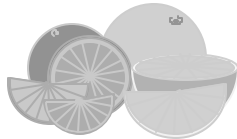


H. Dou and M. A. Ritenour

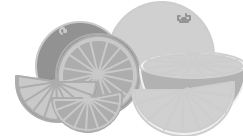
Measures to Minimize Chilling Injury of Citrus Fruit



Chilling Injury

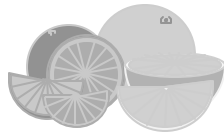
Why?

Several incidents were reported in 1998-1999 and in 1999-2000 seasons



What is Chilling Injury?

- ✗ Peel tissue collapse
- ✗ 4-6 weeks in cold storage
- ✗ Low storage temperature (37-42 F)
- ✗ Reduced by waxing



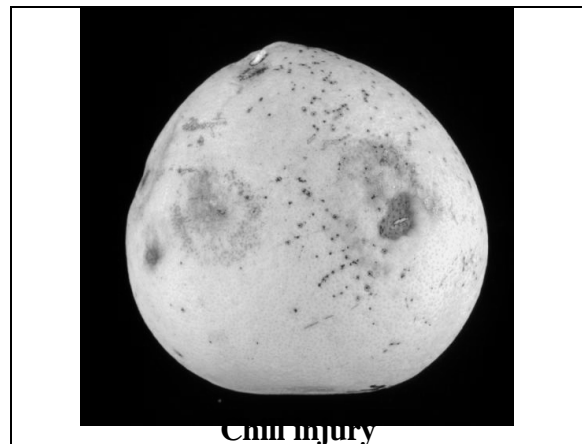
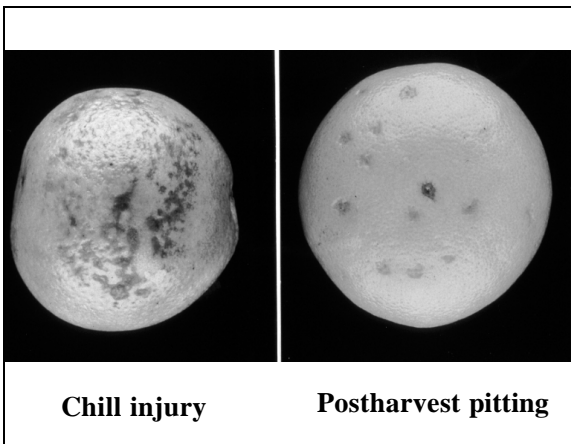
Chilling Injury vs. Pitting

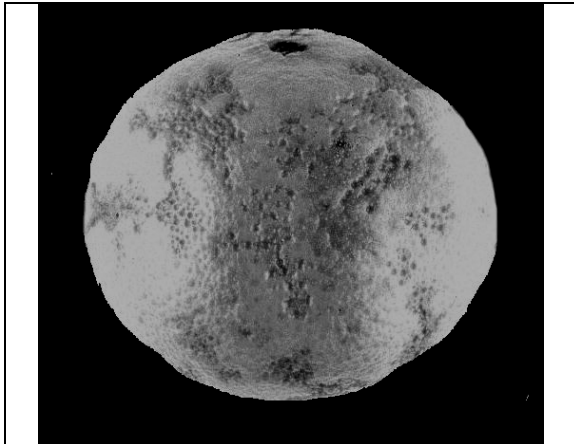
Chilling Injury

- ✗ Peel tissue collapse
- ✗ Develops in 4-6 weeks in storage
- ✗ Enhanced under low temp.
- ✗ Reduced by waxing

Postharvest Pitting

- ✗ Oil gland targeted
- ✗ Develops in 2-4 days
- ✗ Promoted/enhanced by high temperature
- ✗ Caused by wax application



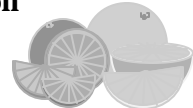


Factors Effecting Chill Injury

☞ Susceptible vs. Less Susceptible

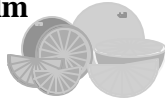
- ☞ Time of Season
 - ☞ Early / late — Jan - March
- ☞ Position on Canopy
 - ☞ Exterior — Interior
- ☞ Exposure to sun

Varies from season to season



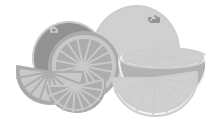
Control of Chilling injury

- ☞ Fungicides application
- ☞ Intermittent warming
- ☞ High humidity
- ☞ Low oxygen and high carbon dioxide
- ☞ Dipping fruit in chemicals
- ☞ Sealing in polyethylene film

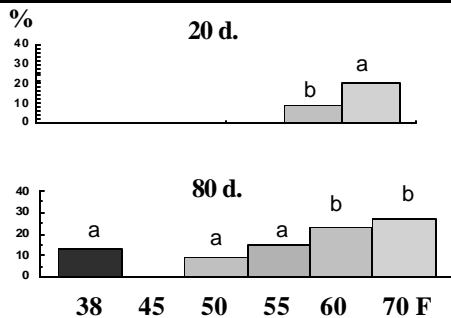


Control of Chilling Injury

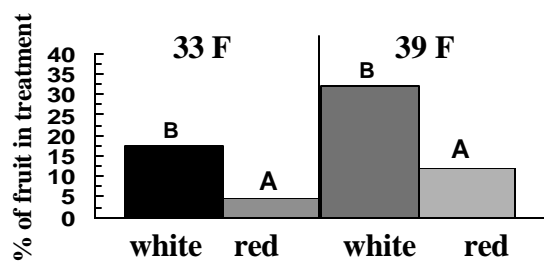
Shipping and storage temperature is critical to control of chilling injury



% Chilling & Pitting of White Grapefruit Coated with Shellac



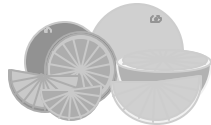
% Chilling injury of white vs. red grapefruit (Carnauba + 15 weeks)



Recommended Temperature for Grapefruit:

45-50F

- > 50 F enhances pitting
- <42 F increases chilling injury



Control of Chilling Injury

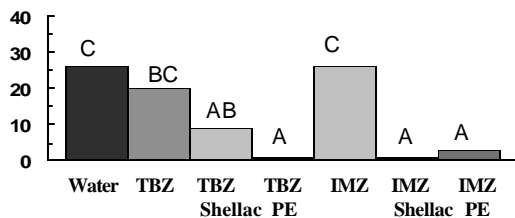
Wax application reduces chilling injury

Shellac=Polyethylene > Carnauba wax



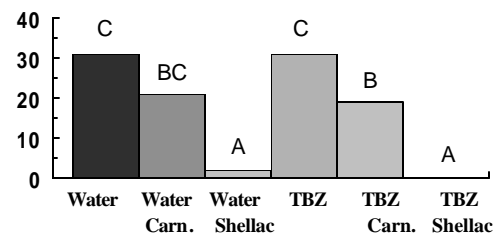
Effect of TBZ/IMZ and Waxes on Chill Injury of Grapefruit Stored 14 weeks at 37 F

Chilling Injury (% of fruit in treatment)



Effect of TBZ and Waxes on Chilling Injury of Grapefruit Stored 12 wks at 37°F

Chilling Injury (% of fruit in treatment)



Conclusion

- ✍ Temp and wax are the two important factors in controlling chilling injury
 - ✍ Shellac
 - ✍ better control of chill injury
 - ✍ causes severe postharvest pitting
 - ✍ Carnauba
 - ✍ less control of chill injury
 - ✍ less severe postharvest pitting
- ✍ Optimal temp with proper wax is the best means for controlling chilling injury