

SAFE CONTROL OF MIRIDS IN WEST AFRICA

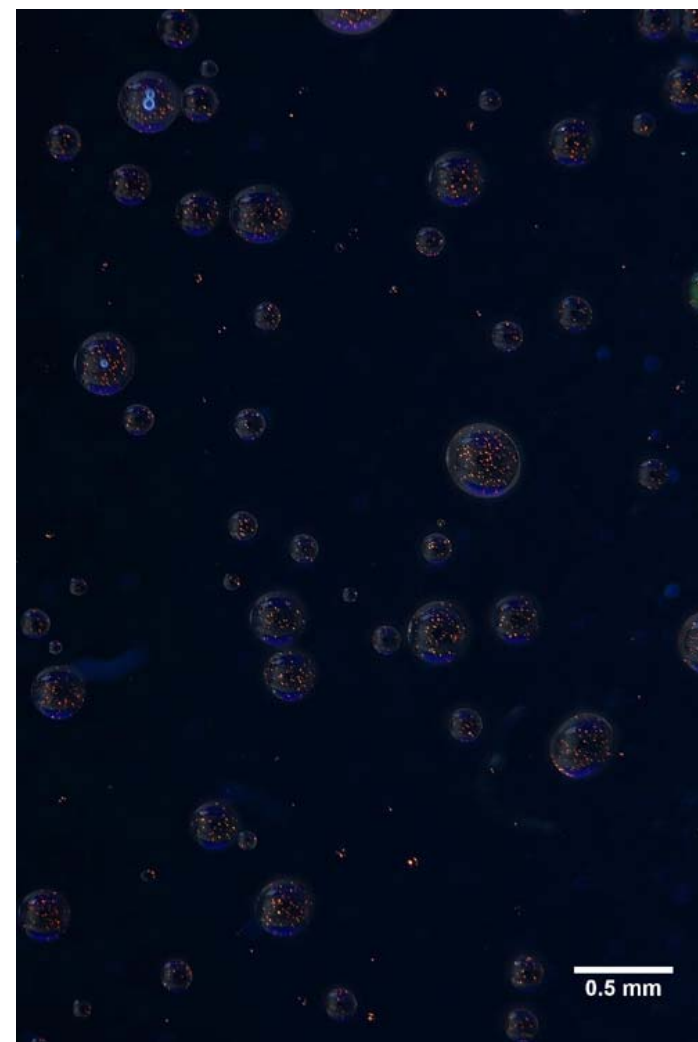
Dose transfer efficiency of particulate suspensions to cocoa pests of West Africa

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Thames Valley Cocoa Club
@ ICCO, London, 8 April 2011



International Pesticide Application
Research Consortium - sponsored by



The Target Organisms

- Approx 25-30% of cocoa in Ghana has significant damage from Mirids
- The two dominant species are Heteroptera: Miridae ...
 - *Distantiella theobromae*
 - *Sahlbergella singularis*
- Feed on many parts of the tree
- Controlled with insecticides: usu. coordinated by CODAPEC
- Concerns about new EU regulations for residues



D. theobromae
(adult)

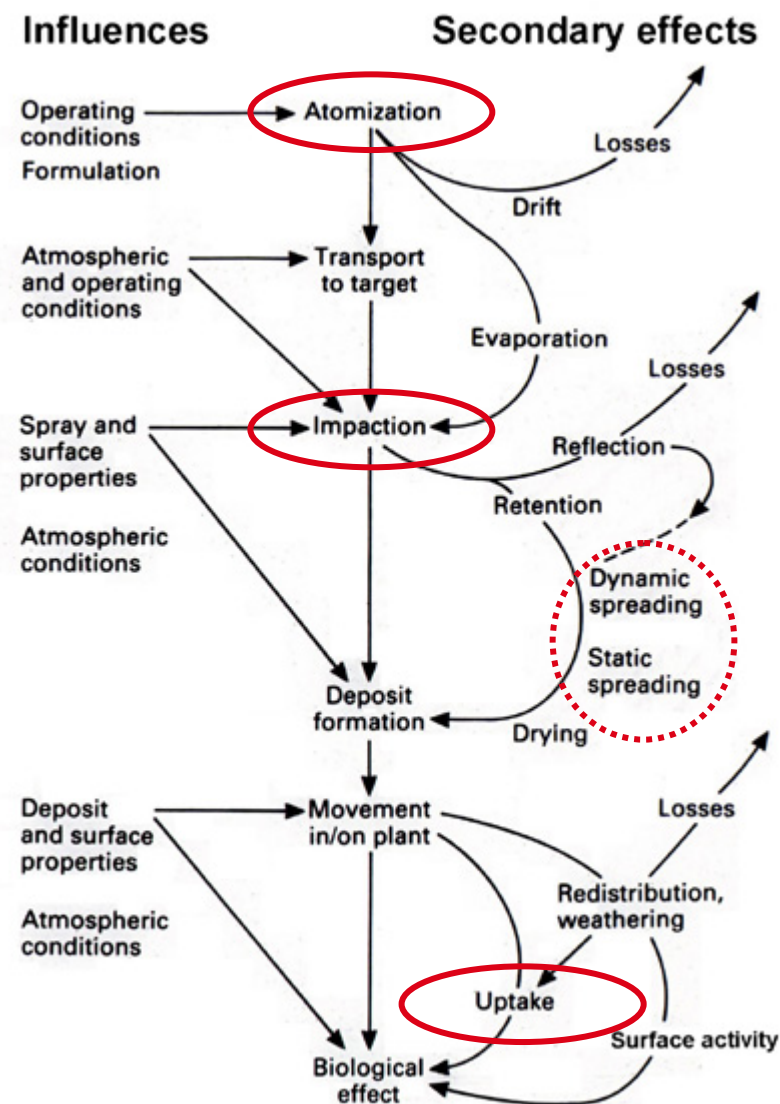


S. singularis
(adult)

The Application Process

... is complicated! ...

B.Young (1986)





Imperial College
London

Mistblowers: in Practice

- How to make the most of mirid insecticides?

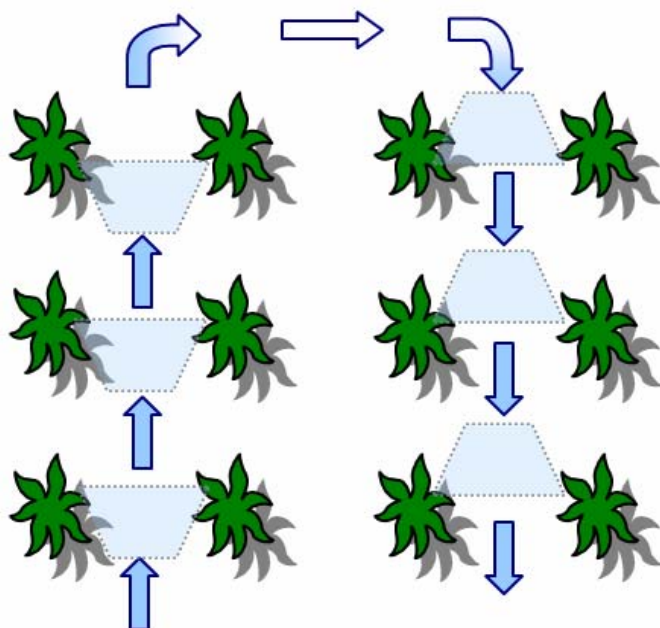


Jessop, Awudzi & Bateman
(2010) *AAB*: 99, pp 191-196



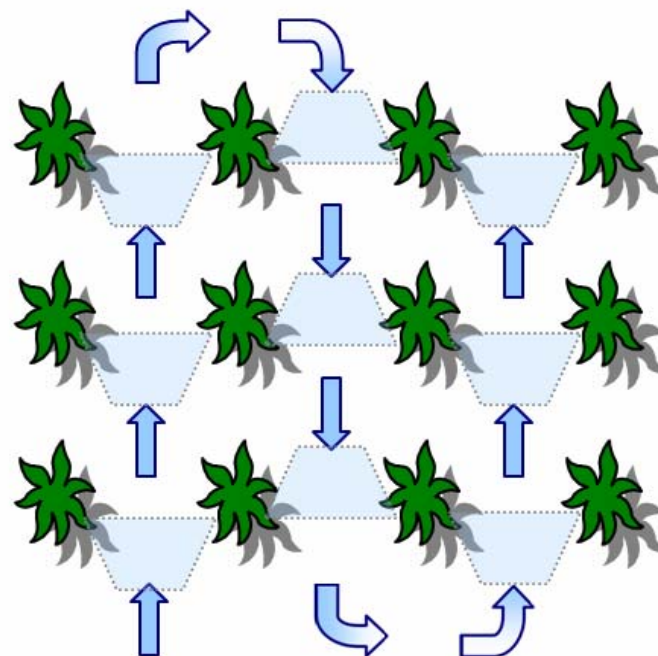
Coverage & Spray Techniques

Technique 1 (alternate)



- Current practice
- Uneven spray distribution

Technique 2 (every)



- Even distribution - especially at low flow rates





Key Findings

- Higher flow rates do not give proportionally higher deposition
- Application to every row gives a more uniform distribution than alternate rows
- Every row application at lower flow rates can equal more deposition than high flow rate alternate on 50% of targets

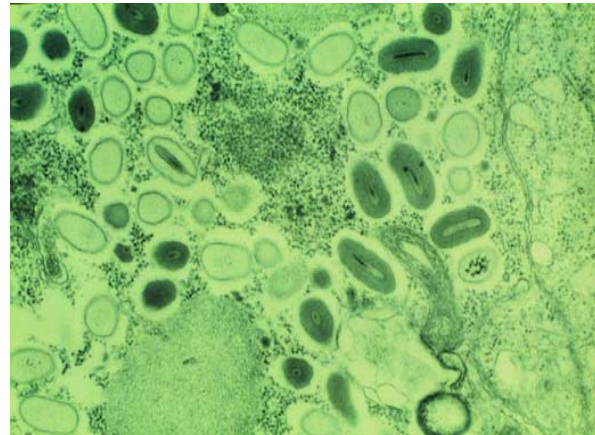
Implications:

Higher work rate: reduced operator exposure & cost

Reduced cost of chemicals and and/or better control of pest species?

A reduction in chemical pesticide usage → reduced risk of exceeding MRL's

Microbial Control Agents (MCAs)



granulosus virus



Metarhizium anisopliae

Bacillus thuringiensis vegetative cell, showing spore and crystal



MCAs are all
particles

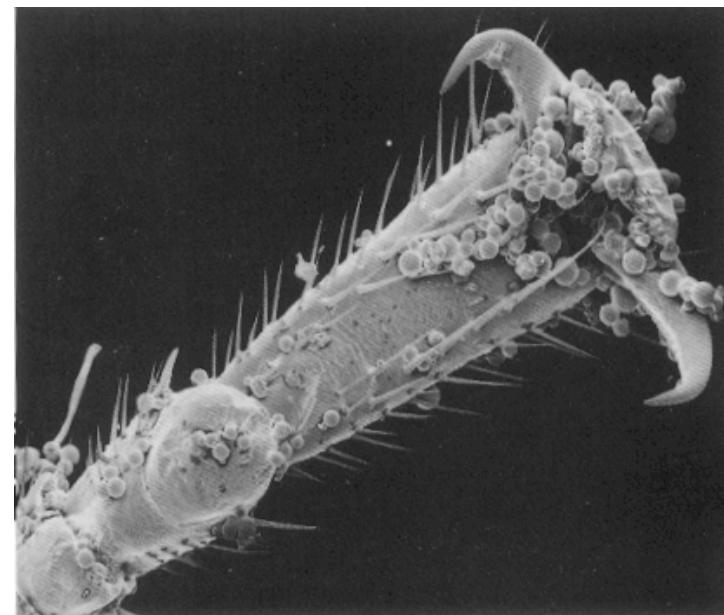
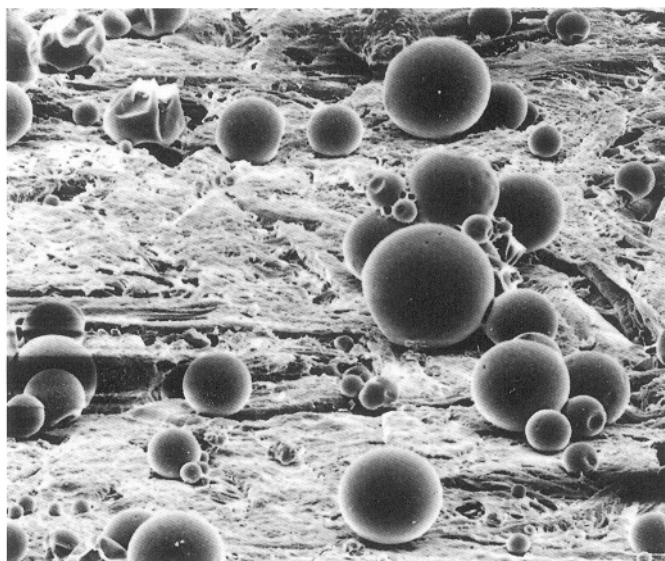


Particulate chemical formulations



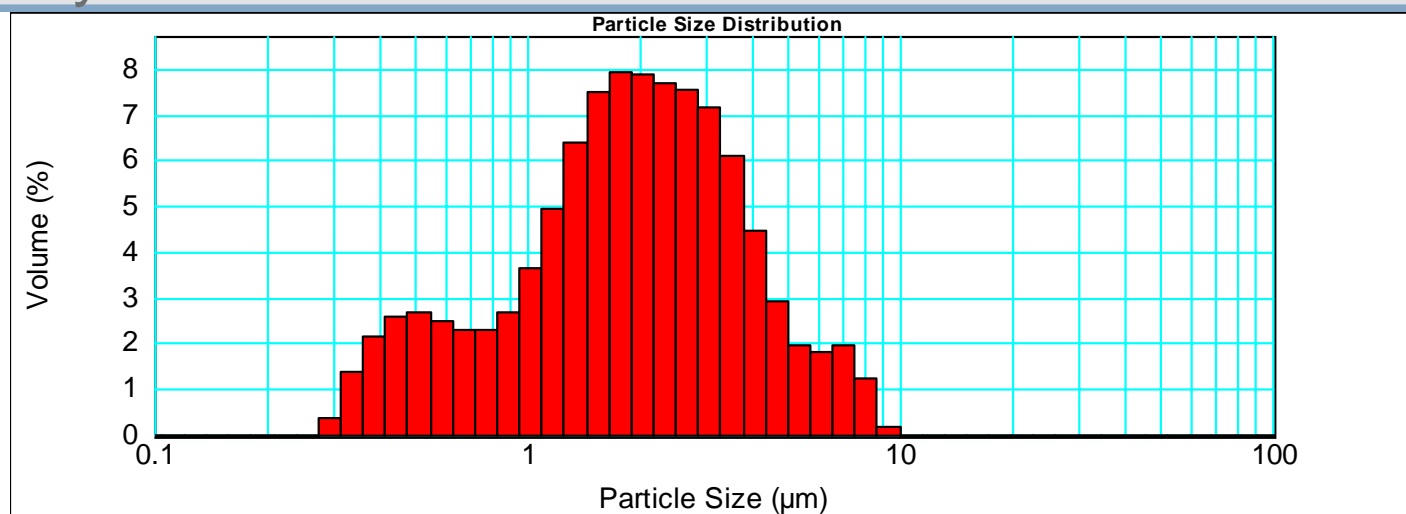
Malvern
'Mastersizer'

-  CS
-  SC
-  WP

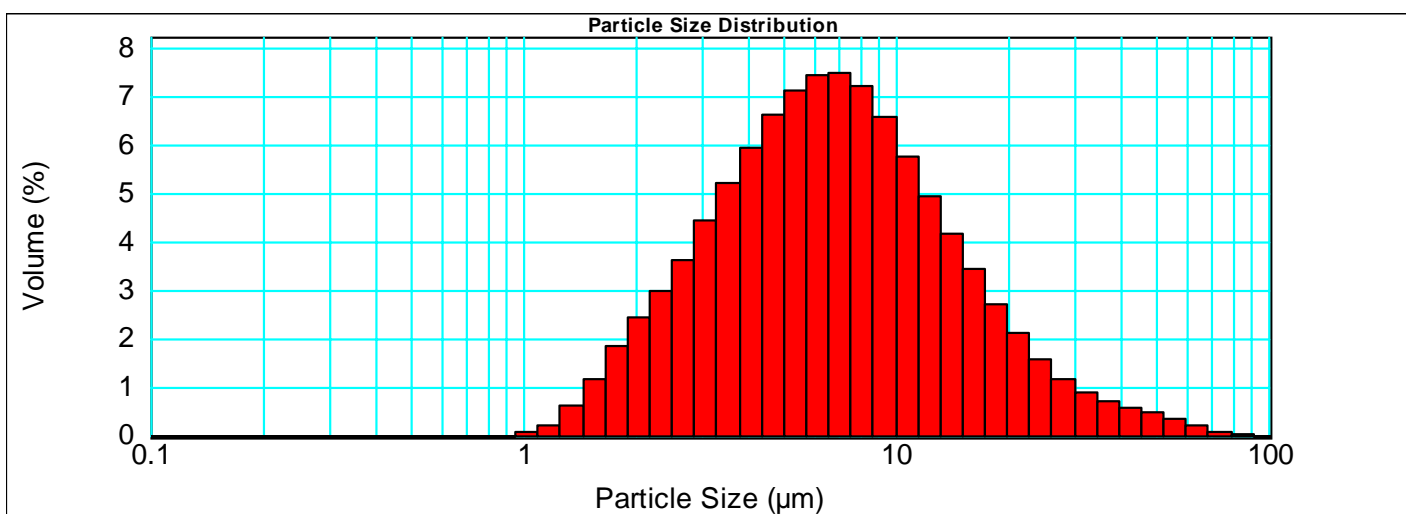


Particle size spectra

Pyrethroid insecticide CS



Carbamate insecticide WP





Imperial College
London



Mycopesticide Production

Rice bag production system ...

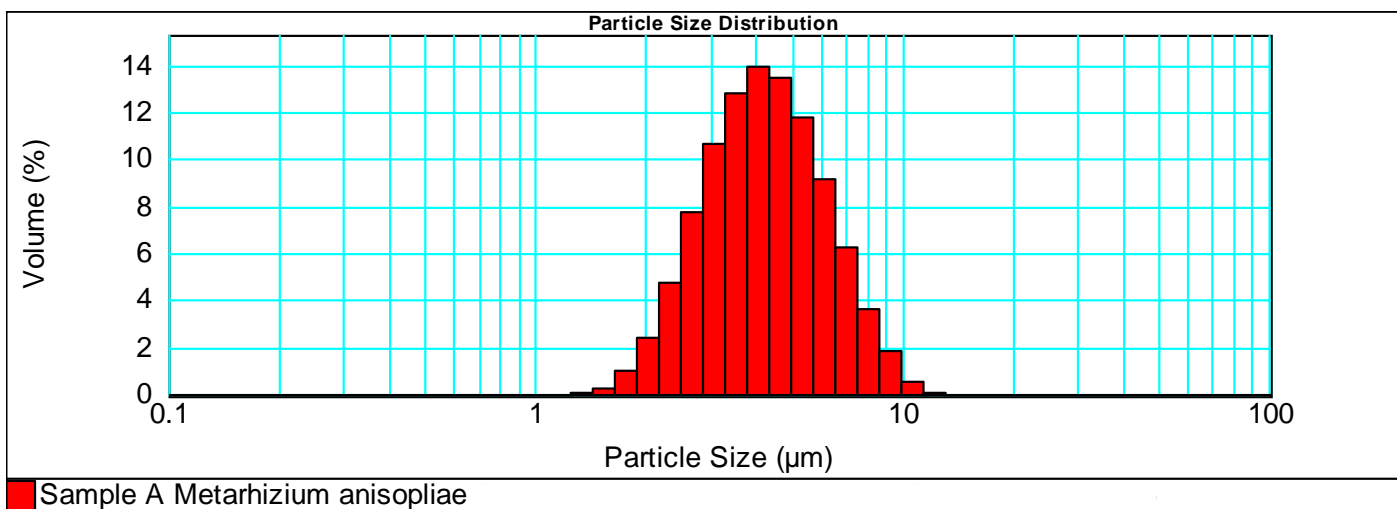
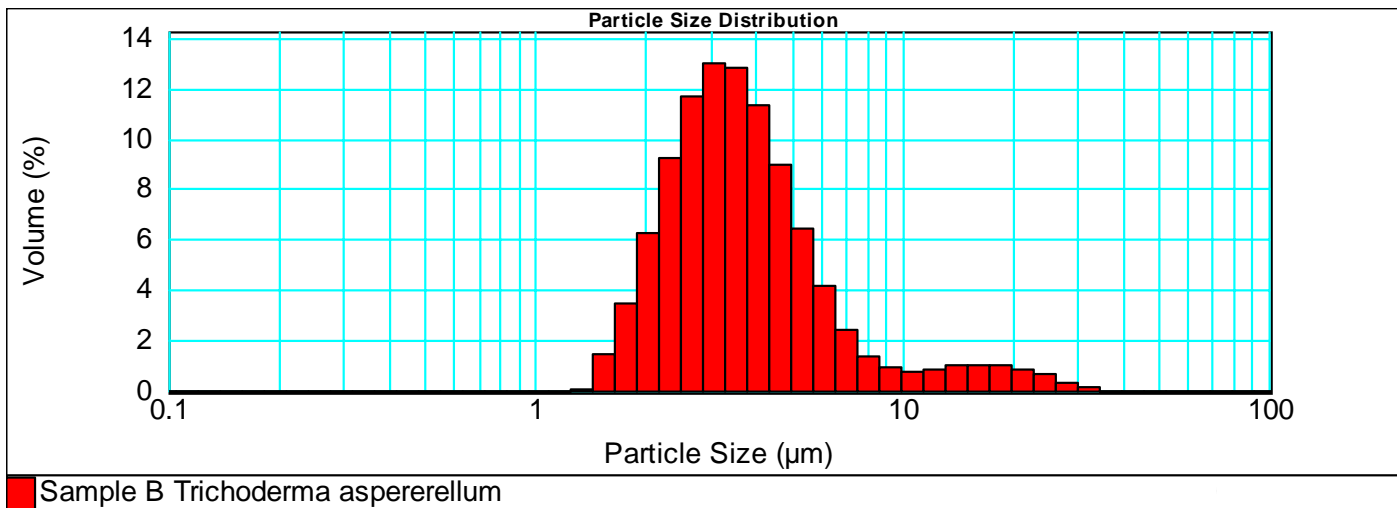


MH 5



the 'MycoHarvester'

Specification: mostly single conidia



MCA yet to be Identified/Developed

- Not possible repeat the results of previous work by CRIG/CABI (*Beauveria bassiana* isolate: 35% control in chupon test).
- Search for virulent local isolates included a survey of wild Cola trees in the Atewa Reserve, but without success



Particulate Tracking

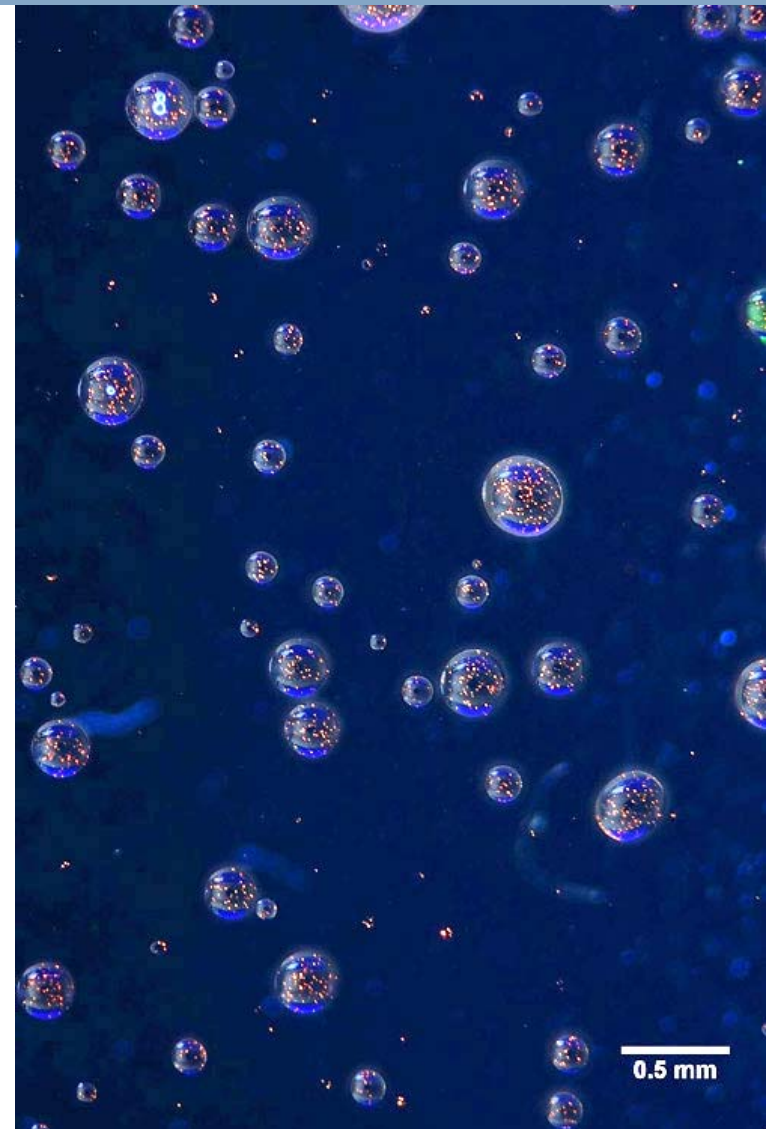
Microbial agents are particle suspensions

Problems of tracking the fate of biological particulates in the field

Quantify secondary pick up by target pest?

Solution:

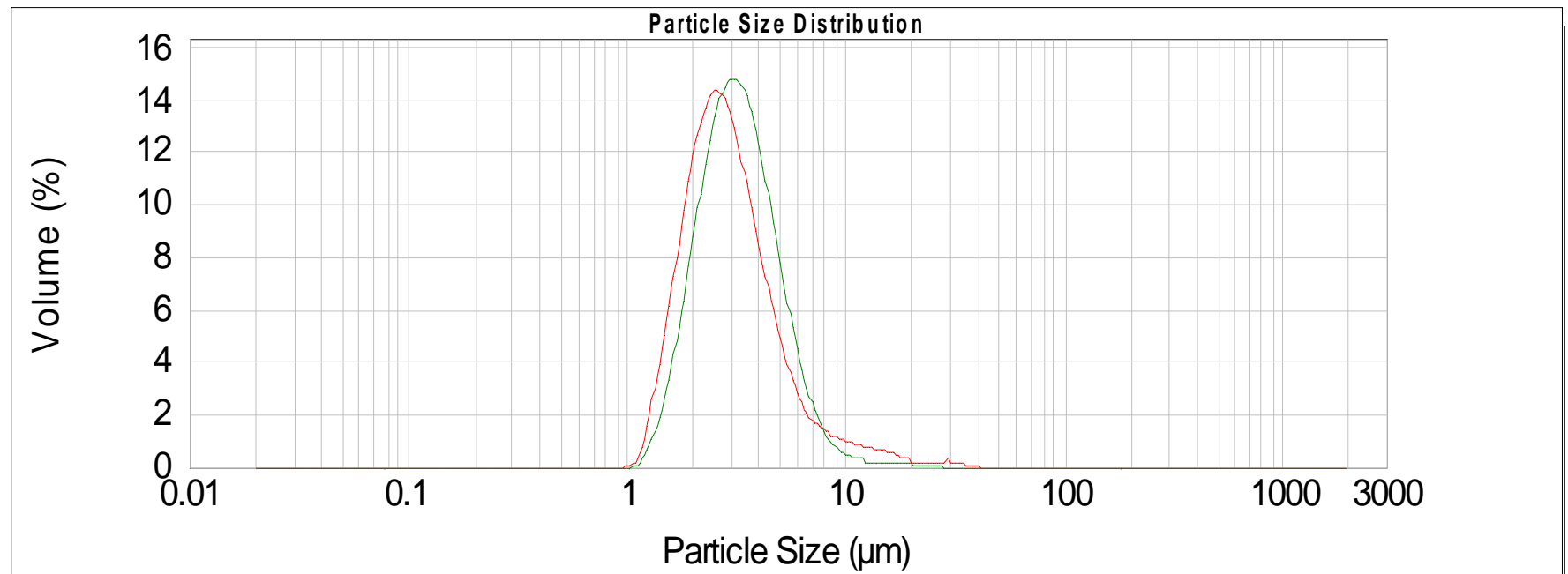
Substitute the spores with a fluorescent particulate tracer with similar physical properties: size, surface charge



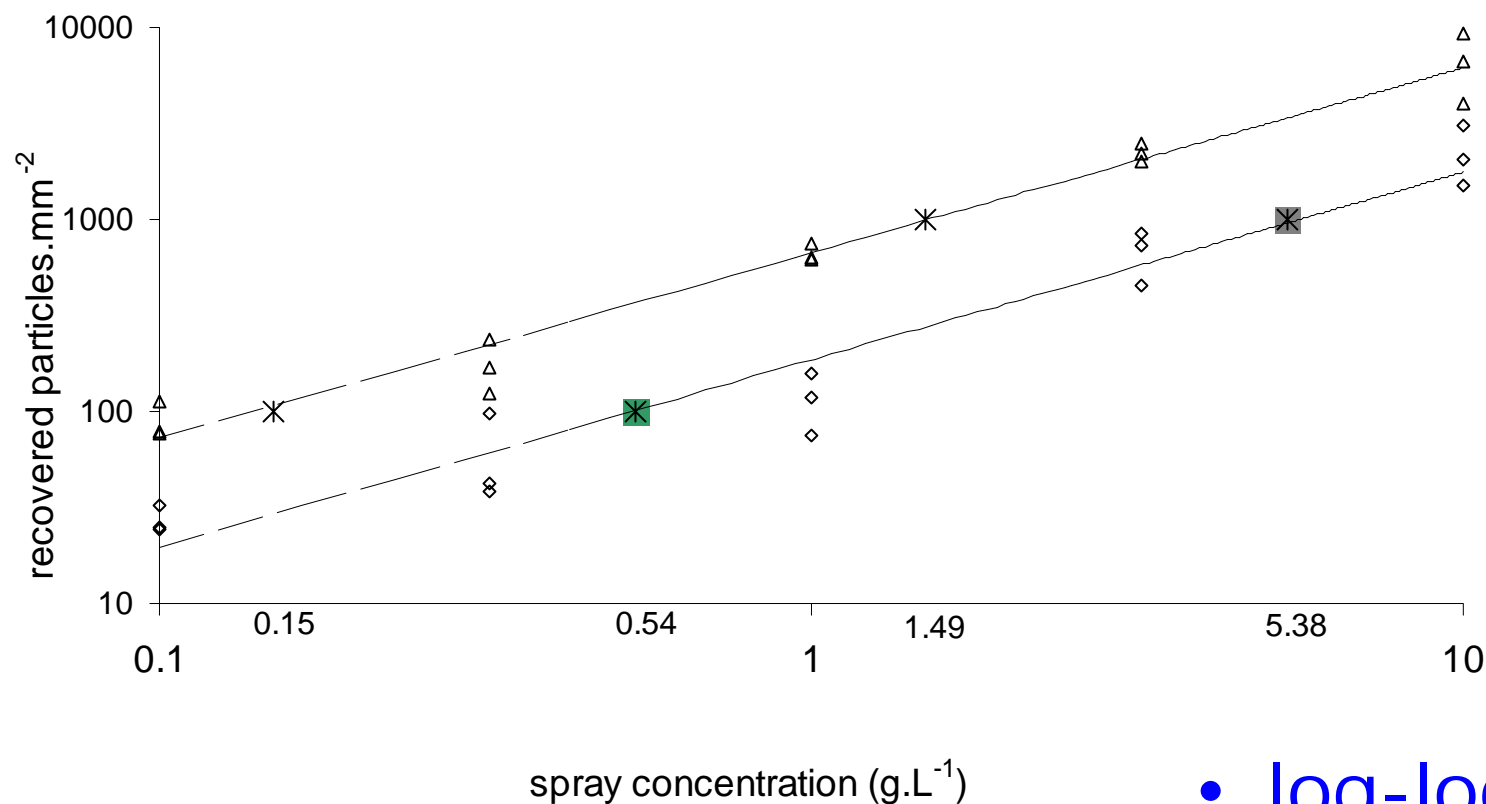
Particle Sizing using Laser Diffraction

Weight to number relationship (CFU/g for MCA)
Tracer particulate concentration: $1.5 \times 10^{11} \text{ g}^{-1}$

- *Fluorescent Tracer* (VMD = $2.9 \mu\text{m}$)
- *Metarhizium acridum* IMI330189, MH3 (VMD = $3.2 \mu\text{m}$)



Particle recovery from pods (2 flow rates) in spray trial



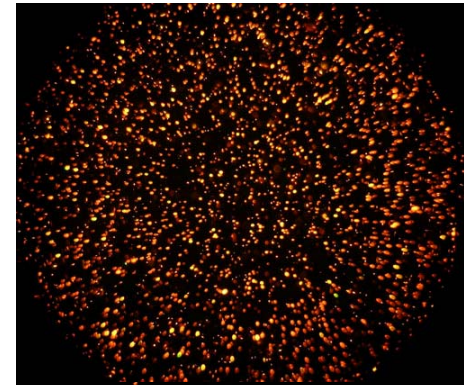
- log-log scale
- linear

Laboratory: secondary pick-up

Replicate deposition shown using
particulate pigment – approx 5ml.m^{-2}

Using standard 9cm Ø petri dish

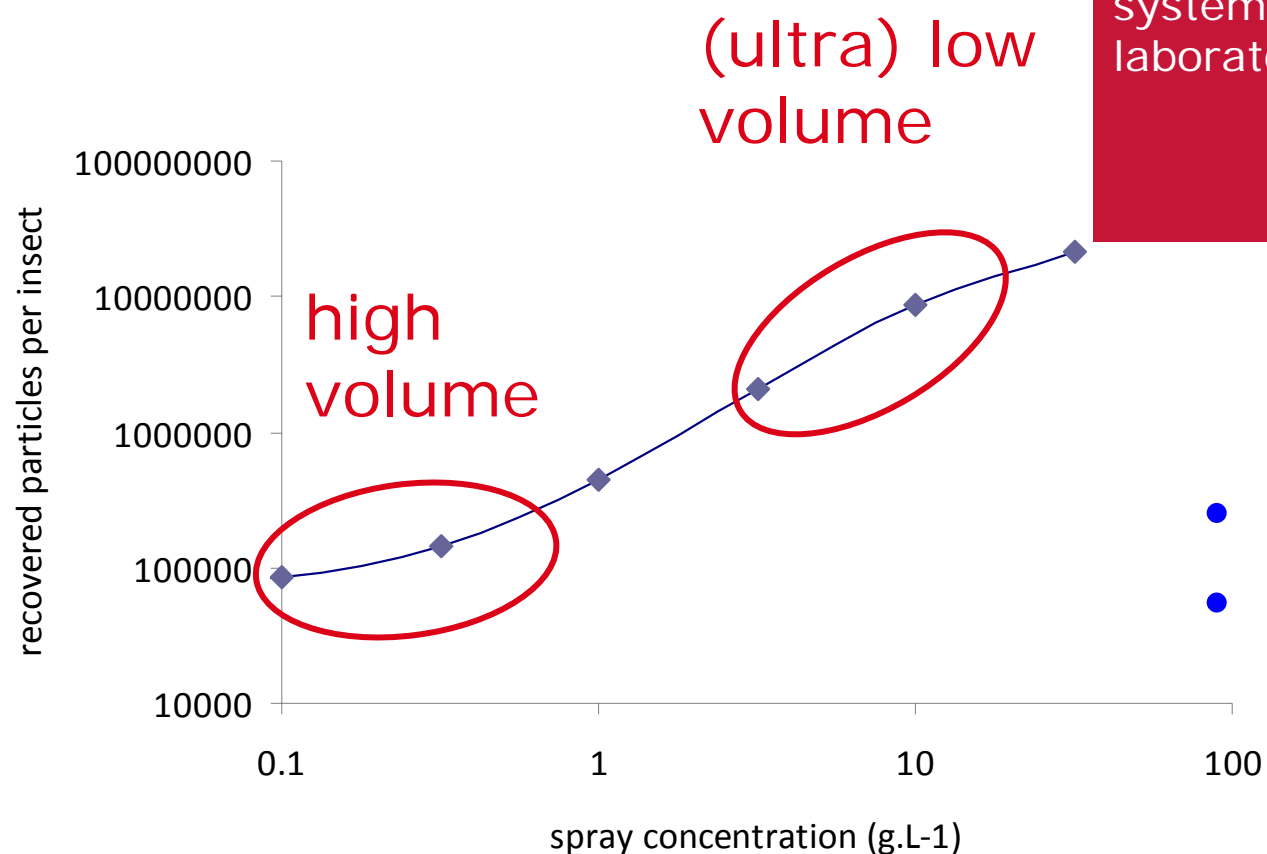
‘Mardrive’ Track Spraying system
(8002 E flat fan nozzle)



Very consistent spray deposits –

- droplet numbers remain similar between the 4 concentrations tested
- particle ‘loading’ per droplet varied in a predictable way

Secondary pick-up using surrogate insect



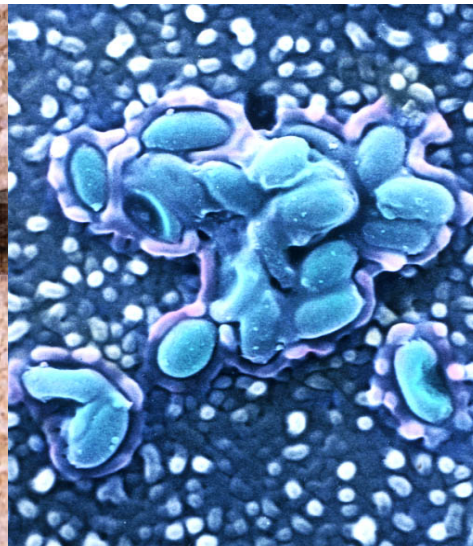
Cotton stainers:
robust model
system for
laboratory studies



- log-log scale
- non-linear

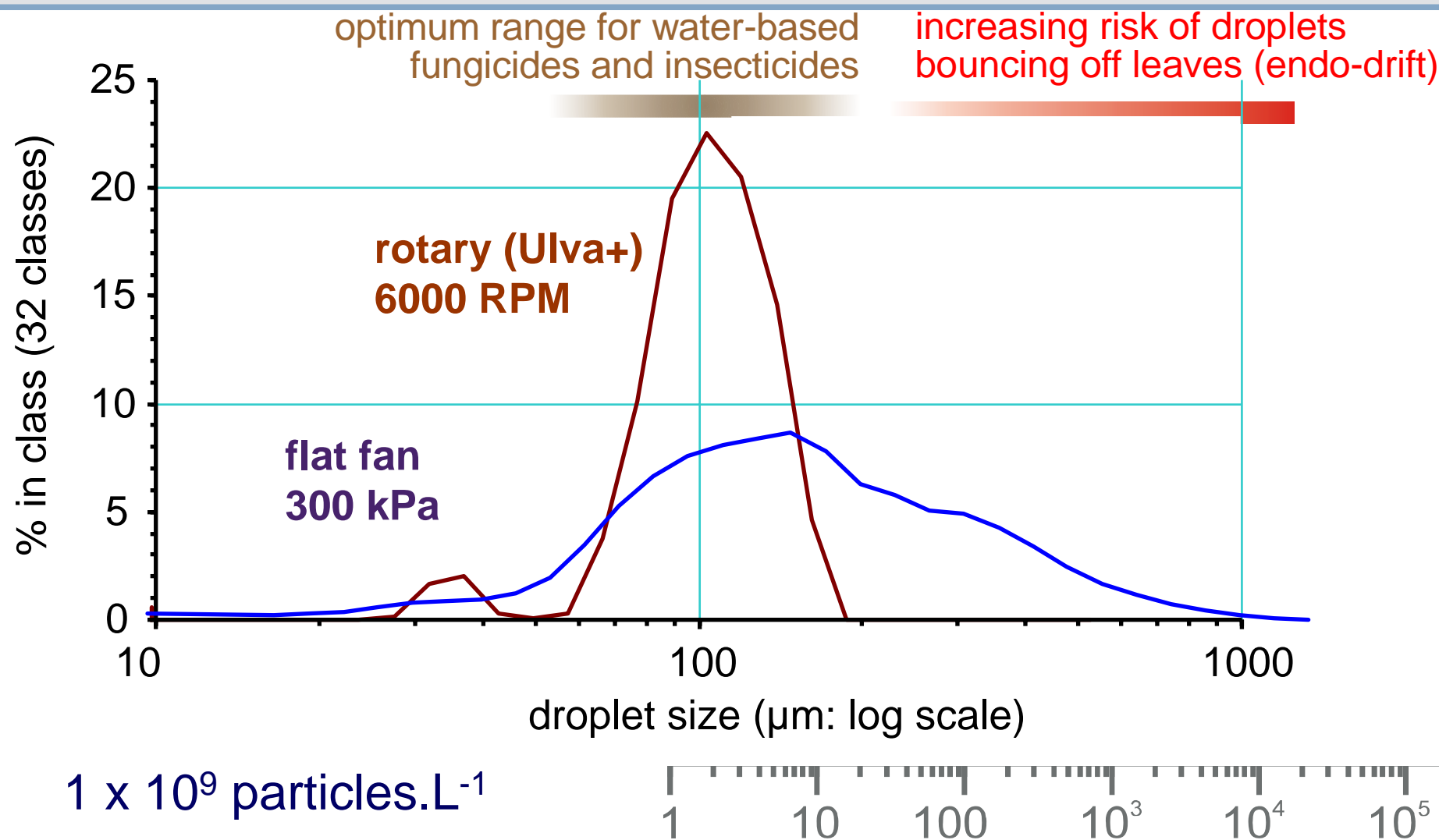
A factor in the efficacy of ULV applications of *Metarhizium acridum*?

- E.g. 'Green Muscle' (LUBILOSA Programme)



- Would concentrated tank mixtures applied at low volumes be better for particulate suspensions?

Droplet Size Spectra and a Particulate Suspension Scale



Summary

- Unable to find virulent MCA so focused on dose transfer of particulate insecticides
- Relationship between secondary pick-up and formulation concentration appears to be non-linear
- Very high volume application rates of spray are less efficient for dose transfer to pods than lower rates
- Spraying every row at lower flow rates achieves more uniformity and greater deposition on 50% of targets
- Understanding the dose transfer process improve prospects of a MCA isolate providing successful control in the field and
- ... is applicable for both biological and chemical contact pesticides

Acknowledgements

*Cocoa Research UK
- principal sponsor*

Cocoa Research Institute of Ghana

ANY QUESTIONS?

