



# USING STERI-MAX® BIOCIDES FOR MANAGEMENT OF PANAMA DISEASE IN BANANAS

## Introduction

The product Steri-maX Biocide was supplied to the Department of Agriculture and Fisheries (DAF) to test efficacy against the fungus that causes Panama disease of banana (*Fusarium oxysporum* f.sp. *cubense* (Race 1, *Foc*)). Testing was conducted against the Race 1 strain of the fungus rather than the TR4 strain because of quarantine requirements and restrictions. The testing was carried out under laboratory conditions using a range of contact times, dilution rates and in the presence and absence of organic matter and soil.

## Trial Design

Steri-maX was tested at two dilution rates (1:100 and 1:1000 dilution) for its efficacy against *Fusarium oxysporum* f.sp. *cubense* (Race 1, *Foc*) in the absence and presence of soil. A suspension of *Foc* was prepared for the laboratory experiments at a concentration of 100,000 chlamydospores/ml, these are the resistant survival spores of the fungus that can persist in the soil for decades. The suspension also contained conidia (a less resistant type of spore) and fragments of the fungus. A standard volume (100µl) was pipetted into microcentrifuge tubes to which 900µl of a product dilution were added. Three replicates of each product dilution were prepared. The suspension in each tube was mixed thoroughly prior to a 100µl sample being taken and spread across ½ potato dextrose agar (PDA) plates plus streptomycin, this media that allows the fungus to grow. This process was carried out at contact intervals for the product at 0, 5 and 30 minutes, then 24 hours. In addition, a number of control treatments were included in the experiments: water only, water plus *Foc*, water plus soil and water plus soil and *Foc*. Plates were incubated and fungal colony counts conducted after 48 and 72 hours. All treatments with 'zero' counts at 72 hours were kept for further assessment. Therefore, the data presented in Table 1, shows the final colony count.

**Table 1: Number of colonies of *F. oxysporum* f.sp. *cubense* (*Foc*) per plate after chlamydospores were exposed to products at different dilution rates and contact times.**

Treatment	Contact times	No soil - no. of colonies	Soil added - no. of colonies
Control (Water only)	0	0	0
	5 minutes	0	0
	30 minutes	0	0
	24 hour	0	0
Control (Water plus <i>Foc</i> suspension)	0	659.3	791.6
	5 minutes	684.6	787
	30 minutes	597.2	785.7
	24 hour	347.3	782.4
Steri-maX (1:100 dilution)	0	0	0
	5 minutes	0	0
	30 minutes	0	0
	24 hour	0	0
Steri-maX (1:1000 dilution)	0	0.2	2.6
	5 minutes	0	1.8
	30 minutes	0	0.3
	24 hour	0	2.6

## Results

Steri-maX was effective at the 1:100 dilution rate in the presence or absence of soil and across all contact times. At the rate of 1:1000, a few colonies were detected when a 'zero' contact time was used (in the absence of soil) and the performance of the product improved as the contact time was increased. Even though colony numbers were low, Steri-maX at 1:1000 was not able to completely eliminate *Foc* in the presence of soil. For this reason we would only recommend using Steri-maX at the 1:100 dilution rate.



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