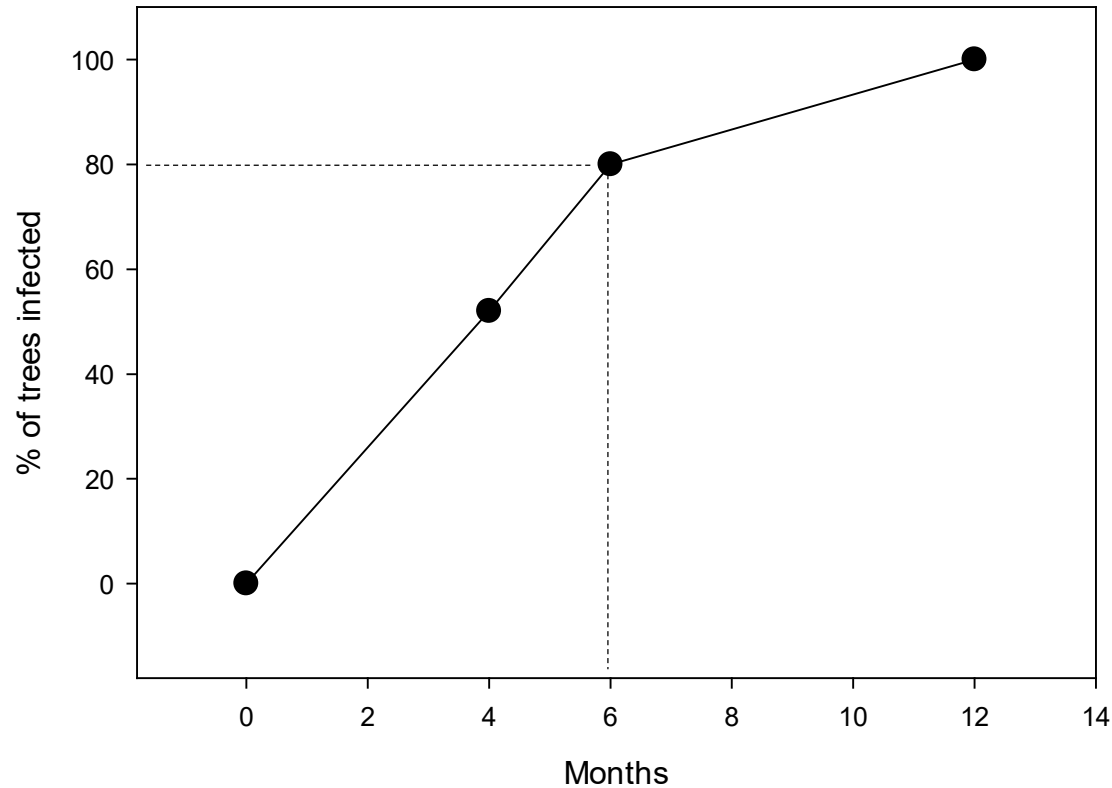


Chai et al., 2013 Plant Growth Reg.

Young trees



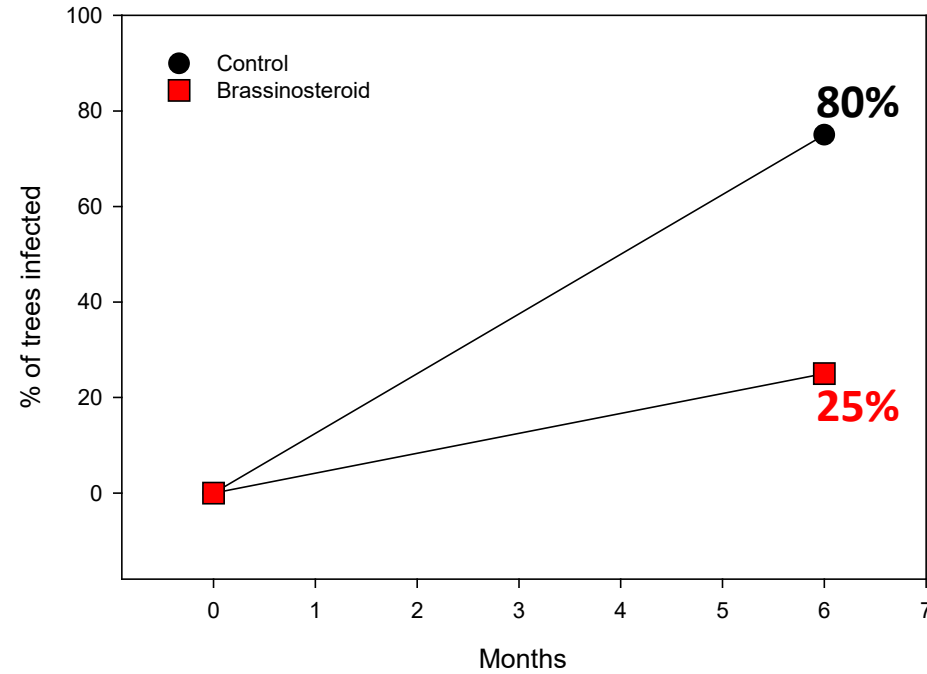
The rate of HLB infection in a non-protected, newly planted citrus grove



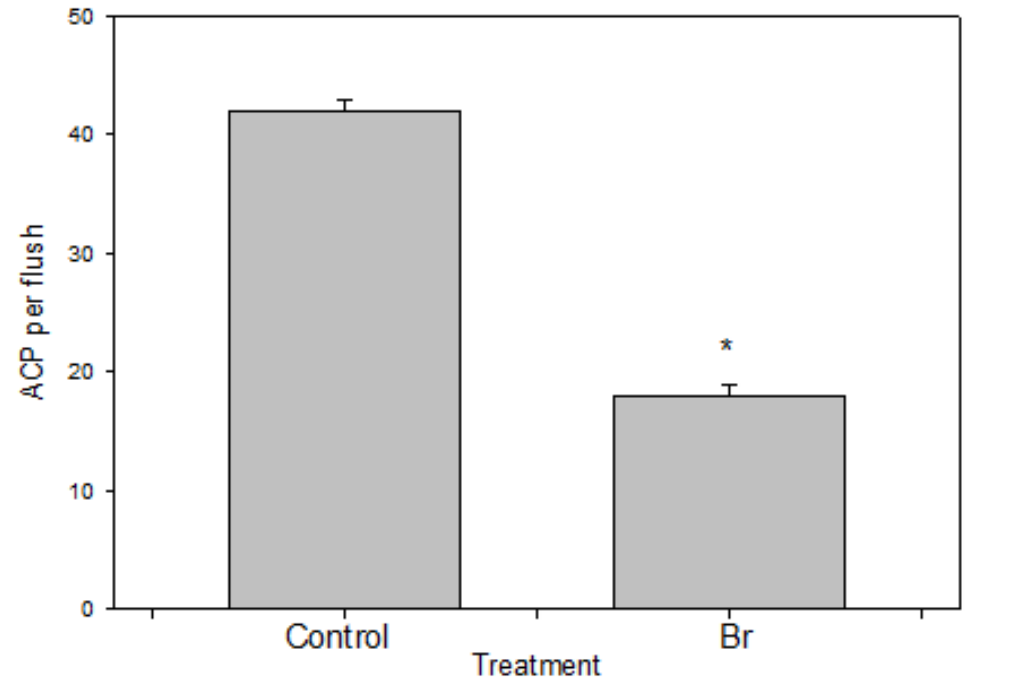
In less than 6 months, most newly planted trees in a grove tested positive for HLB

Data from non-protected trees at SWFREC Immokalee

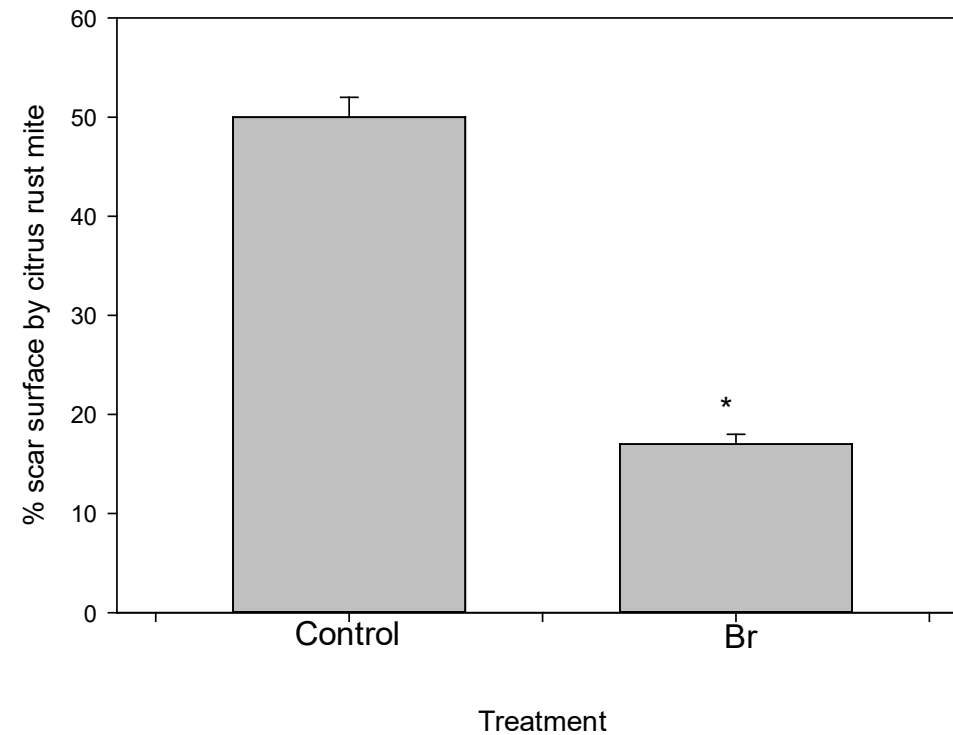
Brassinosteroids reduce rate of HLB infection in newly planted trees



Brassinosteroids reduce ACP incidence in newly planted trees



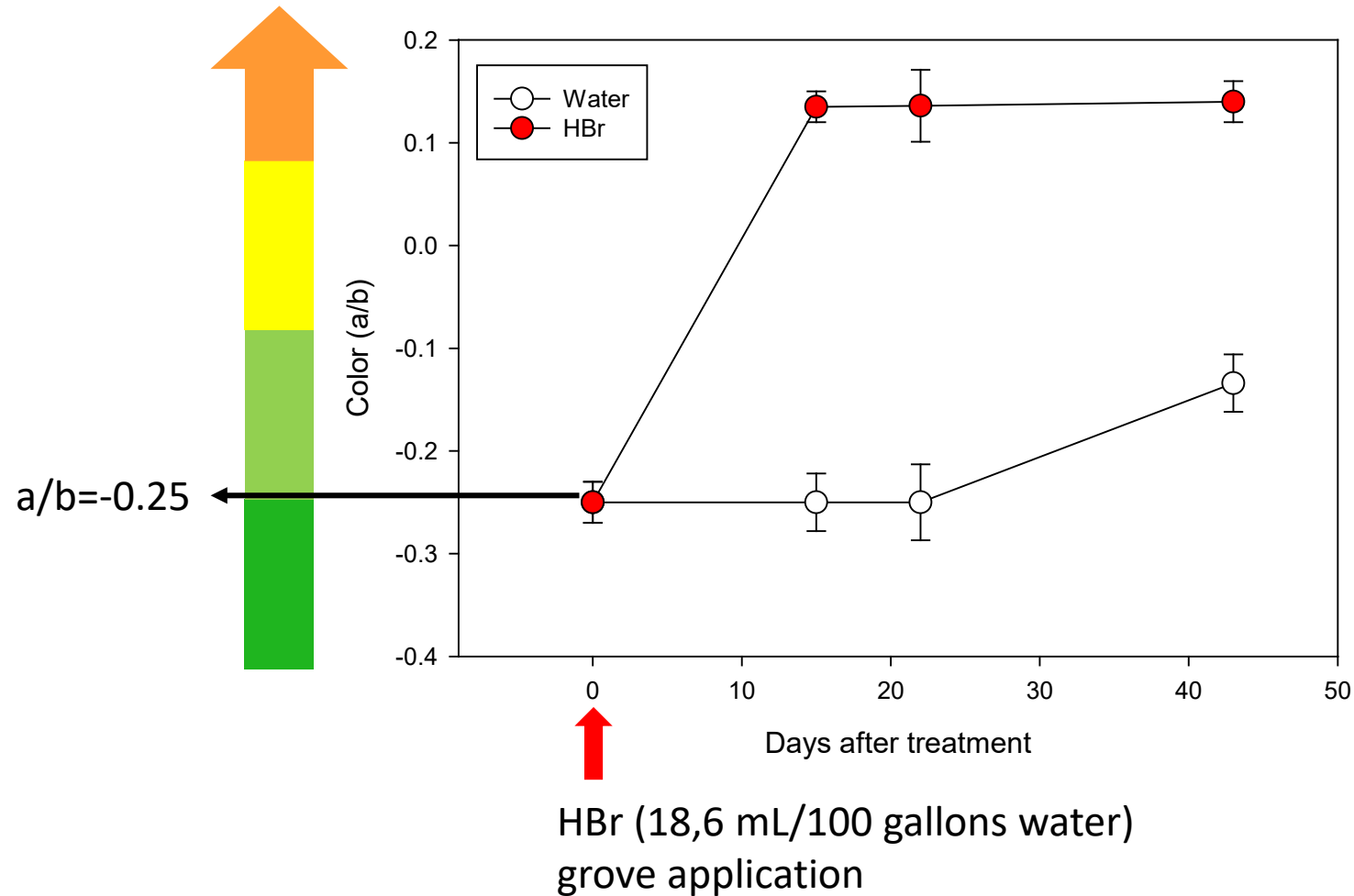
Brassinosteroids reduce rust mite in fruit from young trees



Mature trees



HBr improves coloration in Tango mandarins. On-tree treatments



On tree treatments

Postharvest treatment

Control



$a/b = -0.4$

HBr



$a/b = 0.05$



$a/b = 0.18$
HBr

$a/b = -0.25$

$a/b = -0.25$
Control

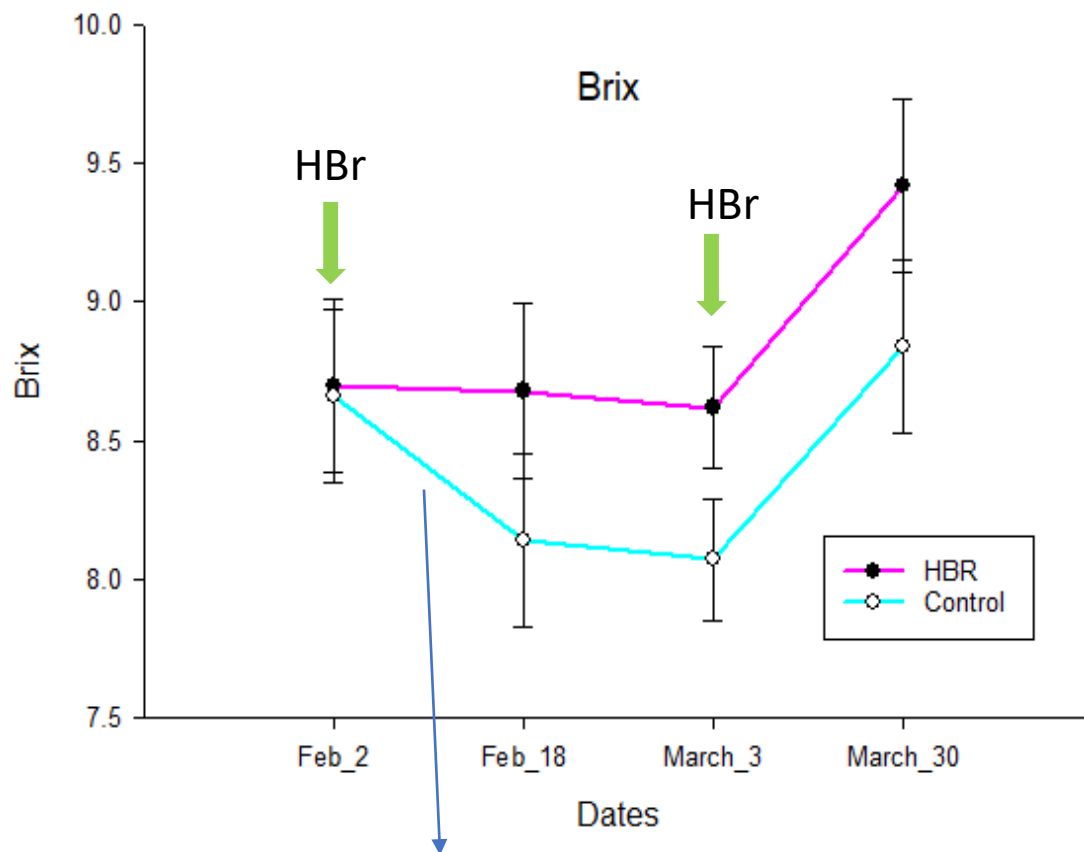
$a/b = 0.1$



Postharvest Application of 24-Epibrassinolide Reduces Chilling Injury Symptoms and Enhances Bioactive Compounds Content and Antioxidant Activity of Blood Orange Fruit

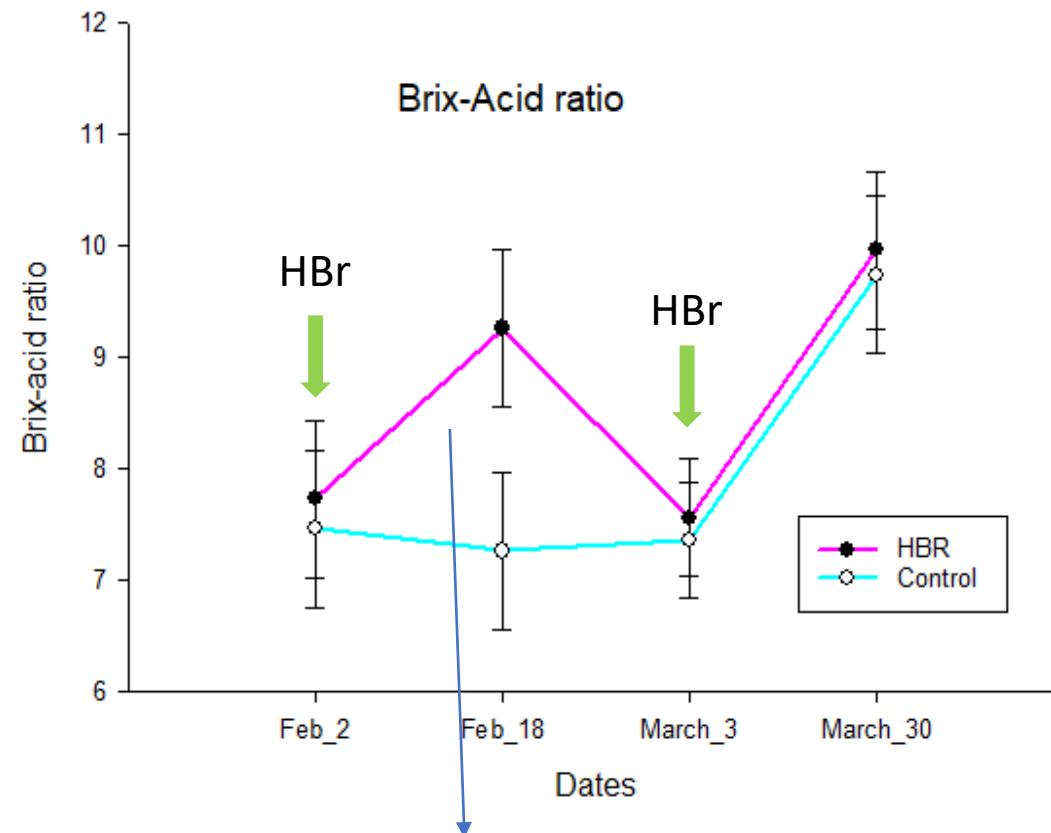
Fariborz Habibi^{1,2}, María Serrano³, Lorenzo Zacarías⁴, Daniel Valero^{2} and Fabián Guillén²*

Internal quality is improved in Valencia fruit after just one HBr application @ 186mL/100 gallons of water



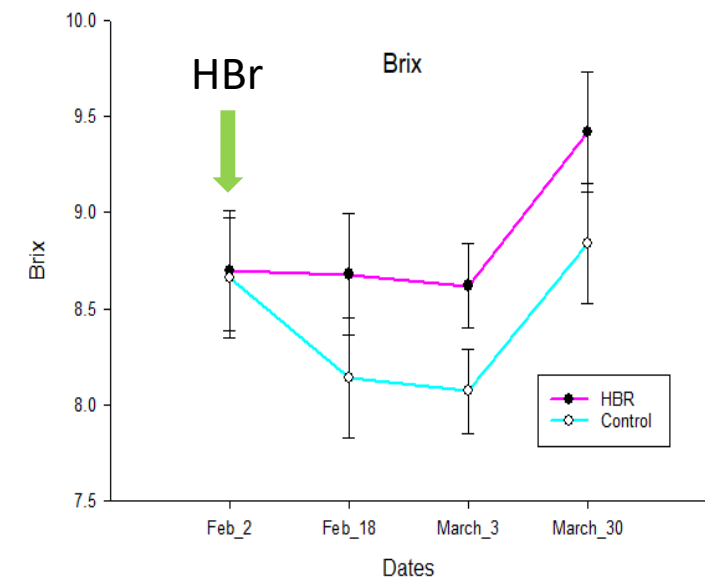
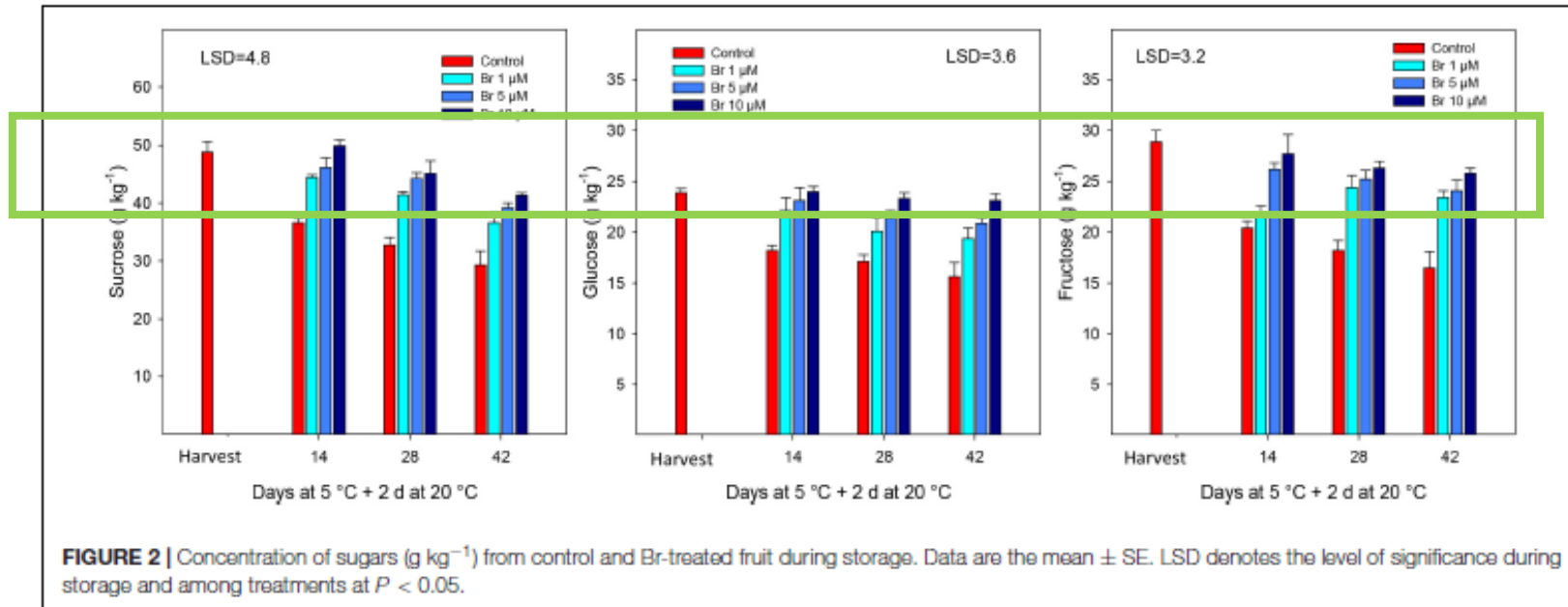
We believe that this decrease in sugars in the control is due to new flower/fruit set induction triggering competence for photoassimilates. HBr maintains levels of sugars.

This is coincident with the paper on HBr's effect on blood orange postharvest quality



One single application increases the ratio to commercial levels by February. We need to try earlier apps because when the fruit starts natural maturation (late Feb/ early March) the effect is lost

Boakye and Alferez, 2022 to be submitted

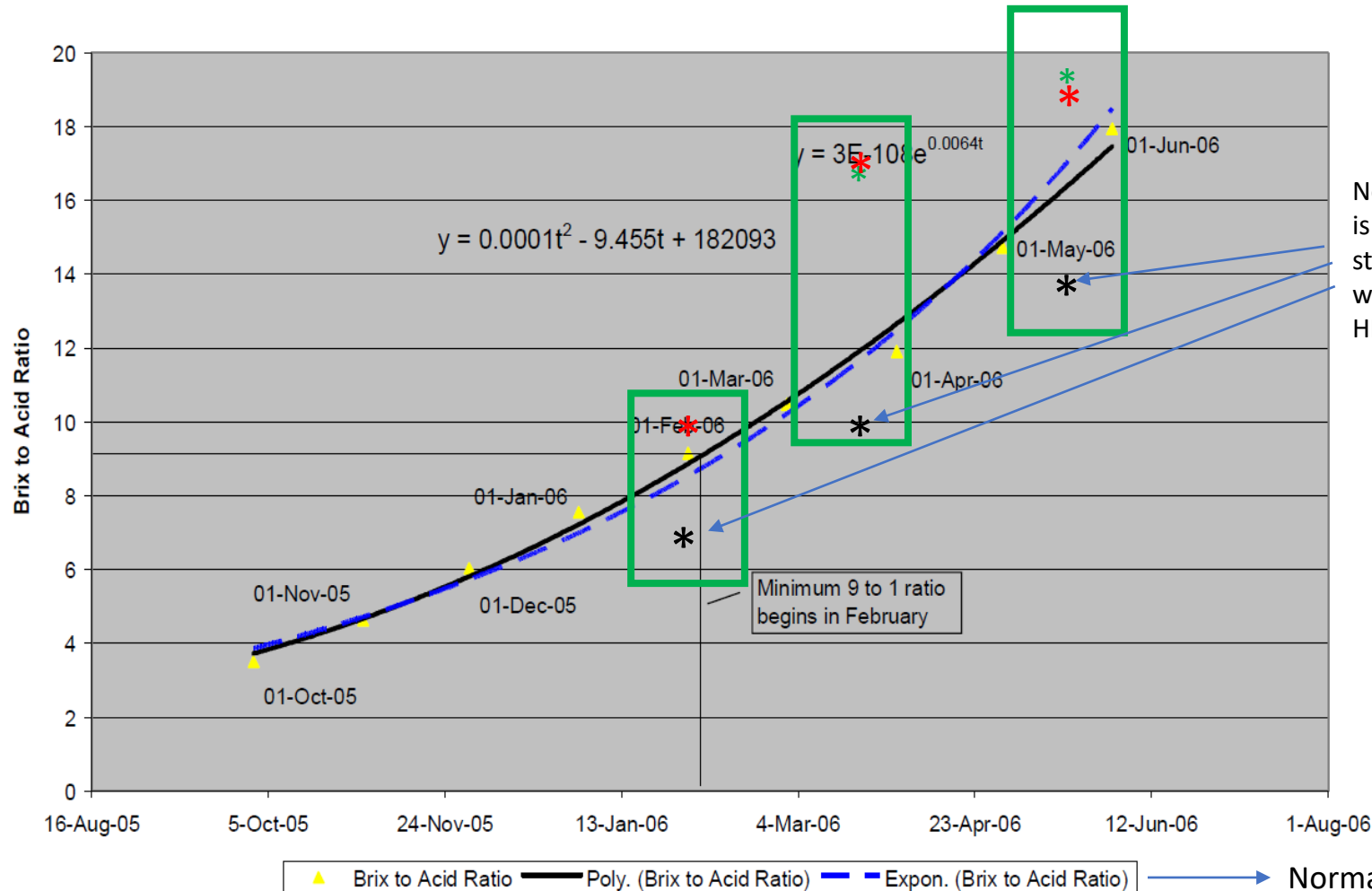


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Internal maturation in 'Valencia' oranges is advanced by HBr (applied every other week)

- * Control
- * HBr 18,6 mL
- * HBr 186mL



Notice how now normal maturation *
is delayed and interestingly
still parallel to what
was normal 15 years ago
HBr **increase ratio

Take home messages

- Brs can reduce rate of HLB infection in young trees planted healthy. The mechanism is not clear yet.
- We still don't know for how long lasts Br protective effect against HLB in young trees. We are investigating this.
- Brs work well in a range of 18,6 mL to 186 mL per 100 gallons water. We typically use 1 gallon water to full-cover one mature tree.
- Brs can advance internal fruit maturation. Time of application to maximize this effect is still under research.