The Safe Use of Pesticides in Cocoa

Kuala Lumpur, 26/1/2011

Roy Bateman
Overview

Pest problems and the Manual
- Where are pesticides used?
- What to Apply?
- MRLs: case studies and communication

Good Agricultural & Warehouse Practices
- IPM (and RPU)
- How to apply pesticides?
- When to apply?
- Policy issues

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Threats to Cocoa production

- Black pod diseases: *Phytophthora* spp. especially
  - *P. megakarya*
  - losses of ~90% if left untreated

- respond well to chemical control …

- … coupled with good cultural practices (crop sanitation, shade management, etc.)
Phytophthora disease control

Traditionally: copper (oxide, hydroxide, oxychloride etc.)
protective: since 1760s

enhanced control with copper mixed with metalaxyl (1977; ~M: 1996)

other new(ish) AIs promoted (e.g. Carboxylic Acid Amide compounds: 1990s)
- but are they what farmers want?

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Insects

- “Mirid blast” (tree die back)
- Crop loss estimates (Ghana ann. of about 100,000 T)

... so they are sprayed with insecticides
Originally with insecticides such as HCH (lindane): 1950s - 2001

- Long residual contact action
- Some fumigant activity
- Broad spectrum

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Asian insects

- Cocoa pod borer
- *Helopeltis theivora* (= *H. theobromae*) and other spp.

Photo: Pham H D Phuoc
Sulawesi: frequency of spraying
Farmer Survey 2003 (PRIMA)

so in 2003 92% of Sulawesi farmers “voted with their wallets”:

- observable field effects based on previous experience?
- influence of salesmen?
- Now: 7 AIs for CPB, but many more for Helopeltis

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Invasive diseases

- *Moniliophthora* spp.
  - Resistant vars? (narrow genetic base)
  - Cultural methods
  - Copper fungicides: limited effect
  - *Trichoderma*?

- Pesticides not used for CSSV

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Also used:

- Rodenticides

Establishing cocoa

- herbicides, rarely fungicides (VSD)
- insecticides for defoliators termites

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Storage pests
Insects or residues?

- Possibly a major source of illegal residues
  - especially sprays to sacks?

- Phasing out of methyl bromide, heavy reliance on phostoxin:
  - resistance issues?
All of which may leave residues

- New regulations for residues on commodities in the EU, Japan & USA.
- Shipments of cocoa have been rejected by Japan (including herbicide residues).
- September 2008: EC/396/2005 came into force
  - MRLs set for cocoa (now 421 AIs)
  - residue tolerances of obsolete compounds (not Annex I,II) at default MRL of 0.01 mg/kg (ppm)
- Improved analytical methods
Good Agricultural Practice
Good Warehouse Practice

- Frequently quoted: “must be produced according to GAP”
- FAO - “practices that address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food agricultural product”

- What does this mean in practice?

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Complicated and interdisciplinary, so...

- Specific advice requested from ICCO member countries
- Neglected subject, no existing manual focusing on pesticide issues in cocoa
- What is rational pesticide use and its role in IPM?
Overall objectives

- Sharing information on pesticide science
- Linking

Field practice

Policies & residue requirements of consumers

R&D needs

Emphasising safety issues, e.g. …
The scientific community is divided. Some say this stuff is dangerous, some say it isn't.
“Full protective clothing should always be worn when using pesticides”
The reality?
Contents

A. Introduction (regulatory)  
B. Pesticides and their properties  
C. Safety, residues (and how to manage them)  
D. Good agricultural practices  "How to do?"
E. Good crop storage practices
F. Recommendations

Appendices  
(including ‘positive’ and ‘negative’ AI lists)

Back-ground  
‘Case study’ boxes

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Initially, emphasis on W. Africa and EU because:

2nd Edition

Update on legislation (e.g. 91/414/EEC to be repealed 14 June 2011 and replaced by EC 1107/2009)

- Message - stay ‘ahead of the game’

Improving illustrations, correcting errors (continuous!)

New boxes:

- older insecticides, neonicotinoids, herbicides
- CPB and other SE Asian issues
- Criteria for grouping pesticides …
Legal and practical notice

Manual stresses the need for accuracy and specificity, so for practical reasons individual compounds are discussed: sometimes in detail, but ...

Inclusion of compounds or products in the text is for illustration only and does not imply recommendation or otherwise

Nevertheless, an attempt is being made to identify ‘strategic pesticides for cocoa’
3rd Edition (end 2011?)

- Updates
- Re-organisation with main sections on
  - The major pesticide groups
  - Overview of pesticide application
  - Other quality issues
- More on Latin American issues
- Finalised version for translation (subject to funding ...)

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Introduction and background

- Pesticide names and formulations: importance of accuracy
- Pesticide labels

- Biological activity, modes of transfer
- Modes of action
- "Technical problems" resistance, resurgence

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Pesticide breakdown

What are MRLs?

- Not measures of safety!

How to avoid exceeding them

(axes are linear)
Timing: e.g. Pre-Harvest Interval (PHI)
Metalaxyl: a vital black pod fungicide:

“do not use within 30 days of harvest”
Contents (continued)

- Hazards and risks
- Environmental safety
- Assessment of residues
  - Standard methods in future editions?

- Good agricultural practices
Includes: convincing farmers early that tall trees are difficult:

- to spray
- to monitor
- to harvest
Good Agricultural Practice starts in the pesticide store: pesticide selection

_lists are unavoidable?

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Pesticide lists: Appendix 3 more complicated (e.g. tMRLs and global scope) (1st Edition had 2 categories)

A. ‘Strategic list’ for key pests (effectively recommendations, EU/Japanese/US import tolerances and evidence of efficacy)

B. Compounds to be used with great CAUTION (limited time remaining, etc)

C. Lists of experimental and other control agents

D. Pesticides that MUST NOT BE USED for cocoa
My thanks to the many colleagues who have commented to date

Further suggestions and corrections would me most appreciated - you are members of ICCO
Criteria for inclusion in “Strategic list” (effectively recommendations - Manual appendix 3A)

- Proven efficacy in at least one cocoa growing country in the region
- … supported by (pref. refereed) EVIDENCE in the literature
- … and registered there
- **Does not** belong to WHO/EPA toxicity Class I
- Listed in appropriate EC, Japanese annexes etc.
B. Compounds to be used with great CAUTION (limited time span, restricted markets, etc.)

- have permitted MRLs / TMRLs in some markets, but not others and/or ...
- are likely to be phased out within 2–3 years, but ...
- have shown demonstrable efficacy in at least one regional cocoa growing country
- do not belong to WHO/EPA toxicity Class I
  - Examples: organo-phosphorus (OP) compounds - diazinon, chlorpyrifos ethyl, pirimiphos methyl
Issues arising

Initially, clarifications with:
- metalaxyl: unresolved and mefenoxam
- generic products (e.g. OPs such as pirimiphos methyl, diazinon, chlorpyrifos)
- fenobucarb (BPMC)

Fipronil
- potentially important (CPB, termites, etc.)
- MRL is 0.005 mg/kg (includes sulfone metabolite)

Mixture of active ingredients?
C. Lists of experimental control agents for possible future inclusion in category ‘A’

- On 91/414/EC Annex 1 (or pending)
- Subject to current or recent field tests and could well conform to criteria in category ‘A’
- do not belong to WHO/EPA toxicity Class I and are preferably in Class III or better

Examples:

- novel neonicotinoids and IGRs
- carboxylic acid amides (CAA) e.g. dimethomorph
- mycopesticidies and pheromones?
- novel agents against stored products pests?
Key Areas for Research: mirid control

- What about bifenthrin (‘Akate Master’, etc.)?
- What to apply, how best to screen for new compounds with no fumigant action (contact/systemic)?
- How best to apply contact insecticides?
- When to apply them?
D. Pesticides that MUST NOT BE USED for cocoa

Recorded as used on cocoa but have been rejected by major importing countries (usually, but not always, for good toxicological/ecotoxicological reasons).

- e.g. organochlorines (DDT, lindane, endosulfan)
- Now most OPs and carbamates

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residues: where do they come from?

💦 Cocoa in storage/transit

💦 Applications in the field

A more difficult problem to manage?
High herbicide residues

- Most unlikely to originate from cocoa field
- E.g. 2,4-D: volatile
- Focus on quality along the whole supply chain
Drying: also about PAH, M-OTA, etc.
Solutions

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“Integrated Pest Management” (IPM) or alternatively “Incredibly Popular Mantra”?

- Pesticides
- Biological
- Quarantine
- Interference
- Cultural
- Host plant resistance

remove?
Sub-set of good agricultural practice:
Rational Pesticide Use (RPU)

targeting …

How to spray?

When?

What to apply?

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Application: the importance of nozzles!

... seeing “spray to run-off” as wasteful - costs money!
Participatory exercises
What is the “right nozzle for the job”?

photos: Sonii David

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“Modern pesticides are too expensive”

- Spraying less by improving efficiency
- Previously a conflict of interest with suppliers of pesticides (main source of profit) also selling sprayers
… what about a cocoa nozzle?

- Narrow cone
- Fixed setting
- Optimised droplet size

2x - 3x dose transfer efficiency?

Farmer field research trials
Cocoa Research Institute, Nigeria compared side lever knapsack (SLK) with DC3-45 and trombone sprayers

![Graph showing yield comparison between Trombone, SLK, Trombone, SLK, Trombone, and SLK for different locations: Bamikemo, Wasimi, Idanre.](http://www.dropdata.org)
Mistblowers

How to make the most of mirid insecticides?

Jessop & Bateman

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Coverage & Spray Techniques

**Technique 1 (alternate)**

- Current practice
- Uneven spray distribution

**Technique 2 (every)**

- Even distribution - especially at low flow rates

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Better application may also mitigate residue levels?
Better timing of sprays

- Action thresholds for some pests
- Monitoring tools (e.g. pheromones)
Recommendations

- Harmonisation of standards by all importing countries
- Strategic cocoa pesticides
  - Regional recommendations?
- Capacity building for applied R&D in crucial areas
- Communication: putting rational pesticide use “on the agenda” (FFS etc.)
- Developing skills in pesticide science

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‘Next generation’ of pesticide scientists?

Terima Kaseh ...

and many thanks in advance for your further ideas and comments

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http://www.dropdata.org /cocoa