Scolytines attacking coffee berries in Hawai‘i

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Coffee in Hawaiʻi
Presence of two scolytines attacking coffee berries

Black Twig Borer (BTB)
*Xylosandrus compactus*

Coffee Berry Borer (CBB)
*Hypothenemus hampei*
Black twig borer (BTB) *Xylosandrus compactus* (Coleoptera: Curculionidae)

- Native to Asia and found in Honolulu in 1960 attacking pink tecoma (*Tabebuia pallida*).
- BTB is an ambrosia beetle which infects the plant with the fungus *Fusarium solani*, which kills the twig.
- BTB is highly polyphagous, reported from >200 hosts, including native plants such as the valuable timber species *Acacia koa*.

Photograph by: Lyle J. Buss, University of Florida
Life cycle and damage of BTB

Ambrosia fungus: resource of food for BTB

Eggs (3-5 d)
Larvae (7 d)
Pupae (6 d)

Brood chamber up to 70 BTB

The wilted leaves and bark beyond the affected area turn brown or black
Coffee berries new host for BTB

Black Twig Borer Inside coffee branch

Black Twig Borer Attacking coffee berry

Black Twig Borer Damage to coffee seed
Use of traps and lures for BTB

### Treatments

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>ETOH</th>
<th>ETOH-PHERO</th>
<th>Eugenol</th>
<th>Alpha-pinene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>0</td>
<td>20</td>
<td>40</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>+/- SE</td>
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### Traps

<table>
<thead>
<tr>
<th></th>
<th>JBT</th>
<th>MFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>800</td>
<td>200</td>
</tr>
<tr>
<td>Number</td>
<td>+/- SE</td>
<td></td>
</tr>
</tbody>
</table>

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Japanese Beetle Trap

Multiple Funnel Trap
Use of repellents for BTB

Control  Verbenone  Limonene

Total number of beetles +/- SE per trap

0  500  1000  1500  2000  2500

Repellents

Total number of beetles +/- SE per trap

Control  Verbenone  Limonene

Repellents

a  b  b
Effect of Imidacloprid on BTB

![Bar chart showing the mean number of infested coffee branches per tree ± SE for Control, Provado, and Admire across different months (Oct, Nov, Dec, Jan, Feb, Mar).]
Coffee Berry Borer (CBB) *Hypothenemus hampei* (Coleoptera: Curculionidae)

- CBB is the most economically important coffee pest worldwide.
- Endemic to Central Africa and now distributed throughout all coffee producing countries in the world, with the exception Papua New Guinea,
- CBB was reported in South Kona, HI in August 2010.
Presence of CBB in Hawai‘i
Biology and damage of CBB

- The female lays an average of 30 to 70 eggs
- Life cycle: ~25 to 35 days
- Fertilized females stay on the berries for 3 or 4 days then leave the coffee bean for another.
- The female can live up to 282 days.
Use of lures and traps for CBB

- Attractant: methanol : ethanol 3:1
- 8 traps are recommended in 1 acre
- The traps can catch around 12,000 CBB per day per acre when coffee berry density is high.
Potential natural enemies of CBB in Hawaiʻi

*Cryptamorpha desjardinsi*

*Bigheaded ant Pheidole megacephala*

*Beauveria bassiana*
Seasonal fluctuation of *Hypothenemus birmanus* and implications for IPM of CBB
Practices for an integrated management for the Coffee Berry Borer (CBB)

- Fallen coffee berries
- Eggs
- Larvae
- Pupae
- Adult

- Pruning
- Beauveria bassiana

- Trapping

- JAN
- FEB
- MAR
- APR
- MAY
- JUN
- JUL
- AUG
- SEP
- OCT
- NOV
- DEC

- Dormancy
- Flowering
- Fruit Development
- Harvesting
Summary

- BTB typically lives inside branches and feeds on ambrosia fungus and this is the first report of the coffee berry as feeding habit for this species.

- The shift to attack coffee berries as alternative host tissue for BTB might be explained as a response of high beetle populations and high temperatures during summer.

- JBT baited with 95% ETOH is an effective attractant of BTB.

- Verbenone is an effective repellent of BTB. It does not remove insects from the system but it could potentially be part of a management system that reduces dispersal into coffee by beetles.
Summary

- Baited traps can be used as a monitoring tool for BTB and CBB and might work as a mass trapping tool.

- Potential natural enemies for BTB and CBB are *Chryptamorpha desjardinsi*, *Pheidole megacephala*, *Canthartus* sp. and *Beauveria bassiana*. 
Future research

- Study the seasonal fluctuation of CBB - a key factor in an IPM program.

- Determine level of infestation and yield losses of CBB at different elevations.

- Determine the efficacy of *B. bassiana* on CBB present in fallen berries and berries on the trees.

- Search for more natural enemies and determine their effectiveness on BTB and CBB.
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