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Dose-Transfer Efficiency of Cone Nozzles for Pesticide Application

Examining the efficiency of spray techniques using fungicides against cocoa black pod disease as a model system

Pests and diseases can cause heavy losses to cocoa crops with severe impacts on farmer livelihoods. When used responsibly, pesticide spraying can form part of an integrated pest management system. However, the spray application techniques used by farmers are often inefficient with negative consequences for the control of the pest or disease, farm economics and the environment. The adoption of technologies which improve the targeting of the application would provide better disease contol whilst reducing the volume of pesticide needed and limiting exposure of non-target organisms and the chance of fungicide resistance developing.

The choice of nozzle fitted to the spray equipment and how they are set up and mainained are important factors in determining spray efficiency. Bateman (2004)[1] described the use of selected cone nozzles for optimising the performance of manual hydraulic sprayers used by the majority of smallholder cocoa farmers.

Such nozzles are applicable for a number of cocoa pest and disease problems to provide good spray coverage over a narrow band.

This short MSc project set out to compare the performance of two nozzles (DC31-25 and DC3-45) which have been previously identified in field trails as achieving high deposits on pods per volume emitted, with a selected standard farmers' nozzle. The trials were carried out at the Cocoa Research Institute of Ghana (CRIG) using a copper-based fungicide, with contact action only, with the intention of investigating how the choice of nozzle affected control of black pod disease and the amount of fungicide used. However, the results from the trials did not show any significant differences. It was considered that this was most likely due to the practice of "spraying to run-off" used by the spray operators. This practice is highly inefficient since much of the pesticide would have been wasted whichever application method had been used.

It is clear that for future trials to investigate spray technology, it will be essential to ensure that spray operators are trained to avoid "run-off".

Further details of spray application technology and other aspects of good agricultural practices concerning the use of pesticides can be found in Bateman (2015) Pesticide Use in Cocoa: A Guide for Training Administrative and Research Staff (www.icco.org)

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[1]Bateman, R. (2004) The use of narrow-angle cone nozzles to spray cocoa pods and other slender biological targets. *Crop Protection* **23**: 989-999

Dose Transfer Efficiency of Cone Nozzles to apply Fungicides against Black Pod of Cocoa in Ghana

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ABSTRACT

Black pod, caused by *Phytophthora* species, is the most serious disease of cocoa in West Africa. Current management strategies rely on cultural and chemical control methods, although research into biological control and breeding for resistance is ongoing. There are also continuing efforts to improve the efficacy of chemical control methods, including research into more targeted application techniques. Cone nozzles with low flow rates and narrow angles of output, fitted to manual knapsack sprayers, have been identified as having the potential to improve dose-transfer efficiency to targets such as cocoa pods.
DC31-25 and DC03-45 nozzles (which have been selected as having the potential to improve dose-transfer efficiency) were compared in two trials with the standard nozzle used by farmers in Ghana. In a fungicide trial, the three nozzles were sprayed at three concentrations of fungicide to identify whether they produce different levels of disease control in the field. A tracer trial was also carried out to identify whether there is any difference between nozzles in terms of the amount of deposit left on the pods. Significant overall differences between nozzles were not identified in either the fungicide or the tracer trials. Possible reasons for these results are discussed, especially the effect of spray operator behaviour. In both trials it was observed that spray operators applied fungicide until run-off was achieved, meaning that any differences between nozzles, in either disease incidence or deposit left on the pods, would be masked by the over-application of fungicide. The importance of correcting this spraying behaviour is discussed, as are possible strategies for improving farmers' spraying practices. It is important that this is managed when the fungicide trial is repeated on a larger scale next black pod season by the pathology department of the Cocoa Research Institute of Ghana.

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