

How huanglongbing affects oranges' detachment force, fruit properties

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Photo shows an HLB symptomatic sweet orange tree. A study found that HLB symptomatic orange trees are more likely to have problems with preharvest fruit

drop than asymptomatic trees. Credit: Jinhe Bai.

The citrus greening disease, huanglongbing (HLB), is a devastating condition that has been reported in 40 countries across the globe. Citrus trees infected with *Candidatus Liberibacter asiaticus* (CLAs) develop HLB symptoms such as reduced plant height, yellow shoots, blotchy mottled leaves, canopy thinning, and premature abscission of fruits. Citrus fruits severely affected by HLB can be small, lopsided, and poorly colored, with bitter or sour tasting juice. As HLB severity increases, preharvest fruit drop becomes increasingly problematic, contributing to declining crop yields. HLB is a very serious issue for the citrus industry, as it can kill or debilitate citrus trees quickly, and no effective treatment has been identified.

The authors of a study in the April 2016 issue of *HortScience* have discovered how HLB affects citrus peel and fruit mechanical properties. Jinhe Bai, corresponding author of the study, said there has been little information about how HLB severity affects these physical and biomechanical properties that may contribute to mechanical injury of fruit during harvest or postharvest handling and processing.

In experiments with two major Florida juice orange varieties ('Hamlin' and 'Valencia'), the researchers investigated how HLB impacts [citrus](#) fruit detachment force (FDF), or abscission, the mechanism that leads to fruit drop. The researchers evaluated three types of 'Hamlin' orange samples: fruits from severely symptomatic HLB trees (HLB), fruits from HLB-symptomatic branches on trees for which at least 50% of the canopy was HLB asymptomatic (HLB-B), and fruits from HLB-asymptomatic (AS) trees. Asymptomatic and severely symptomatic fruits were also evaluated for 'Valencia' oranges.

Fruit detachment force was measured using a digital pull force gauge; fruit stems were secured by a clamp which was connected to the force gauge, and fruit were then twisted and pulled to emulate hand harvesting. Analyses showed that fruit detachment force was similar for HLB and HLB-B fruit, but higher for AS fruit. "This may contribute to the high incidence of preharvest fruit drop for symptomatic HLB trees," the authors said.

Other analyses revealed that, in general, HLB-symptomatic fruits were softer and had a lower capacity for recovery once compressed when compared with AS fruits. "On the other hand, puncture force, toughness, and deformation values, measured by a puncture test, were higher in HLB-symptomatic fruits than in the AS fruits," the scientists said.

"Our results indicate that fruits from severely HLB-symptomatic sweet orange trees are more likely to have problems with preharvest [fruit](#) drop and postharvest pressure damage and breakdown, but may have less puncture damage in harvesting, transportation, packing, and juice processing," Bai said.

More information: *HortScience*, hortsci.ashspublications.org/content/51/4/356.abstract

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