



# Steri-Max Biocide - For Management of Panama Disease in Bananas

## Introduction

Panama Disease Race 4, was discovered in a banana plantation in Tully during February 2015. Panama disease is a plant disease of the roots of banana plants. It is a type of Fusarium wilt, caused by the fungal pathogen *Fusarium oxysporum*. The strain of most concern is Tropical Race 4, which attacks all banana varieties including the main commercial Cavendish line. If the disease were to become widespread, it would become a serious threat to the Australian banana industry.

## Symptoms

The disease is quite virulent to Cavendish bananas. It infects the roots and actually travels up through the water supply of the plant. This then causes a problem with water absorption from the roots thus affecting the plants ability to use water effectively.

## Yield Loss

If the plant cannot absorb water effectively, especially during the fruit bulking up stage, then yields can be seriously affected and could be as serious as not obtaining fruit at all.

## Managing the Spread of the Disease

Growers on the Cassowary Coast - an area which produces about 85 per cent of Australian bananas - have been urged to act immediately to minimise the risk by controlling and limiting the movement of people, vehicles, machinery and plants on and off their farms. Steri-maX offers growers an effective option for preventing the spread of the disease through sanitisation of farm equipment. Farmers can assist to prevent the spread of the disease by controlling all movements on and off their own properties, not just ones from high risk areas by using Steri-maX biocide.

## Common Questions About Steri-maX

### What is Steri-maX?

Steri-maX is a biocide containing 120g/L of Didecyl Dimethyl Ammonium Chloride, which is effective against a range of fungal and bacteria pathogens. Steri-maX stays active as long as it is in solution (does not oxidize). Under heavy agitation, foam may form and a de-foaming agent (food grade) may be useful. A test kit is available to measure active Steri-maX in water. Steri-maX is noncorrosive. Steri-maX has wetting characteristics, so a wetting agent does not need to be added.

### How effective is Steri-maX?

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.

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.

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.



**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- <i>maX</i> (1:100 dilution)	0	0	0
	5 minutes	0	0
	30 minutes	0	0
	24 hour	0	0
Steri- <i>maX</i> (1:1000 dilution)	0	0.2	2.6
	5 minutes	0	1.8
	30 minutes	0	0.3
	24 hour	0	2.6

## How do I apply Steri-*maX*?

**Appliances:** Apply to appliances or equipment that are clean and free of detergent, dirt or other forms of organic matter. Apply a 1% solution of the disinfectant to all parts of the appliance or equipment.

**Prior to leaving the property:** For disinfection of equipment associated with normal farming operations, apply to equipment that is clean and free of detergent, dirt or other forms of organic matter. Apply by spraying a 1% solution of the disinfectant to all parts of the equipment.

## How long must I leave Steri-*maX* on my equipment?

Steri-*maX*'s mode of action is as a contact biocide and the data provided above shows it is effective with or without soil present in the solution almost immediately as long as it is used at the 1:100 dilution rate (1%). Ideally keep the surfaces wet for a minimum of 5 minutes to be absolutely sure it has been completely effective. Alternatively, immerse the equipment in a solution (eg a footbath) for a minimum of 5 minutes. Equipment includes hats, plastic bags, knives, footbaths, immersion containers, and spray equipment.

**Disposal:** Dispose of used treatment solutions (from footbaths/immersion containers) onto the ground before leaving the property.

**General hygiene measures for vehicles:** Remove visible soil and plant material from the vehicle and tyres. Spray tyres with disinfectant (1% solution) to run-off.

## How long will Steri-*maX* remain effective once diluted in knapsack sprayers?

When mixed with clean water Steri-*maX* will remain active for 2 to 3 days. Steri-*maX* will break down more quickly in the presence of organic matter.