Ecological Pest Control in Cocoa in SEA – A Narrative

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Valuable ecological categories

Pests in prevailing agronomic practice

Key: virtually always a problem

Occasional: usually scarce or absent, but flare up from time to time

Induced: never common except if environmental disruption (generally pesticides)

ECOLOGICAL PESTICIDE CATEGORIES

Disruptive – tend to kill natural enemies more than pests. Usually –

- broad spectrum
- contact
- long residual

Selective – usually lack one of those characteristics

Cocoa: induced pests can occur, but agroecosystem very stable. Several chemicals disruptive in other crops can be used.

MORE SPECIFICALLY -

Severe induced flare ups in Sabah in late 1960s – endrin, dieldrin

Used without repercussion – BHC, synthetic pyrethroids

However – some disruption risk, residues, worker toxicity, cost, effectiveness.

Many reasons to minimise applications

COCOA KEY PESTS IN SEA

- ***Helopeltis* spp**
- **Cocoa Pod Borer (CPB)**

Narrative account of my experience with control and R&D with these – toward minimising chemical usage

Concluding: most effective approach with present techniques

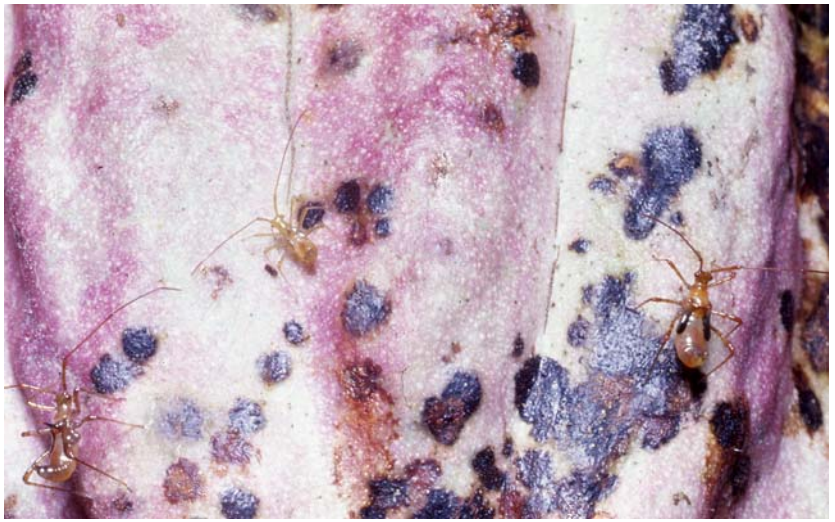
Areas where further R&D needed/could give best impact on procedures

Emphasise – an opinion

Helopeltis – theivora (= *theobromae*) in Sumatera, Borneo Peninsula Malaysia

- *bradyi* in Java

Inevitable build up if treatment stops, to severe defoliation



Chemical against *Helopeltis*

Essentials for good kill –

- **thorough blanket coverage**
- **at least one repeat application after two weeks (=“treatment”)**

Best results – monitoring response

Eg divide field into small plots (say 10x10 bushes at present spacing). When central (census) bush has +ve sign:-

- **Treat any +ve plot on response (avge 1 - 1.5 treatments/year)**
- **Treat whole fields when threshold 25% or more plots +ve (avge 2 treatments/year)**

Calendar spray – done eg at 2-monthly (6 treatments/year) but based on (false) idea that controls CPB also

SPRAY APPLICATION

Shoulder mistblower

Tractor drawn

Helicopter

HELOPELTIS CHEMICAL R&D NEEDS

- Test any available chemicals with potentially good profile
- Evaluate response system for pattern of plot infestation – random or variable subjectivity
- Spot spraying -frequent low dose directed to pods only (linked to assumption that controls CPB too, which needs testing)

HELOPELTIS - BIOLOGICAL

Black Ants – old method shown to be effective

Must be supported properly. Not compatible with chemicals

Top: tending mealybugs

Below: nest in place

HELOPELTIS – BIOLOGICAL, R&D NEEDS

Exact relationships - eg repels the pest, or consumes it?

Does it establish spontaneously especially in young plantings

Mealybugs & virus transmission

HELOPELTIS - PHEROMONE

Attraction of males to virgin females recently demonstrated

R&D Needs

Use of such traps in monitoring

Isolate any pheromone and synthesise

COCOA POD BORER

Regular Complete Harvesting (RCH)

Is effective to keep infestation (ie % pods infested) down to about 50% or less.

If done properly! Emphasise COMPLETE

This shown in trials and field practice

Trials may include a follow up harvester

Problem assessing CPB infestation

Sample – more often than not, by harvesting separately

Definition of what is lost or “wasted” not consistently defined, but refers to pods with unextractable beans

Usually, at around 50% infested, wasted is 1-2% BUT sometimes can be up to 25%

Excessive proportion wasted

Inspection shows many ***"unextractable"*** pods have low or no infestation.

Often ***unripe*** – "precautionary" harvesting.

Loss from other causes included

IMPLICATIONS OF HIGH "WASTED"

Big variation in subjective interpretation of severity of CPB (usually too high)

Need – repeatable representative sampling and assessment method.

Two tier –

- infestation grade of pod, zero to heavy,
- with extractability separate within each (& some indication of non-CPB cause of unextractability)

R&D needs for RCH

- Harvester payment systems
- Higher infestation and waste in low crop periods
- Practicalities – perceived as difficult (especially for smallholders). But is it more so than any other possibility that requires regular action/control??
- Nothing else effective yet found

CPB Chemical control

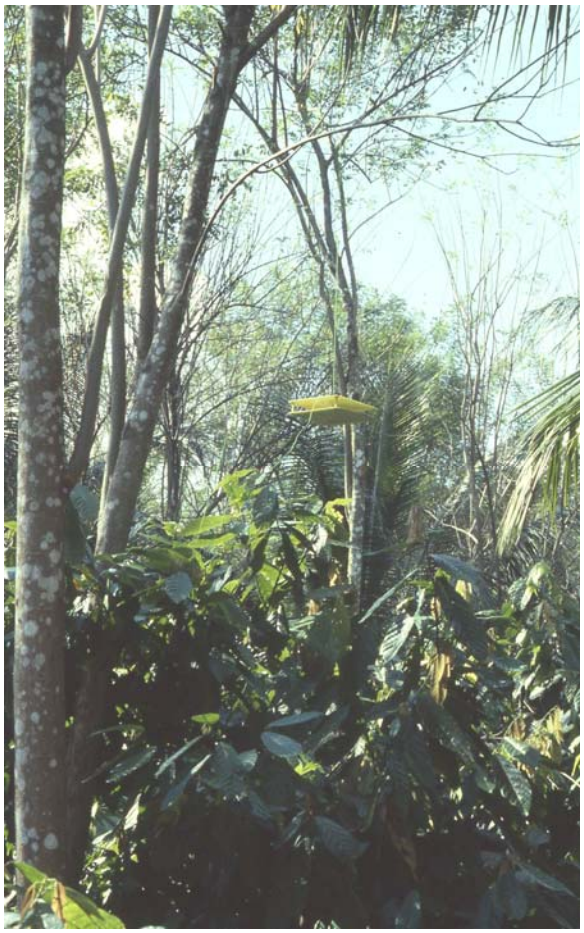
Lots of trials, nothing consistently effective yet found.

R&D NEEDS

- Stages should be susceptible, so what is the problem?
- Recheck spot spraying

CPB Pheromone control

Early extensive studies in Sabah not positive



Recent trials

Many caught, no evident effect on infestation.

R&D needs

Further work on field application, trap density

CPB Biological control

Black ants: small consistent reduction (?)

Egg parasites (Sabah): long term mass rearing project – no cost effective benefit

Parasites of *Conopomorpha cramerella*: good natural control on other plants SEA. Some collection from outer regions & release (not much detail known). No dramatic effect, as would be expected if any potential.

Need – DNA confirmation of species status

CPB Biological control 2

Exotic parasites ?

- There may be effective parasites of pod boring caterpillars in S America and Africa.
- Would be adapted to cocoa environment unlike those in SEA.
- Several success stories exist of imported parasites controlling “unfamiliar” hosts.

CPB resistant cocoa control

There is some evidence of certain genotypes having resistance – specifically a thick sclerotic layer to hamper emergence of mature caterpillars.

R&D Needs

- **Look for consistent clonal difference in ratio entry to emergence holes**
- **Any other character**
- **Long term as would need large scale testing.**
- **But would be independent of specific ongoing control action**

CPB other possible control methods

Sleeving – works but more effort than RCH, and ?cost effectiveness

“Rampassen” – intended to break cycle, but what advantage?

Light traps?

Conclusions 1

Keep bushes regularly in good shape

Helopeltis now

Chemical

- *Good coverage*
- *Two week repeat*
- *Response system, preferably small plots*
- *Avoid calendar if possible*

Biological

- *Ants – proper attention; not compatible*

Conclusions 2

Helopeltis R&D needs

Pheromones – continue

Ant/virus/mealybug linkage – investigate

Chemicals – test any new possibilities

recheck “spot spraying”

Conclusions 3

CPB – CURRENT KNOWLEDGE

- Apply RCH
- Make sure assessment is representative of harvest, and cause of loss
- Payment system to encourage complete recovery

CPB – R&D NEEDS

- Search for parasites in S America & Africa
- Continue to look for resistance characters and test
- Continue work on chemicals, lures, and others