Invasive Ambrosia Beetle Conference
The Situation in California
August 12 – 14, 2012

Meeting sponsored by:

The Hofshi Foundation

University of California, Riverside

UC Center for Invasive Pest Research

The Huntington Botanical Gardens

The Los Angeles Arboretum

Invasive Ambrosia Beetle Conference
The Situation in California
August 12 – 14, 2012

Session 3

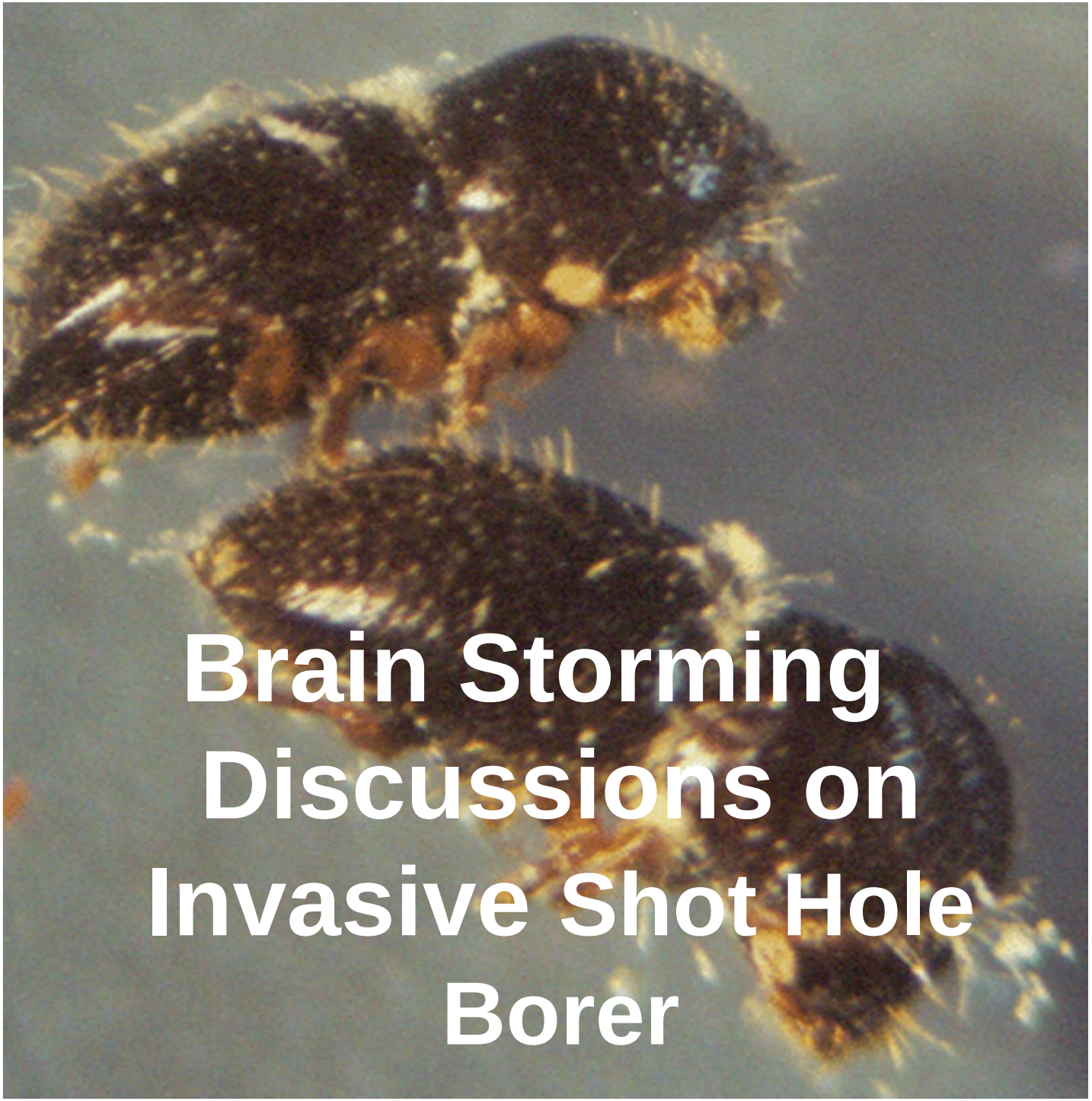
Biology of the Beetles

Non Chemical Management of Shot Hole Borer: Sri Lankan Experiences

Keerthi Mohotti

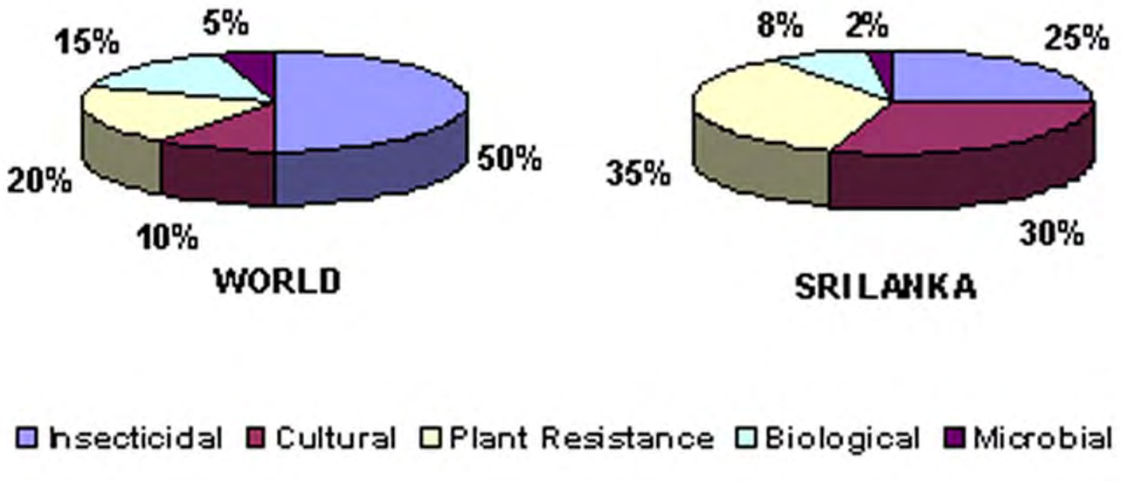
Head, Entomology & Nematology Division

Tea Research Institute of Sri Lanka



Brain Storming Discussions on Invasive Shot Hole Borer

Integrated Pest Management Assuring Cleanest Tea With Respect to Pesticide Residues

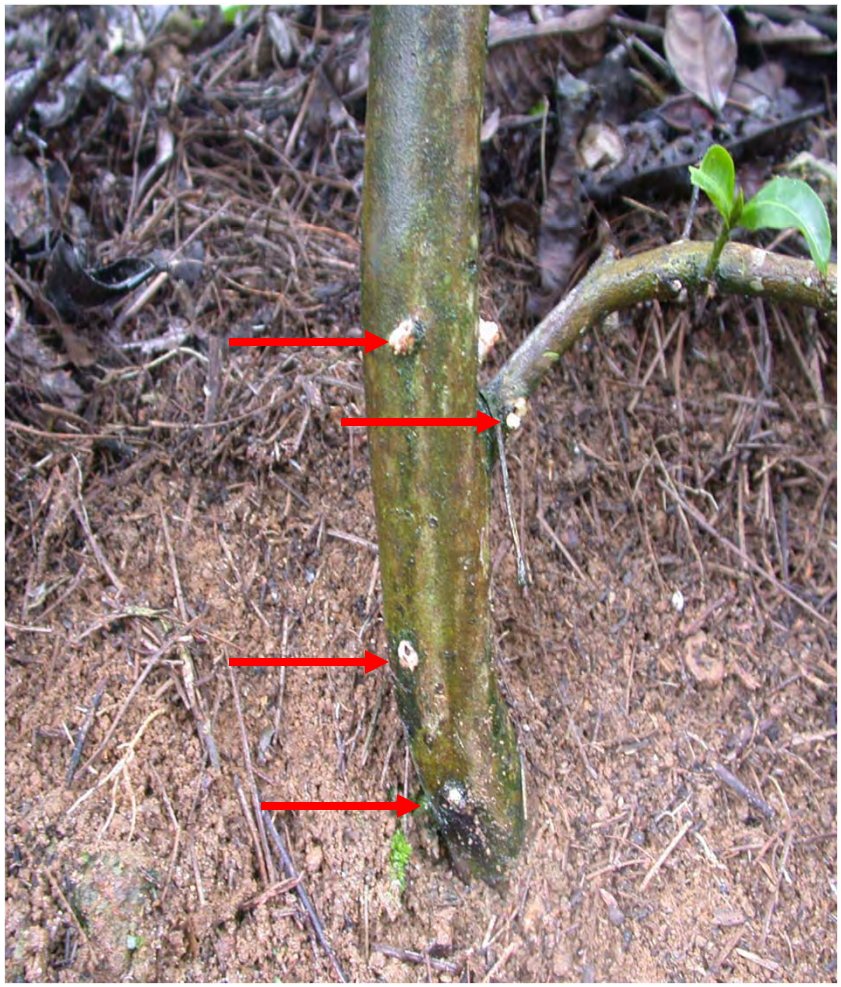


More rational and limited use of pesticides harnessing more of non chemical methods

Different stem sizes

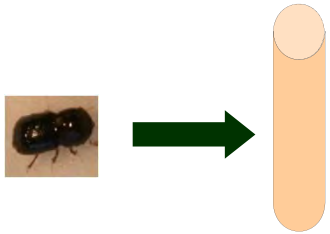
Different stem sizes

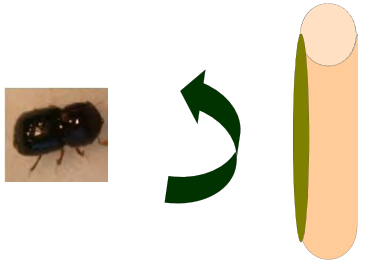
Protection of new clearings



Stem Protection

- Prophylactic stem protectants
- Sanitation pruning
- Bush health and vigour






Sanitation Pruning


Burial of Prunings /
Chipping prunes

Wound Dressing

Spraying

Biochemical and Physiological basis of susceptibility of tea cultivars

Branches in pencil thickness are most preferred by the beetles due to optimum moisture content 61% - 63%

Nodes are more favorable for boring due to high Alfa spinasterol content (Karunaratne, 2004)

- **Correlation between different levels of saponin and the degree of resistance.**
- **The relative amounts of alfa spinasterol and saponin Wickramasinghe *et al.* (1976)**
- **Substances interfered with hormonal activity during pupation and during spore formation of the ambrosia fungus.**

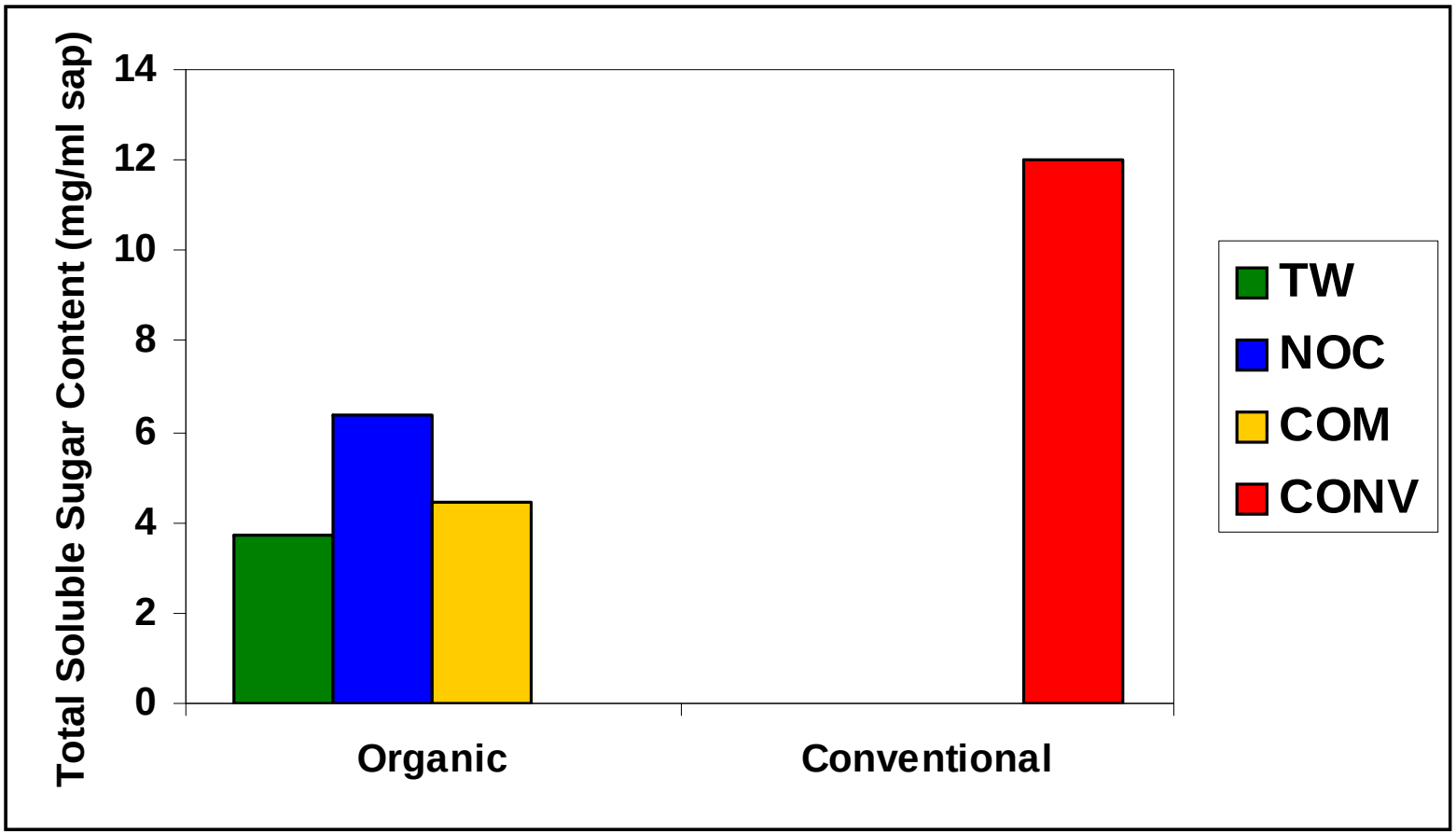
Biochemical basis in susceptibility of tea cultivars

Compound	Susceptible	Tolerant	Reference
alfa spinasterol	40 % high	low	Wickramasinghe (1973)
saponin	less	high	
Caffeine	low		Kumar et al. 1995
Polysaccharides sugars			Herath, 1995
Volatile compounds (5)			Abeysinghe, 1996
Volatile compounds (5)			Amarasinghe et al. (1999)

- Susceptibility to TSHB is related to saponin which complexing with a spinasterol unavailable to TSHB beetle as an ecdysone precursor
- Caffeine acts as phagostimulant to TSHB beetle but not under high levels
- Infected stems show increased levels of Caffeine
- High Caffeine levels in tolerant cultivars make toxic to ambrosia fungus and reduced fungal colanization; beetle survival impaired

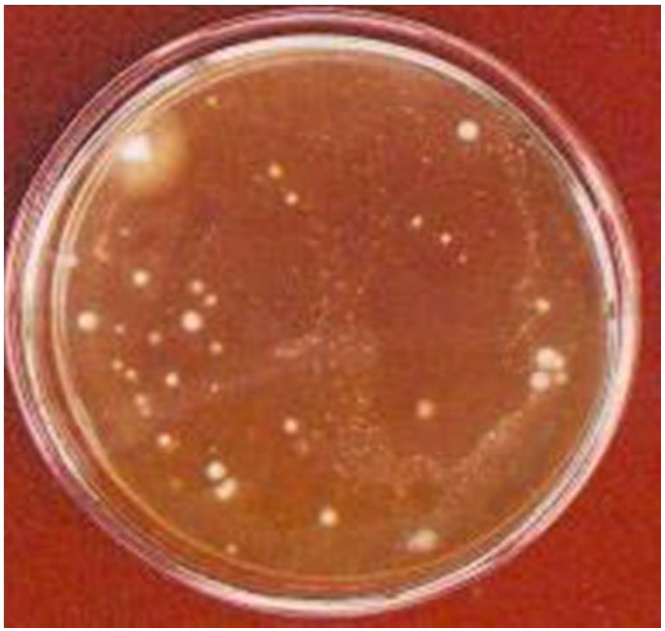
Experiences with organic tea cultivation

Total soluble sugar concentration in xylem sap



Association of *Ambrosia* fungus inside borer galleries (Total cfu)

Organic



4.23×10^4 a

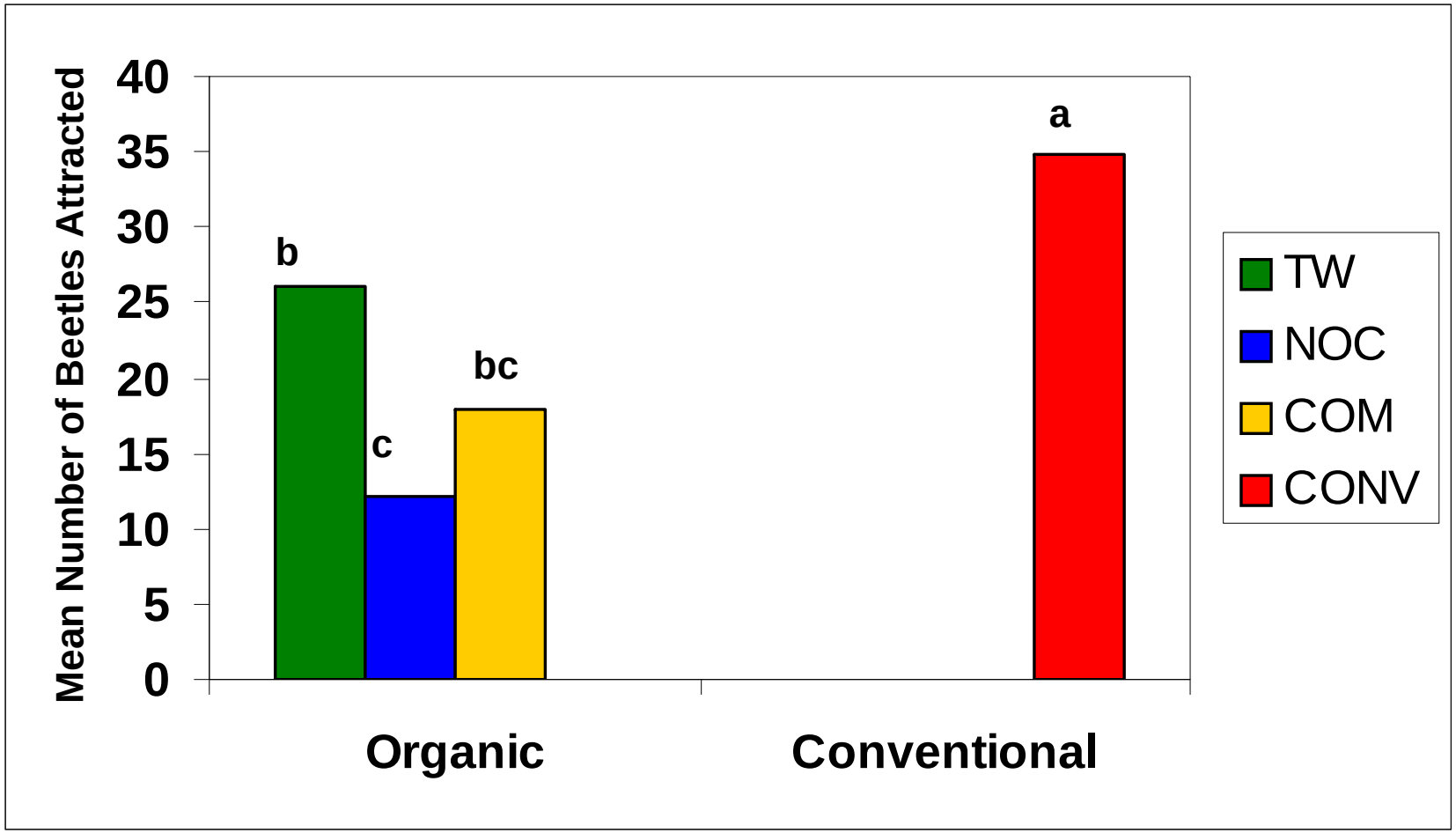
Conventional

6.83×10^4 b

Volatile compounds (Peak Area/10^7)

Compound	TW	NOC	COM	CONV
2-Furanmethanol, 5-ethenyltetrahydro-α,α-5-trimethyl-,cis	19.0	13.5	13.5	43.8
cis-Linaloloxide	36.4	23.4	31.0	79.7
Linalool	10.8	30.7	35.8	48.0
Bicyclo[2,2,1]heptan-2-ol,1,7,7-trimethyl-,(1S-endo)-Boneol 2-Amino-4-methylbut-2-ene-nitrile 1,3-Dimethyl-1-cyclohexane	5.5	38.8	2.0	15.7
Geraniol	2.3	3.0	3.4	9.2

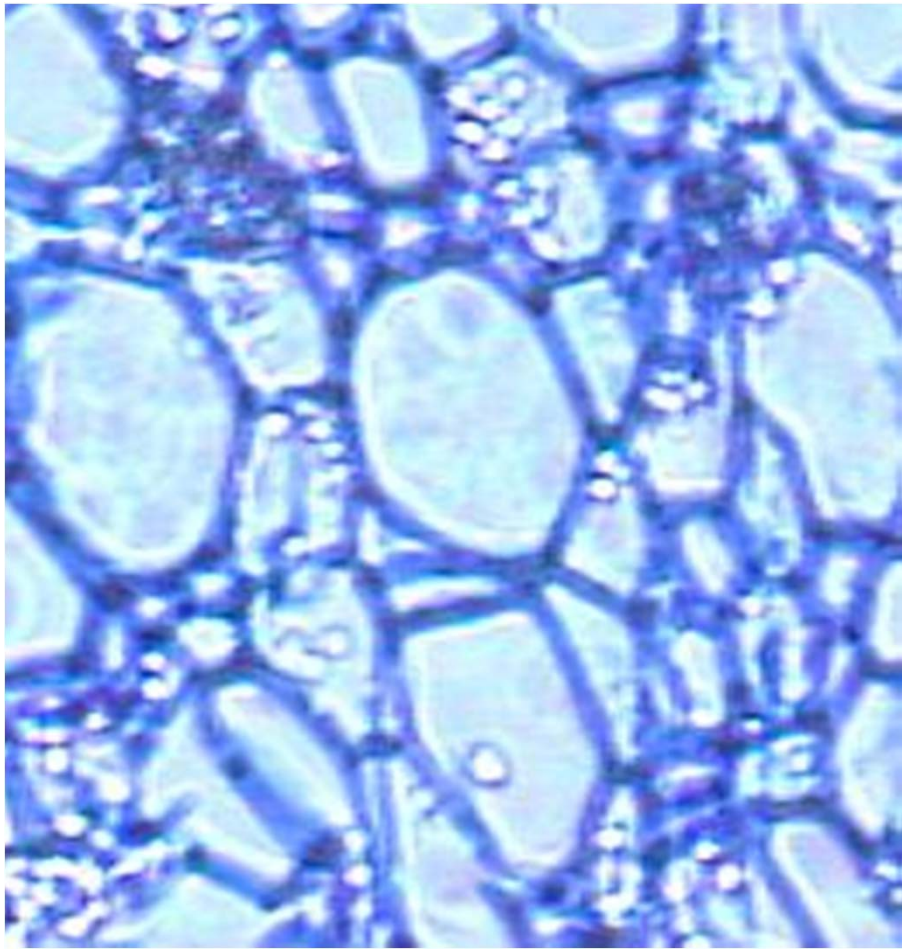
Attraction of beetles to volatile chemicals



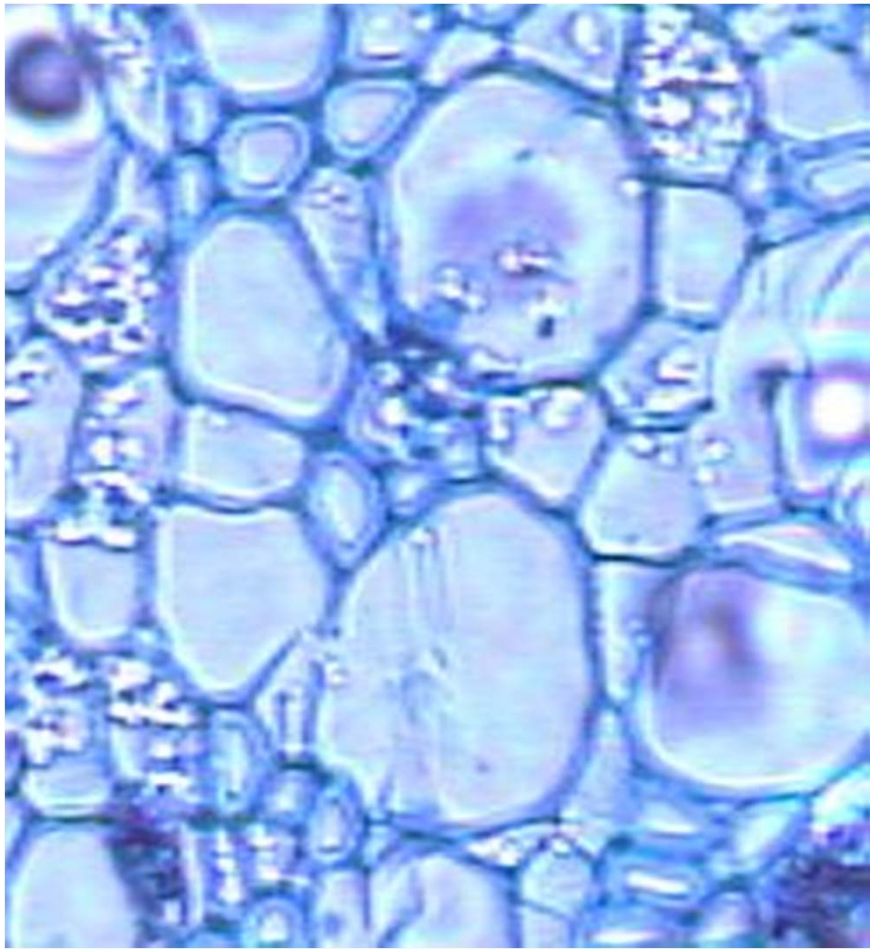
Shot-hole borer infestation
(Mean number of Galleries 30cm^{-1})

Management System	Type of manure	Total	Open	Healed
Organic	Tea Waste	1.89 ^{b}	0.68 ^{b}	1.21 ^{b}
	Neem Oil Cake	1.85 ^{b}	0.75 ^{b}	1.08 ^{b}
	Compost	2.59 ^{ab}	1.07 ^{a}	1.52 ^{ab}
Conventional		3.06 ^{a}	0.94 ^{ab}	2.11 ^{a}

Xylem tissue Histology



ORG × 10



CONV × 10

Non Chemical Management of SHB

1. TSHB incidence is widespread; damage occur in nurseries, new clearings and young tea.
2. Host range is wide despite resistant and tolerant tea cultivars.
3. Poor establishment and growth, yield loss and bush architecture.
4. TSHB is attributed to bush debilitation and unusual yield declines.
5. Chemical control is uneconomical as well pose limitations owing to International market restrictions.
6. IPM is strengthened through on exclusion of possible critical points for SHB infestation, bush health and stem protection by GAPs.

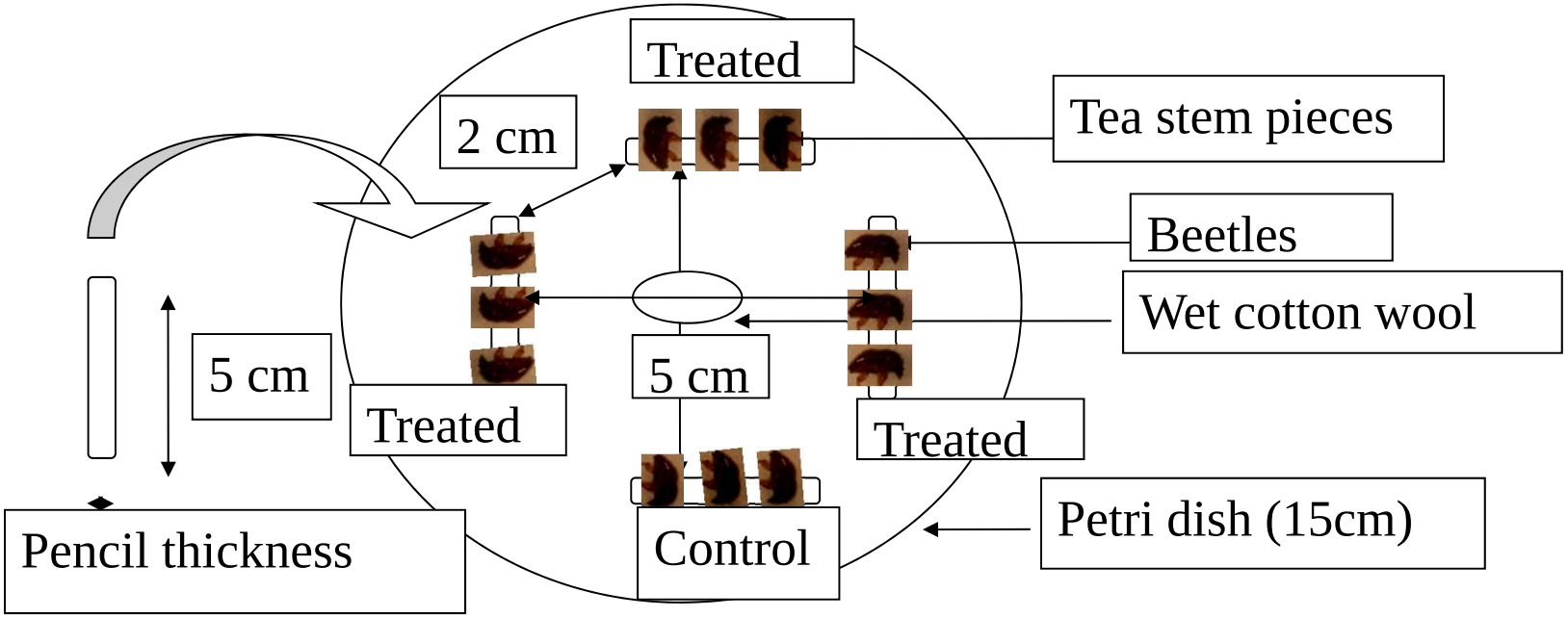

17 JUNE 21

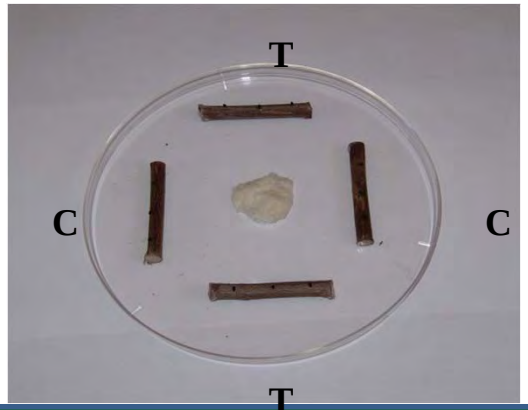
Points to consider during the Brainstorming Discussions

1. Host range clearance
2. Resistance, tolerance and susceptibility mechanisms
3. Recognition of critical points in Avocado cultivation
4. GAPs for better control
5. Collaborative links and exchange of expertise


Thank You

Bioassay methods





Shot hole borer