Coffee berry borer in Kona:
alternate hosts and alternative approaches

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Origin: Africa **Distribution**: worldwide

REVIEW ARTICLE

A review of the biology and control of the coffee berry borer, *Hypothenemus hampei* (Coleoptera: Scolytidae)

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El Colegio de la Frontera Sur, Apdo. Postal 36, Tapachula, Chiapas, México

Table 1. Alternative host plants of *Hypothenemus hampei*.

Specific name	Family	Reference	Reproduction reported	Feeding only reported
Coffea canephora Pierre ex. Fröhner.	Rubiaceae	[1], Le Pelley, 1968 Various authors	•	•
C. arabica L.				
C. *dewevrei*				
C. dybowski				
C. excelsa				
C. liberica W. Bull ex Hiern				
Ixora sp.	Rubiaceae	[1]	•	•
Psychotria luconiensis (Cham. & Schitdl.)	Rubiaceae	[1]	•	•
Oxyanthus sp.	Rubiaceae	[3], Decazy, 1990	•	•
Cleome rutidosperma DC.	Capparidaceae	[1]		•
Passiflora foetida L.	Passifloraceae	[1]		•
Rubus rosaeflorus Hook.	Rosaceae	[1]		•
Rubus sp.		[3]		•
Eriobotrya japonica (Thunb.)	Rosaceae	Urbina, 1987		
Zea mays L.	Poaceae	Urbina, 1987	•	
Cola sp.	Sterculiaceae	Friederichs, 1922		
Ricinus sp.	Euphorbiaceae	Urbina, 1987		•
Hibiscus sp.	Malvaceae	[3]		•
Gossypium hirsutum L.	Malvaceae	Urbina, 1987		
Dioscorea sp.	Dioscoreaceae	[1]	•	
Operculina turpethum (L.)	Convolvulaceae	[1]		•
Ligustrum pubinerve (?)	Oleaceae	[3]		•
Vitis lanceolaria (Roxb.) Wall.	Vitaceae	[3]		•
Dialium sp.	Fabaceae	Le Pelley, 1968	•	
Dialium lacourtianum De Wild ex. Vermoesen		Decazy, 1990	•	
Caesalpinia pulcherrima (L.) Sw.	Fabaceae	[1 3]		•

Grant proposal: **"Entomologists in other areas of the word have documented seasonal CBB refugia in many other host plants, especially in the Fabaceae and Rubiaceae (Damon et al. 2000)"**

Comment [18]: No, no, no, no!!!! Damon didn't look at the original papers. The research she reports was incredibly mediocre. This entire section is something I'm surprised to see here. If the insect

Comment [29]: I wouldn't do this. It is based on unreliable literature. As I said above, if the insect had alternate hosts, it would be known. This is raising a false alarm and implies the insect feeds on

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THE BIOLOGY OF COFFEE BERRY BORER *HYPOTHENEMUS HAMPEI* (FERR.) (SCOLYTIDAE, COLOEPTERA) AND ITS INCIDENCE IN THE SOUTHERN TAGALOG PROVINCES[1]

B. Morallo-Rejesus and E. Baldos[2]

TABLE 2. Host plants tested for feeding in the laboratory[a].

Family and Scientific Name	Mean Days of feeding
Caesalpinaceae	
Cassia occidentalis L.	14.83
Caesalphinia pulcherrima (L.) Sw.	13.10
Capparidaceae	
Cleome rutidosperma DC.	1990
Convolvulaceae	
Operculina turpethum (L.) Manso	11.25
Mimosaceae	
Acacia rugata (Lam.) Ham.	9.23
Leucaena leucocephala (Lam.) de Wit	14.95
Mimosa pudica L.	4.70
Papilionaceae	

Alternate Host — Pods of plant species belonging to the genera of coffee and other plants that were adjacent to the coffee plantations in Bay, Laguna; in Lipa Batangas; in Tiaong, Quezon and Amadeo, Cavite were collected especially during the non-bearing and flowering months of coffee trees and examined in the laboratory for presence of the pest.

Alternate Hosts. Eggs, larvae and pupae were found on ipil-ipil (*Leucaena leucocephala*), madre de cacao (*Gliricidia sephum*), tagpo (*Psychotia luzonensis*), patani (*P. launatus*) (wild type) and pakit (*Discorea luzonensis*)

Alternate host plants in Kona…..?

Cesalpinia sp. (Fabaceae)

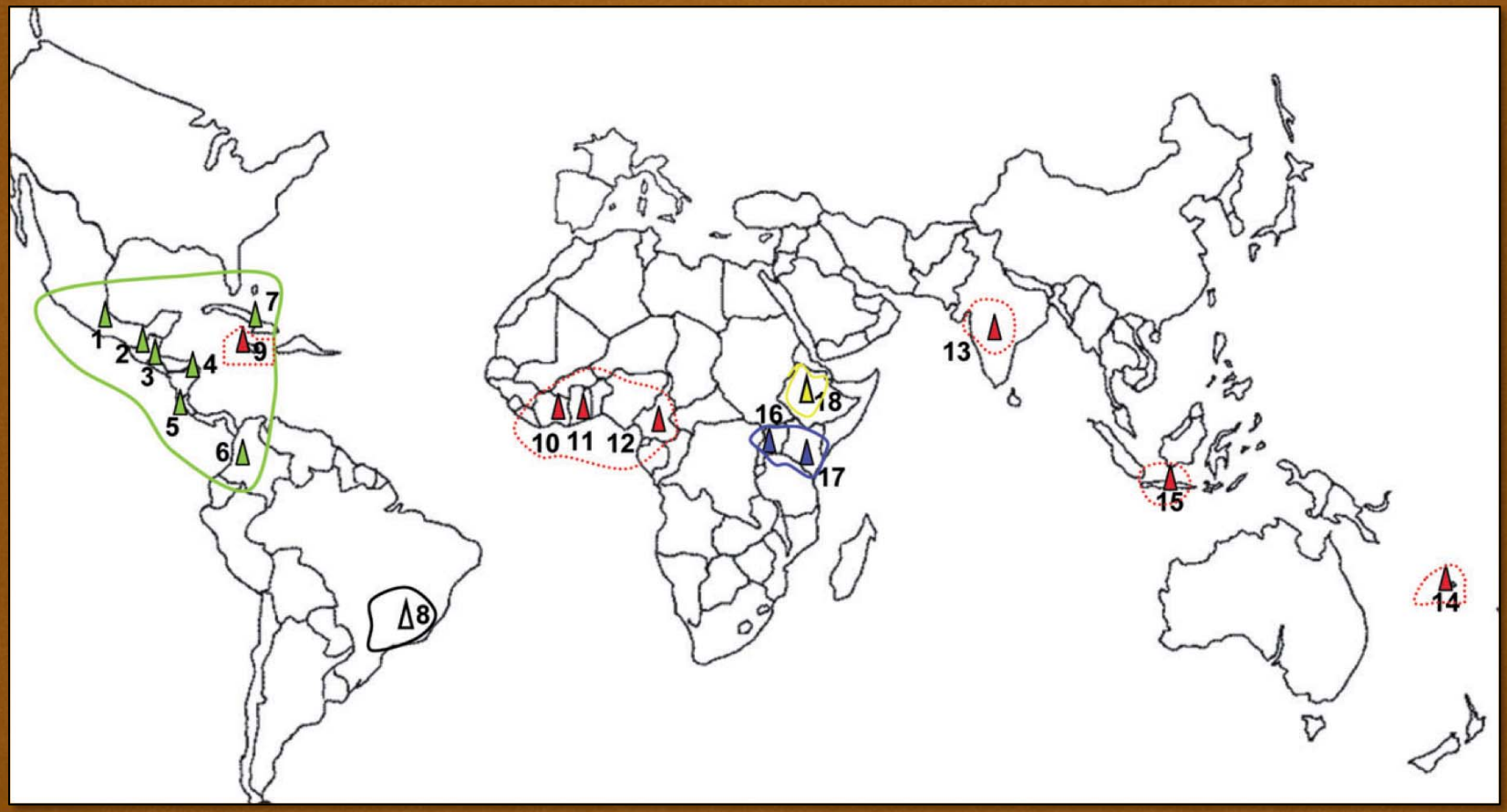
Desmodium sp. (Fabaceae)

Euphorbia cyathophora
Euphorbiaceae

Eugenia uniflora
Myrtaceae

Host Plant	Plant family	Common name	Amount of seed (grams)	CBB dissected	CBB in Berlese
Cajanus cajan	Fabaceae	pigeon pea	301.6	0	0
Cesalpenia pulcherrima	Fabaceae	dwarf poinciana	65.0	0	0
Chamaecrista nictitans	Fabaceae	partridge pea	52.0	0	0
Crotalaria incana	Fabaceae	shake shake	334.8	0	0
Crotalaria pallida	Fabaceae	smooth rattle pod	12.1	0	0
Crotolaria sp.	Fabaceae	rattle pod	26.0	0	0
Delonix regia	Fabaceae	flame tree	96.2	0	0
Desmodium intortum	Fabaceae	tick trefoil	8.4	0	0
Desmodium sp.	Fabaceae		88.3	0	0
Desmodium tortuosum	Fabaceae	Florida beggarweed	43.0	0	0
Erythrina x bidwilli	Fabaceae	coral tree	158.4	0	0
Eugenia uniflora	Myrtaceae	Surinam cherry	753.2	0	0
Euphorbia cyathophora	Euphorbiaceae	wild poinsettia	41 seeds	0	0
Euphorbia heterophylla	Euphorbiaceae	Mexican fireplant	16.8	0	0
Indigofera suffruticosa	Fabaceae	wild indigo	104.9	0	0
Ixora sp.	Rubiaceae	ixora	16.0	0	0
Leucanea leucocephala	Fabaceae	haole koa	2,528.5	0	**3**
Passiflora edulis	Passifloraceae	lilikoi	403.4	0	0
Passiflora tarminiana	Passifloraceae	banana poka	78.6	0	0
Pentas lanceolata	Rubiaceae	star flower	9.4	0	0
Pritchardia sp.	Arecaceae	loulou palm	392.5	0	0
Schefflera arboricola	Araliaceae	dwarf schefflera	196.8	0	0
Schinus terebinthefolius	Anacardiaceae	Christmas berry	5.2	0	0
Senna sp.	Fabaceae		173.0	0	0
Strongylodon macrobotrys	Fabaceae	jade vine	122.1	0	0
Vigna speciosa	Fabaceae	wandering cowpea	41.0	0	0

Hypothenemus hampei: one species or several ?



Gauthier (2010)

Haole koa (*Leucaena leucocephala*)… is it important?

Haole koa (*Leucaena leucocephala*)… is it important?

Coffee fruiting on farms is not well synchronized

Some berries drop during harvest, or dry to raisins

There are many abandoned or unmanaged coffee farms

There is a great deal of wild (feral) coffee in ravines

One thing everyone agrees on: sanitation is important for CBB management

Table 2E. Monthly Wages in Agriculture, Hunting, and Forestry,[1] U.S. Mainland Market Competitors of Hawai'i (U.S. Dollars)

Rank	Country	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Average
1	Hawai'i				1,856.00	1,904.00	1,944.00	1,932.00	2,060.00	2,180.00	2,276.00	2,348.00	2,062.50
	U.S.	1,260.00	1,360.00	1,388.00	1,484.00	1,496.00	1,588.00		1,608.00	1,688.00	1,648.00	1,776.00	1,529.60
2	Australia	1,100.62	1,210.36	1,089.96									1,133.65
3	Italy												798.59
4	Costa Rica	198.34	222.67	216.26	206.39			236.86	217.53			196.98	213.58
5	Brazil	274.32	183.42	182.69	161.60	140.14							188.43
6	Mexico	114.17	127.50	149.27	180.49	184.16	181.06	183.13	204.62	214.95	228.23	239.09	182.42
7	Colombia					61.84	79.52	165.68	113.53	136.90	155.54		118.84
8	Philippines	89.92	111.51		106.92		115.69		132.74				111.36
9	Thailand				47.08	131.04	56.54			81.29	95.15		82.22

Notes: [1] Published data are in local currency units. Conversion to U.S. dollars was done using the published official exchange rate from the World Bank.
Sources: Country data are from LABORSTA-ILO (http://laborsta.ilo.org)
Data for Italy are from agri-info.eu (http://www.agri-ifo.eu). Hawai'i data are from the 2008 Employment and Payrolls in Hawai'i.

Parcon *et al*. (2011)

Other approaches to CBB control:

Newer chemicals (cyantraniliprole, tolfenpyrad, imidacloprid, kaolin)

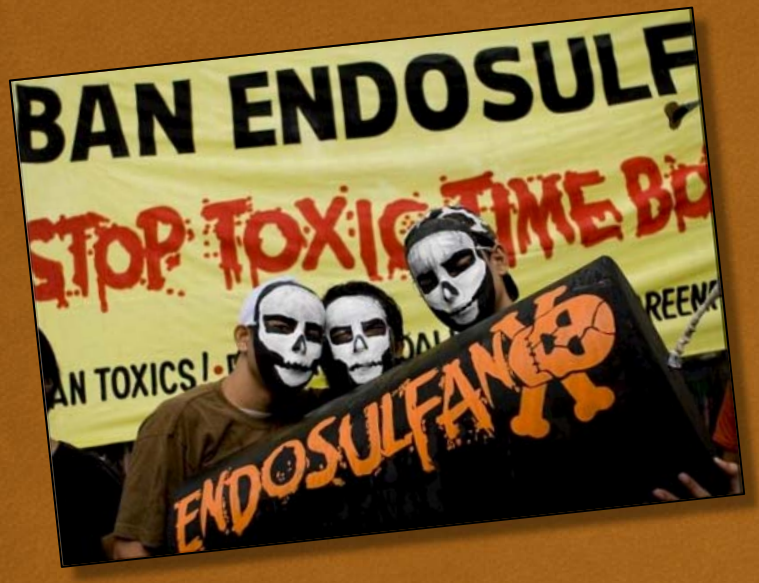
Mixtures of different *Beauveria* strains

Importation of parasitoids

Oviposition deterrents (azadirachtin, eugenol)

Conservation biocontrol (shade, ground cover management)

GMO coffee?



Endosulfan at 1.5 kg ha had a marked and extended period of protection by repellency. Sponagel (1994)

Neem oil ….65% mortality was observed after 3 applications; and a repellent effect was noted, ~80% of berries showing signs of having been rasped only superficially. Schmutterer (1990)

Oviposition deterrence….?

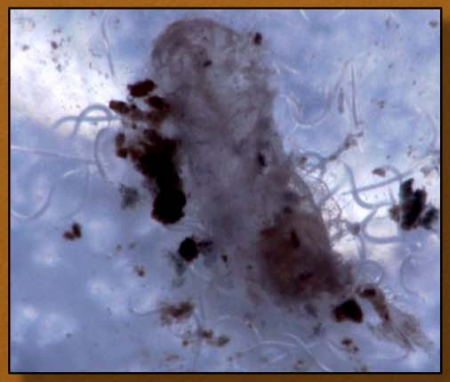
Table 1. Repellency Assay (Blue = significant difference between means.)

Conc (ul/ml)	Repellency (%)	Treatment mean (# of CBB's)	Control mean (# of CBB's)	ANOVA p value
Eucalyptus Oil				
1.0	1.82	10.8	11.2	0.64
10.0	5.36	10.6	11.8	0.216
20.0	9.47	8.6	10.4	0.037
50.0	32.04	7.0	13.6	0.0001
Rosemary Oil				
1.0	-11.83	10.4	8.2	0.03
10.0	16.85	7.4	10.4	0.062
20.0	18.28	7.6	11.0	0.057
50.0	-1.03	9.8	9.6	0.803
Eugenol				
1.0	-10.89	11.2	9.0	0.321
10.0	11.76	9.0	11.4	0.0076
20.0	27.27	7.2	12.6	2.04E-06
50.0	67.68	3.2	16.6	6.22E-08
Neem Oil				
1.0	13.73	8.8	11.6	0.015
10.0	17.65	8.4	12.0	0.008
20.0	21.90	8.2	12.8	0.002
50.0	38.00	6.2	13.8	2.57E-05

Biocontrol is already happening....

ants

thrips



nematodes

Effects of shade……?

What you can do.

- Reduce heavy shade*
- Prune coffee to keep the bush as open as possible*

**to create a less humid environment for the beetle*

Coffee grown under shade has increased levels of biodiversity when compared to non- shaded coffee.

Perfecto et al., 1996; Greenberg et al., 1997a, 1997b; Moguel & Toledo, 1999; Hietz, 2005; Armbrecht & Gallego, 2007; Philpott et al., 2008.

The value of pest control provided by birds (via increased yield) to farmers in Jamaica was ~12% of total crop worth.

Johnson et al. 2010 Animal Conservation 13: 140–147

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