Grove Management Strategies to Reduce Fruit Drop

What do we know about fruit drop? What can we do to reduce fruit drop?

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Rapid shoot dieback in severely HLB symptomatic



Canopy density decreases at faster rate in severely symptomatic trees!



More the HLB symptoms, more is the fruit drop!



Severe trees have poor fruitlet retention



We are loosing fruit beyond preharvest fruit drop

loosing shoots that can support fruit

Fruit drop rate and canopy density value are significantly correlated

Denser the canopy, less is the drop



How fruit drop progresses over time?

Fruit Detachment Force in Hamlin



Number of loose fruit increases overtime especially in Severe trees

Similar pattern in Hamlin and Valencia

Cell wall remodeling genes in AZ-C – 'Hamlin'



October

November



Loose fruit had had higher expression of ethylene related genes in October, but not in November

Abscisic acid biosynthesis gene in AZ-C – 'Hamlin'

ABA \rightarrow Increased ethylene production; ABA is very well related to drought stress



Loose fruit had had higher expression of ABA biosynthesis gene in October, but not in November

Abscisic acid biosynthesis gene in AZ-C – 'Valencia'

ABA \rightarrow Increased ethylene production; ABA is very well related to drought stress



Loose fruit had had higher expression of ABA biosynthesis gene in February, but not in May

-The signals for fruit drop arises quite some time before the fruit actually drops...

Leaf water potential is lower in severely HLB symptomatic trees (March)



HLB-affected trees have small root biomass therefore, water and nutrient uptake is limited in HLB-affected trees

What are the characteristics of fruit that drop?



Fruit that tend to drop are of small size!

Fruit size (mm)



Fruit type: *P* = 0.0007 Symptom level: *P* = 0.0037

No relationship between fruit drop and :

- leaf number on fruiting branch
- leaf blotchy mottle
- aborted seeds
- juice carbohydrates

Fruit drop is related to fruit size.

- Small fruit are more likely to drop
- Severely symptomatic trees have smaller fruit on average than mild trees

Fruit size differences appears in stage 1-2 of fruit development



- Fruit size is driven by water availability
- March-May are usually dry
- HLB trees have small root biomass therefore, limited water and nutrient uptake
- Severely symptomatic trees have more water deficit

What may cause fruit drop?

Molecular study in SugarBelle versus Hamlin





Gibberellic acid application on Valencia Trees

- Originally a flowering suppression study to reduce potential of PFD
- GA applied 5 times during Fall (September to January) at 20 gram active ingredient per acre
 - Progibb (10 fl oz. per application)
- GA resulted in compact flowering period and approximate 50% suppression in flowering in following spring
 Though, no reduction in yield!



GA improved fruit yield consistently!



Fall GA application resulted in larger fruit



Early in the season application of GA improved fruit retention



GA trees did not show decline in canopy density



GA treatment reduced flowering and promoted vegetative growth

Gene expression data is suggesting better defense response in GA tree



higher expression of *PP2-B15* gene (higher phloem regeneration)



higher expression of *CDR1* gene (involved in salicylic acid mediated plant response to the disease)

Use of GA does hold potential:



lower expression of *LOX2* gene (involved jasmonic acid signaling, HLB causes increase in jasmonic acid accumulation)

- Compressing flowering period and reducing flower intensity
 - Promoting vegetative growth
 - Improving fruit retention, size, and yield
 - Possibly improving tree defense response

Take home message!

- Good canopy= less fruit drop and more yield
- Increased fruit drop is not due to starvation of carbohydrate in fruit
- Increased oxidative stress and hormone imbalance results in increased drop
- HLB-triggered events that leads to abscission occur earlier in the preharvest period
- Abscisic acid seems to be involved in triggering fruit drop
- Good caretaking, early in the season, during fruit growth
 - Spoon feeding tree with water and nutrients!
- Fall GA application does hold great potential for improving yield and possibly slowing down the tree decline

Thank you!!

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