Pesticides for cocoa: Saviour, interim Solution or Side-track?

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Developing Good Agricultural Practice (GAP) in cocoa

Many cocoa farmers decide to use pesticides

…some of which (especially insecticides) are toxic

They are often applied highly inefficiently

The fastest, most obvious way to mitigate this situation is:

– better selection of control agents
– more efficient application
Pesticides: the issues

- Residues, MRLs
- Withdrawal of traditional compounds under EU/91/414 etc.
- What do we replace them with?
- Application: operator safety
- Farmers’ skills
- (cost effectiveness)
- Environmental concerns (perception and actual impact)
Scientific Approach: 
**Rational Pesticide Use (RPU)**

targeting ...
Collaborators: Field sites

Ecuador: INIAP  
Moniliophthora (2 spp.)

Brazil: CEPLAC, Almirante  
M. perniciosa

Costa Rica: CATIE/CABI  
M. roreri

Cameroon: IRAD  
P. megakarya

Ghana CRIG ?  
Mirids ?

Indonesia: Prima, Sulawesi CPB  
BLRS Sumatra CPB + Helopeltis

- Developing capacity to improve local production, formulation and application of bio-control agents
- Application and evaluation of chemical control agents
Black pod fungicides: PHIs, residues, costs?

Do not use within 30 days of harvest.
INIAP 2005 / 06

- Evaluation of chemical and biological agents on *Moniliophthora* diseases

- Active spore traps to improve timing of application?
**copper hydroxide (c.f. controls): increase in dry wt. 283 Kg
if value = $377; total costs = $149 ($45 fungicides)
Profit = $228 / ha (benefit / cost = 2.7)
CPB: the Rational Use of Insecticides

“pesticides are ineffective at reducing [CPB] infestation”

92% of Sulawesi farmers (that spray insecticides for CPB) can’t be wrong …

… or can they?
Insecticides that Sulawesi farmers spray

- Endosulfan: 16%
- Chlorpyrifos: 47%
- Cypermethrin: 9%
- Deltamethrin: 3%
- Lambda-cyhalothrin: 21%
- Other pyrethroids: 1%
- Carbamates: 2%
- Other OP: 1%

Total pyrethroids: 34%

Source: Hussin bin Purung
Field trial pre-requisites

- Even stand of crop
- Very good infrastructure
- High pest population

Factorial:
- insecticides x application methods (+ controls)
- 2 stat. blocks (= divisions)
Factorial treatments

Application:
- Side-lever knapsack (SK)
- Motorised mistblower (MM)

Insecticides:
- lambda-cyhalothrin (Matador)
- flufenoxuron (Cascade) “IPM”
Rambong Sialang: proportion wasted & yield

August September October November December

$P$ wasted (bars)

yield (kg at sampling date)

wasted: l-cyhalothrin MM
wasted: controls
yield: l-cyhalothrin MM
yield: controls
Rain - crop cycle

Rambong Sialang: 10 year means

Feb- May spraying
- high *Helopeltis* populations
- elevated proportion of CPB infested pods (“trap crop”?)

Rainfall mm

Cocoa tons

CPB wasted 05

CPB wasted mean

Rising main crop
Monitoring with pheromones

Evaluations at:
Prima (Sulawesi)
BLRS (Sumatra)
**Trial design: overview**

Factorial treatments to provide narrative on the relative efficacy of pesticide intervention strategies (and their cost effectiveness)

<table>
<thead>
<tr>
<th>Control 1 (2005)</th>
<th>Control 2</th>
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<tbody>
<tr>
<td><strong>Toxic standard</strong></td>
<td><strong>Always</strong> untreated</td>
</tr>
<tr>
<td>- continuous paired sprays (from Mar. 06)</td>
<td></td>
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<tr>
<td>IPM agent: low toxicity &amp; “soft” on NEs *</td>
<td></td>
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<tr>
<td>Motorised mistblower</td>
<td></td>
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<tr>
<td>Broad spectrum (BS) insecticide</td>
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<tr>
<td>Motorised mistblower (MM)</td>
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<tr>
<td><strong>Pyrethroid</strong></td>
<td>If not IGR (flufenoxuron) then what?</td>
</tr>
<tr>
<td>Manual (LK) sprayer</td>
<td>Manual (LK) sprayer</td>
</tr>
<tr>
<td>Broad spectrum insecticide</td>
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</tbody>
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Collaborative Bioassay network
Bioassays: the search for molecules and microbial agents

- Sharing (standardising) techniques:
- Insect rearing
- Application & assessment protocol
- Lab to field?
Conclusions (needs & opportunities)

There is much to learn about the role of modern pesticides in IPM (“research vacuum” for 20 years).

Are fungicides/insecticides cost effective in cocoa?

Insecticides (against mirids, CPB etc.): perhaps the greatest priority for operator safety, residues, etc.

Application: some practical research/evaluation needs, but mostly implementation / extension.

Is application taking place at the right time?

- monitoring with pheromones for CPB?
- Active traps / assays for Moniliophthora spores

=> identifying effective measures for Good Agricultural Practice