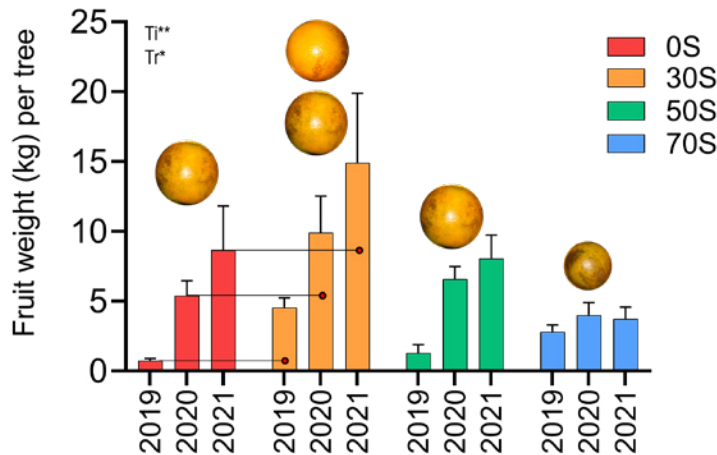


# Made in the Shade

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**Effort Statement:** We are currently constructing a larger study to assess horticultural implementation of shading.

**Summary:** Mild shade reduces stress, increases growth and yield, and may improve pest management under huanglongbing (HLB). It reduces high temperature and water stresses. It may reduce HLB transmission by making the trees less “apparent” to Asian citrus psyllids (ACP). It also appears to reduce the severity of HLB symptoms in already infected trees. We began our research to test whether shade could be used horticulturally to reduce HLB transmission and severity in the field and improve yield. Shade reduced

many symptoms of HLB in infected trees in the field. Under continuous 30% shade, trees produced more than two times the yields of full sun trees for three years, a dramatic increase in yield. Too much shade, though, (50% and 70% shade) reduced yields relative to the 30% level. Shade improved water relations and enhanced photosynthesis in HLB-positive trees. It also made trees more heat tolerant. This may be because the combination of high light and HLB pushes trees beyond their capacity to acclimate. Overall, shade trees were less stressed and grew more than full-sun trees. This information may be used in the future to refine approaches that already use netting (CUPS, IPCs), to target

rates of particle films (kaolin clay), and or directly shading in production systems. We are continuing work on this project to understand the impacts of shade on HLB transmission and to know whether the effects of shade on HLB-affected trees are different from shade’s effect on healthy trees. We are also looking at how to make cost-effective shade structures that have the best effects on citrus trees.

### Take Home Message:

- Moderate shade improves health and mitigates the effects of HLB.
- HLB-positive trees under 30% shade consistently yielded more than two times those in the sun.
- Shade helps trees by reducing water deficit stress.

### Funding:

