

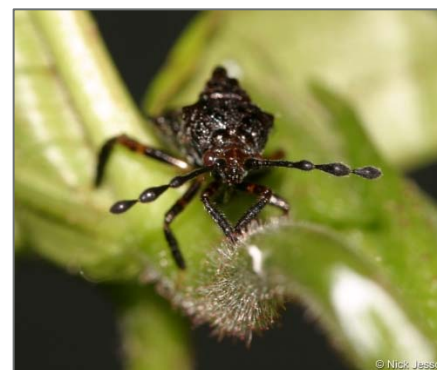
SAFE CONTROL OF COCOA MIRIDS IN WEST AFRICA

Mycoinsecticide Evaluation:
Application, Behaviour
& Efficacy

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Mycoinsecticide Evaluation

Application

- Understanding Dose-transfer
- Lab to Field Conversion

Behaviour

- Response to Treatments
- Chemical Standard Additive

Efficacy

- Bioassay Design
- Pot Trials
- Field Trials



Delivery Systems are IMPORTANT!

Being able to measure the fate of a pesticide when applied provides:

- Understanding of the Spray Efficiency
- Likely effectiveness of the Application
- Transferable for Chemical and Biopesticide Application

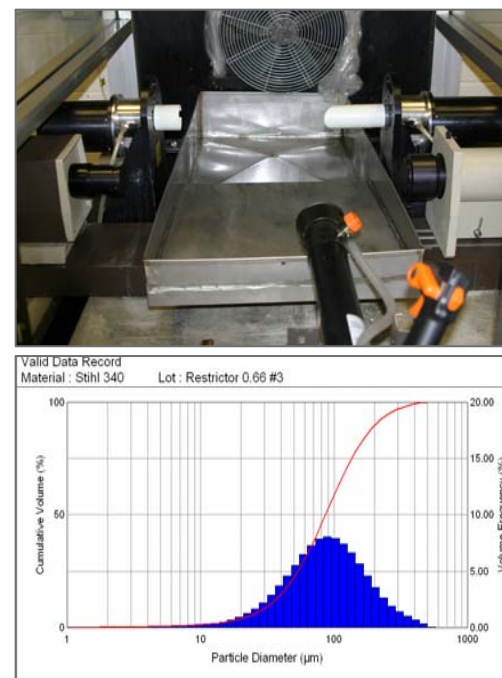
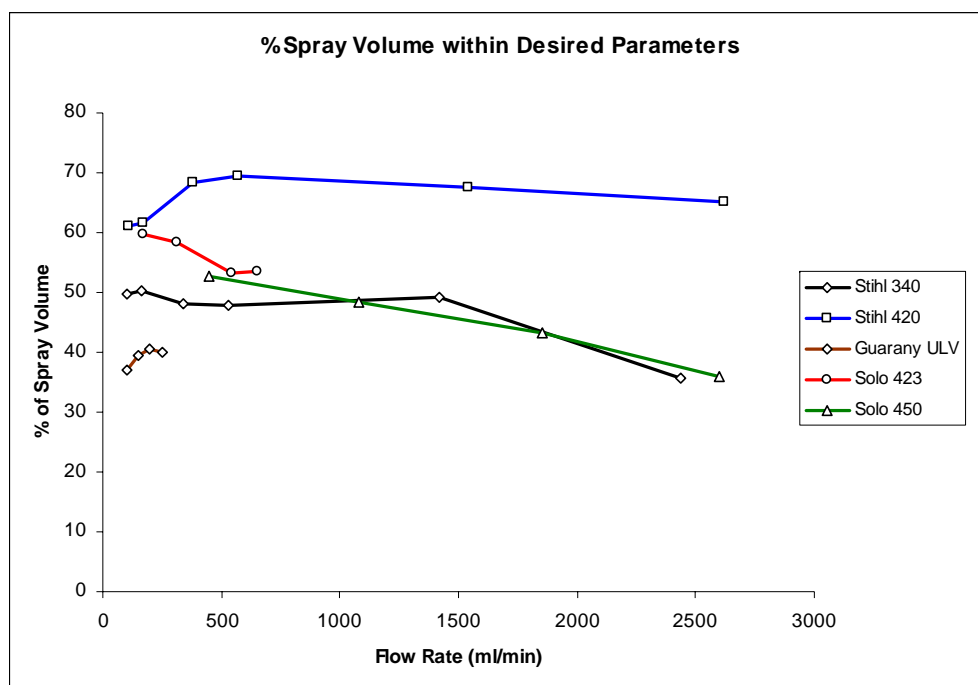
Experimental Factors:

- Flow Rate
- Spray Technique
 - Every/Alternate Rows



Application Field Trials

Equipment Selection



Data from:

Optimising the use of knapsack mistblowers for control of insect pests of cocoa – *Nick Jessop and Roy Bateman - July/August 2007 International Pest Control*

& Motorised knapsack sprayers: their rationale and performance in developing countries – *Roy Bateman and Nick Jessop – January 2008 AAB International Advances in Pesticide Application*

Fluorescent Tracer Work

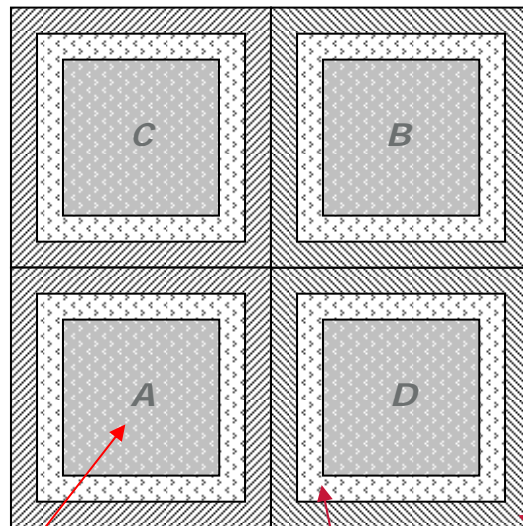
- UV Tracer acts as substitute for the Active Ingredient (AI) of the pesticide
- Fluorescein Sodium Salt
- Cheap and Quick Analysis
- Assess UV Degradation
- Calibrate – Serial Dilutions
- Spray at 250 ppm Concentration



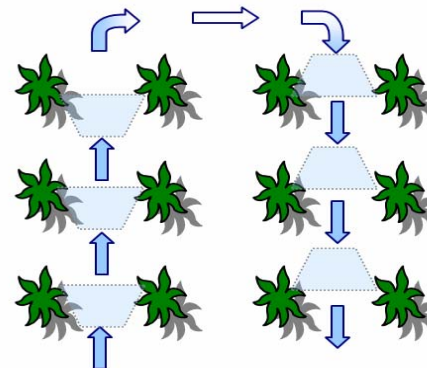
Trial Design

Based on an approximate forward speed of 1m/s the Volume Application Rates (VAR) would be:

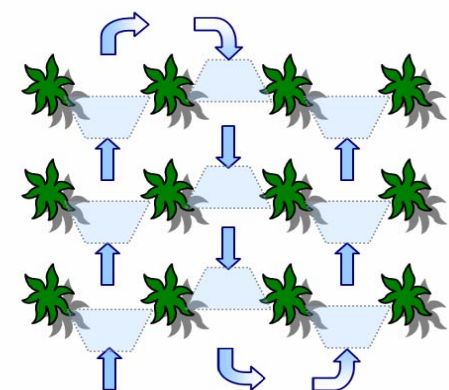
<u>Block</u>	<u>Restrictor</u>	<u>Technique</u>	<u>Flow rate (l/m)</u>	<u>VAR(approx)</u>
A	1.0	alt	0.57	20 l/ha
B	1.6	alt	1.54	50 l/ha
C	1.0	every	0.57 x 2	40 l/ha
D	1.6	every	1.54 x 2	100 l/ha



Technique 1 (alternate)



Technique 2 (every)



Sampled area

Sprayed,
unsampled

Not sprayed,
buffer rows

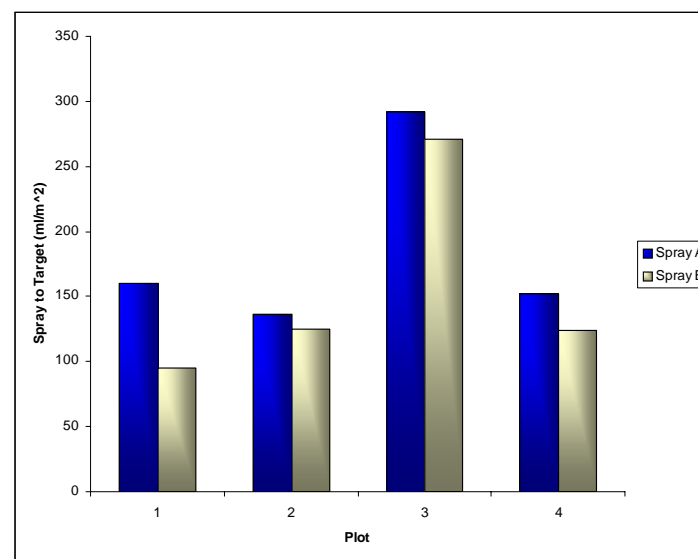
Measured Parameters

● Aim: Determine Spray to Target (Pods) ml/m²

- Fluorimeter Reading
- Approx Surface Area of Pod using –
 - Pod Length
 - Radius (from Central Circumference)
 - Volume (by displacement)
- Pod Model (prolate spheroid)



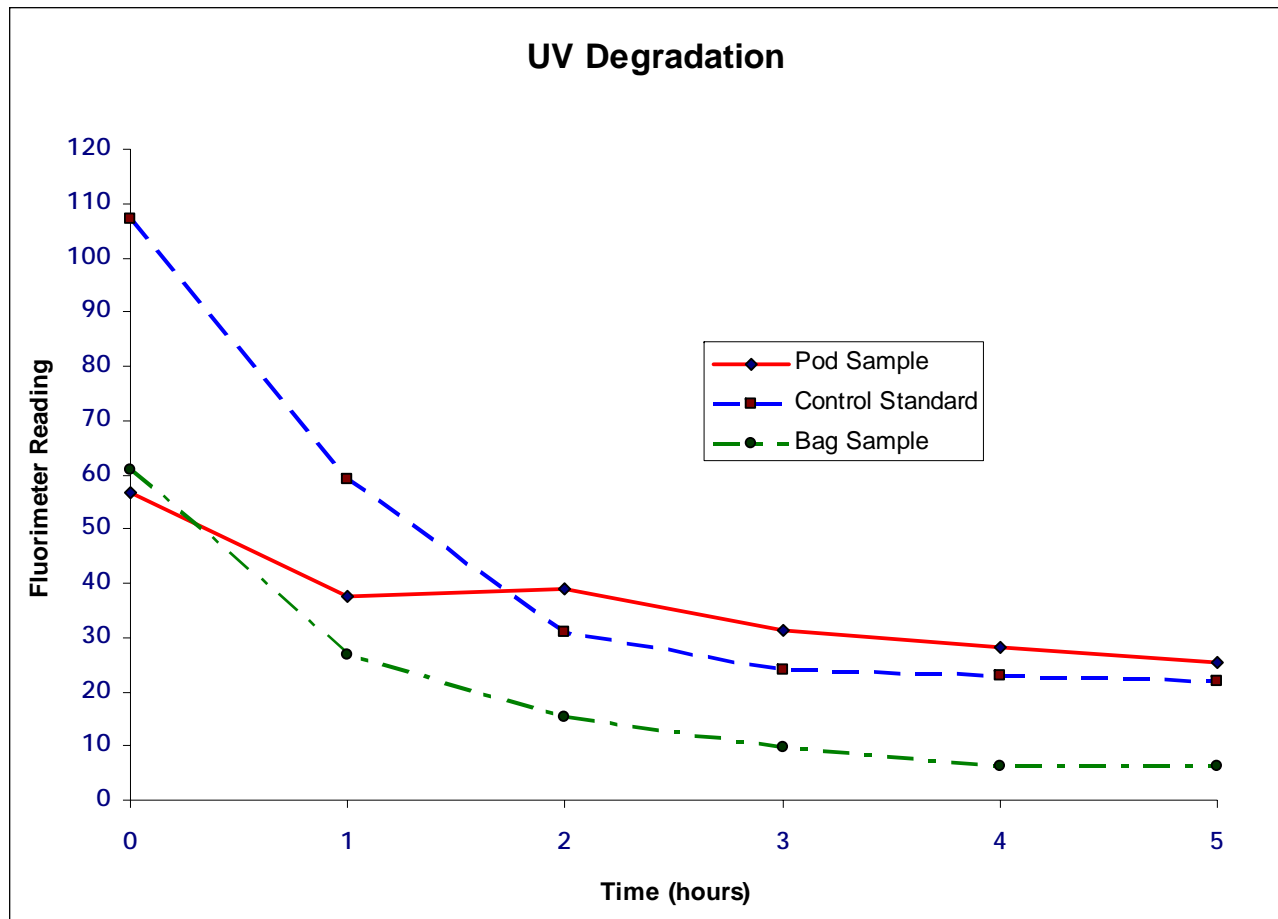
$$2\pi \left(\frac{(ab)\epsilon}{\sin(\epsilon)} + b^2 \right) = 2\pi \left(\frac{a^2}{\sin(2\epsilon)} + b^2 \right).$$



* Predicted Volume using Model differed from Actual Volume by an average of **4%** (n=420)

$$* \frac{4}{3} \pi b^2 a.$$

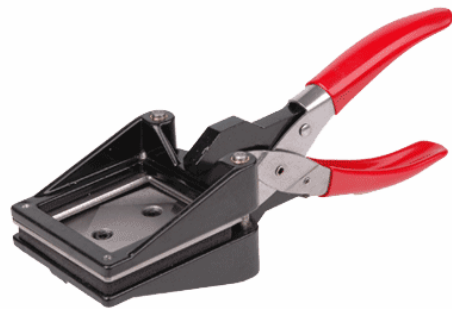
UV Degradation Calibration



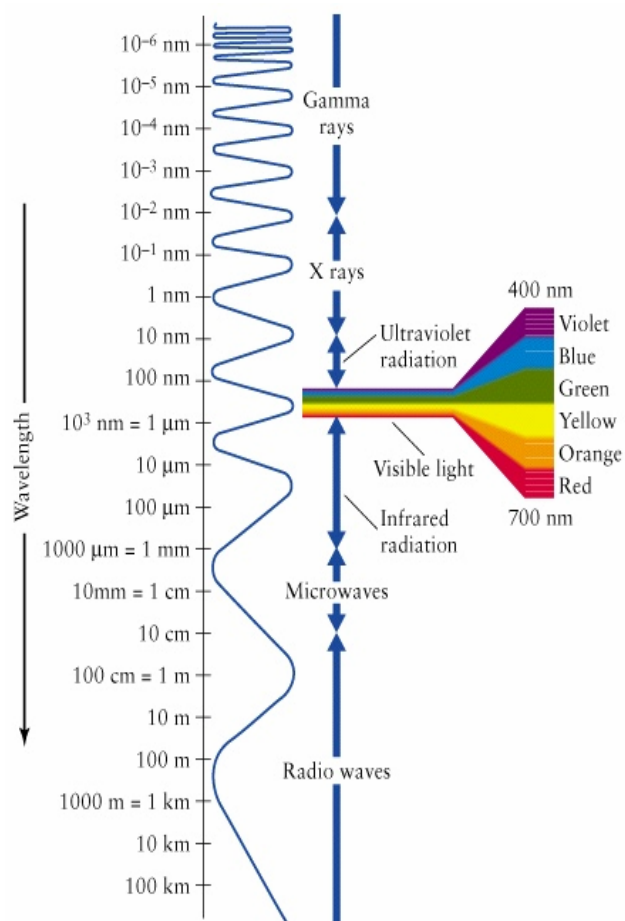
No sig.diff. between
Pod and Bag
Samples

Dye Application Trial '08 – Bunso Site

- Repeat basic design of first trial
- Expand to sample from new growth as well as pods
- Repeat



Food Dye Analysis with Spectrophotometer



Ac

• /



• /

• **Dyes** rapid analysis of samples

• **Equipment** Allura Red – 507nm

• New Jenway 6300 Spectrophotometer supplied to lab at CRIG
Green S – 634nm

Behavioural Evaluation

Is it possible to improve the chances of a mycoinsecticide working?

Behavioural manipulation

Use of sub-lethal doses of chemical insecticide

addition of 20% recommended dose of:

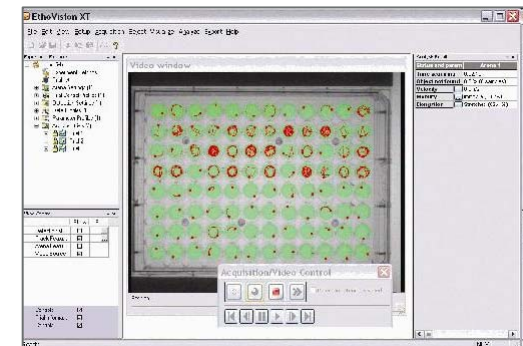
Pyrethroid

Neonicotinoid



Multi-chamber observation of inoculated insects

Behavioural differences compared to infection rates



Arena Observation Sample



Bioassay Assessment

Test Isolate

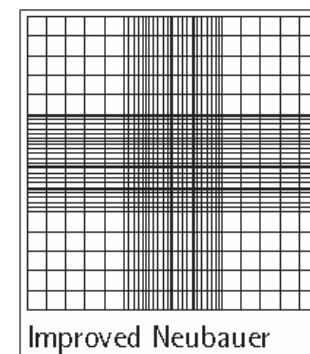
- Initial Passage through surrogate host (*Dysdercus fasciatus*)
- Single Spore Maintenance Culture
- Spore Concentration using Counting Slide
- Spore Viability – rejected if <90%

Inoculation

- Direct Application using Burkard MicroApplicator
- Secondary Uptake from substrate

Assessment & Analysis

- Minimising Control Mortality
- Define ‘death by fungus!’
- Kaplan-Meier Survival Curves
- Median Lethal Times/LD₅₀



Trials – Metarhizium anisopliae isolate

Pot Trials: CRIG (Nov-Dec)

- Using nursery grown 'caged' plants
- Inoculated with known number of target insects
- Subject to different treatments



Field Trials: Bunso Station (2009)

- Area knock-down (clean sweep approach)
- Treatment
- Reassess using repeat of knock-down and damage survey

Trial Layout

- Small plot trials should have a minimum of 5 trees, each treatment replicated 4 times in a randomised complete block design. If the trial is un-replicated plots should be 2,000m². In locations where no commercial treatment is applied to the surrounding area, a buffer zone of 30 m width should be treated with a standard product.

Where do we need more numbers ?

- Between tree distribution of mirids themselves (both *Ss* & *Dt* in Ghana cocoa)
- Spray distribution in cocoa canopy
- Within-tree behaviour of mirids and exposure to deposits, so ...
- Can we target a certain part of the tree? Or do we simply (!) ...
- ... assess likelihood and level of deposit pick-up by mirids (different from chemical standards?)
- LD₅₀ / MLT of mycoinsecticide
- Efficacy (and if not, why not)

THANK YOU

