

# **Control of bean thrips in navel oranges using Vapormate™ fumigation for export to Australia**

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**In cooperation with:**  
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**The Linde Group**

# Ethyl Formate

- **Natural plant volatile – GRAS compound**
- **Registered for use in Australia and New Zealand by Linde Corporation as Vapormate™ in formulation with CO<sub>2</sub>**
- **Previously registered in US for control of insect pests in raisins, but registration expired in the 1980's**
- **US Registration is being pursued by Linde Corporation – expected April 2012**

# Potential for Vapormate

- Needs to be registered in U.S. to fumigate before shipping

or

- Needs to be added to the label in Australia and New Zealand for fumigation there
  - Already registered there
  - Need to add insect pests in Australia and citrus fruit to label in New Zealand
- May want to prove efficacy as quarantine treatment
  - True of other alternative fumigants as well

# **Focus in 2009-10**

- 1. Commercial fumigation test**
- 2. Develop mortality curves to provide quarantine status**

# Commercial Fumigation

- **Rented 20' container from ThermoKing**
  - Transport and install at UC Davis
- **Inside dimensions: 17'8" x 7'5" x 7'1"**
- **Modified for TransFresh system**
  - Inlet and outlet ports on container for introducing the gas and sampling
  - Track around back door for installation of curtain
  - Empty container checked for leaks with CO<sub>2</sub>

# Vapormate™ Fumigation

- 8 pallets loaded in container after leak check
- 54 export orange cartons per pallet
- Back of container sealed with TransFresh curtain after loading
- Specialized Vapormate Dispenser machine (VDM) used to vaporize gas
- Weight of cylinder used to determine dosing

# TransFresh curtain installed



# Vapormate™ Fumigation (cont)

- 5.2kg Vapormate™ introduced into container; took 37 minutes
- Fumigate 1 hour after all gas introduced
- Gas samples:
  - 10 minutes: 0.46%
  - 30 minutes: 0.37%
  - 60 minutes: 0.35%
- Container aired for 1 hour then unloaded

# Mortality of Bean Thrips after 1 hour Fumigation with Vapormate™

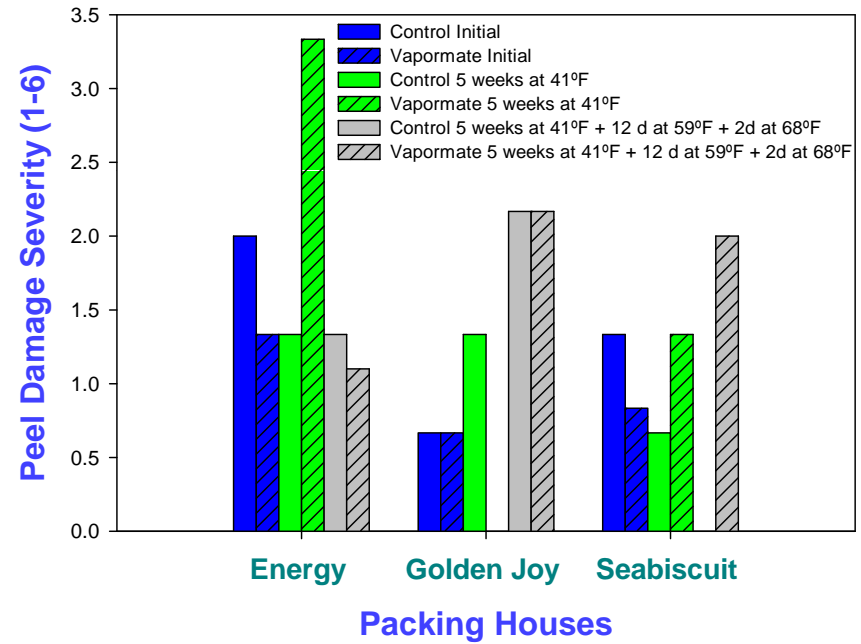
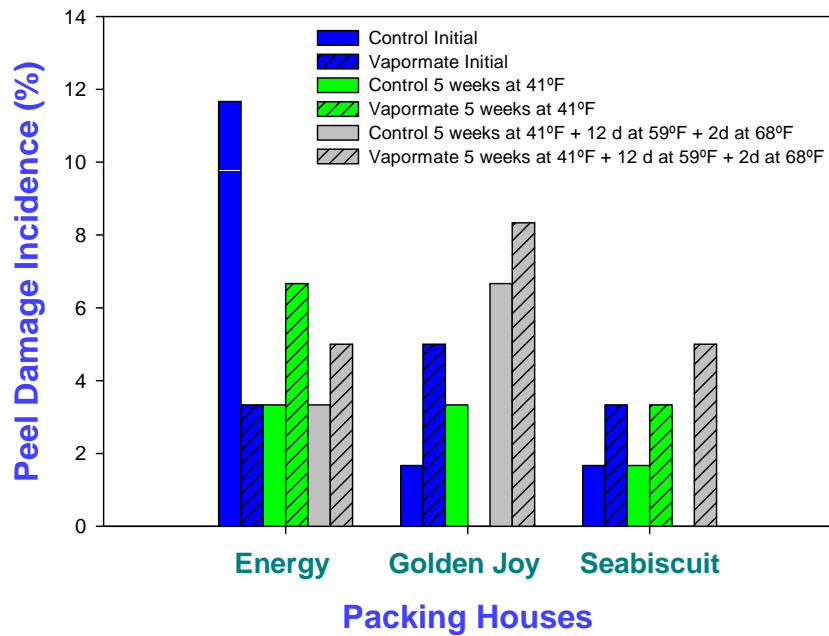
## Marine Container Test

Treatment	Total # Bean Thrips	Mortality (%)
Untreated	81	29.3
Vapormate	1030	100

## Subsequent LabTest

Treatment	Total # Bean Thrips	Mortality (%)
Untreated	483	7.8
Vapormate	6928	100

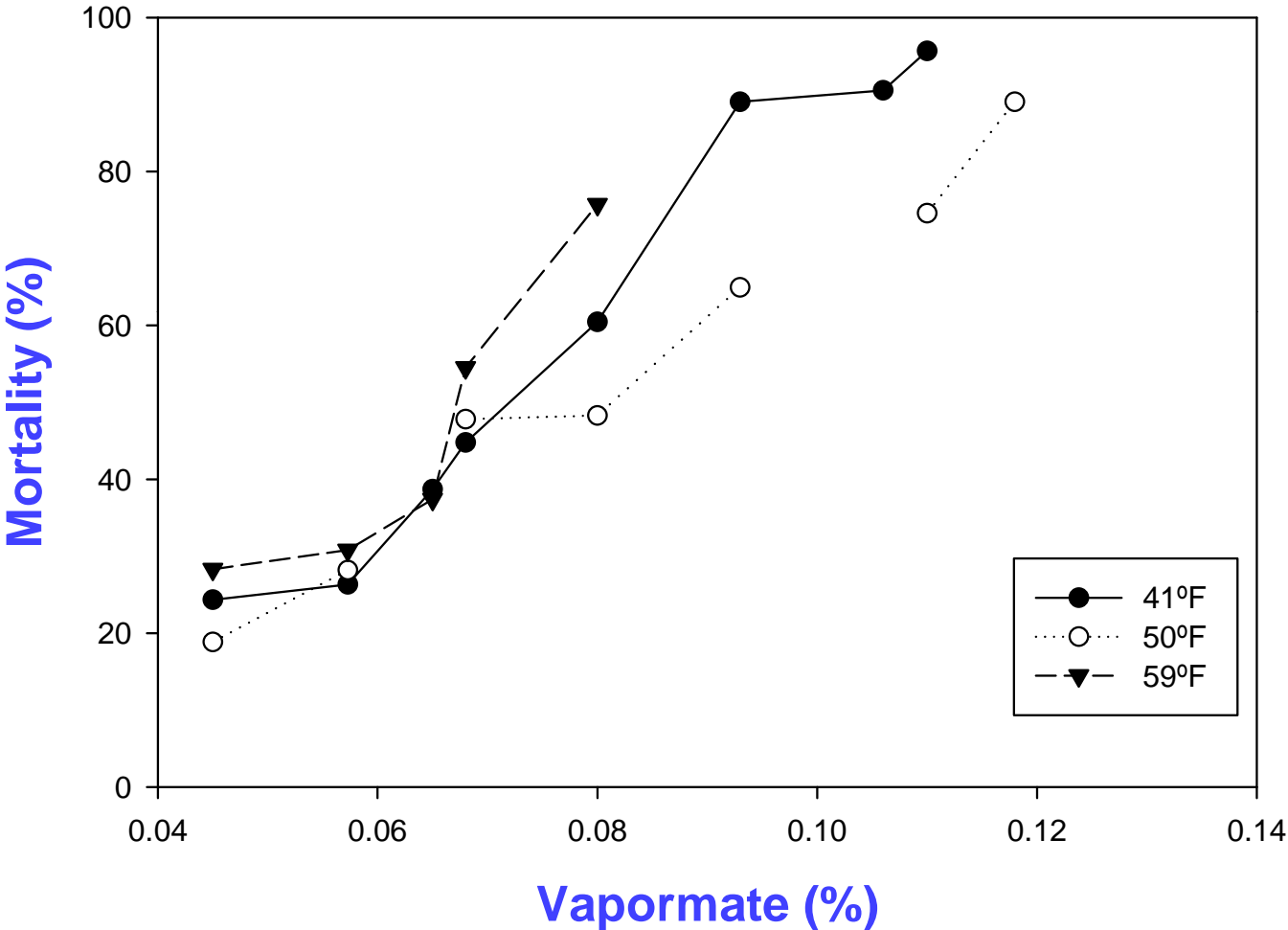
# Laboratory Test



# Developing Mortality Curve for Bean Thrips

- **Small scale laboratory work**
- **Very low concentrations being tested**
- **Infested oranges are kept at 41°F overnight and fumigated the next day**
- **Will develop data at 41°F to 59°F**
- **Mortality evaluation 24 hours after fumigation**

# Bean Thrips Mortality Curve

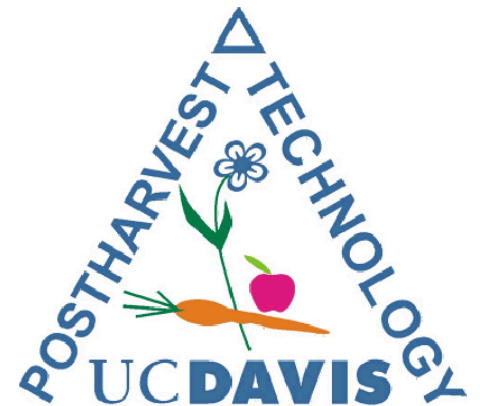


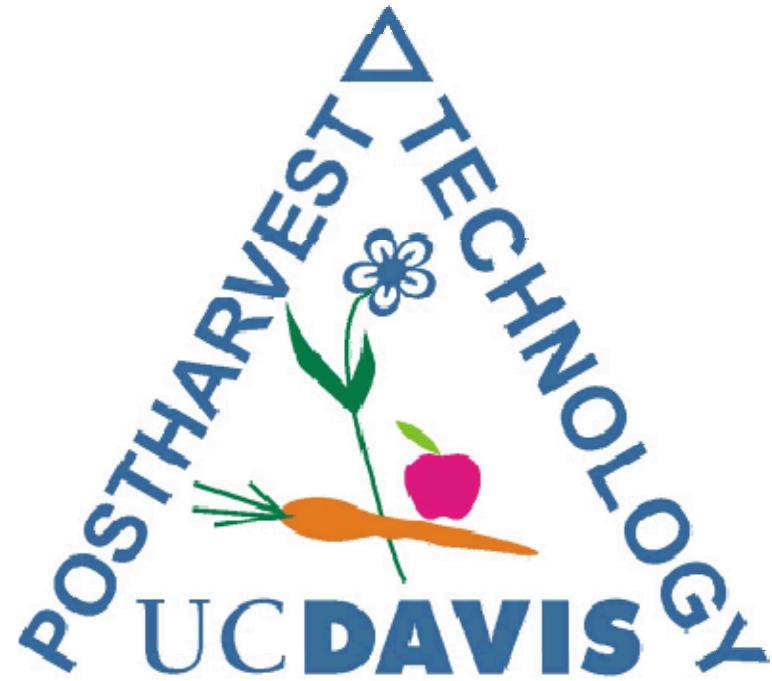
# Potential for Light Brown Apple Moth Control with Vapormate

- Efficacy towards light brown apple moth has been demonstrated in Australia
- Treatment to control all life stages has been determined at UC Davis and will be confirmed.

# Thank you

- California Citrus Research Board for your support
- Joseph Morse and Associates for their assistance
- Sunkist Growers for assisting in fruit procurement





Questions??