

***Xanthomonas citri* subsp. citri**. the effect of selected fungicides on biofilm formation and survival lemon.

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Introduction

Citrus Bacterial Canker (CBC) is a serious disease that affects the production of almost all commercial citrus varieties in subtropical citrus growing areas around the world. Pathogen *Xanthomonas citri* subsp. *citri* (Xcc) is classified as a quarantine agent in the European Union (EU) and must process citrus fruits before entering the EU marketing zone. This study evaluated the effectiveness of selected fungicides for the disinfection of leaves and fruits. Bacterial aggregation and viability were tested on abiotic or biological surfaces in vitro and in plants after treatment with NaCl, CuSO₄, NaClO, Sodium orthophenylphenol, and two hydrogen peroxide-based compounds. Most of the bactericides at higher concentrations reduced biofilm formation and Xcc viability compared to the nontreated control, but did not completely prevent or remove biofilms or eradicate Xcc from either biotic or abiotic surfaces. Some of the bactericides at sublethal concentrations increased aggregates in which Xcc was viable. Based on these results, we conclude that exposure to the bactericides is variable depending on biofilm formation and that plant and fruit disinfection will not only require treatment with an effective bactericide to kill the bacterium but also include the biofilm disruption.

Citrus bacterial canker (CBC), because of *Xanthomonas citri* subsp. *citri* (Xcc), is a critical ailment that impacts manufacturing of just about all industrial citrus cultivars in subtropical citrus developing areas worldwide. CBC is characterised with the aid of using necrotic lesions on leaves, stems and fruit and extreme infections bring about defoliation and fruit drop [1]. The maximum crucial monetary effect is restrict of marketplace get admission to for sparkling fruit access into the canker-loose European Union (EU) due to the fact Xcc is a quarantine pathogen. Quarantine guidelines mandate disinfection remedy of citrus fruit earlier than access into the EU advertising zone [2]. Despite the absence of documented proof for advent of Xcc on fruit with canker lesions, EU considers importation of inflamed or even pathogen-uncovered fruit an unacceptable hazard for advent of Xcc

Traditionally, integrated management techniques have been used to reduce the incidence and severity of CBC in affected

orchards [3]. Plant windbreaks of natural lumber, bactericidal copper spray, and control leaf damage by citrus leaf miners, when integrated, significantly reduces the incidence of illness. An alternative fungicide with disease control activity against Xcc. B. Amino acids or indole derivatives, antibiotics or plant resistance inducers are effective in laboratory tests, but should be combined with copper fungicides for the most effective control of CBC [4]. Multiple applications are required because the copper membrane protects fruit growth only until the protective membrane needs to be reapplied. Copper can cause changes in bacterial populations after repeated exposures [5]. Berau, Personal Communication). Another antimicrobial substitute contains hydrogen peroxide (H₂ O₂), which affects the film integrity and function and damage to DNA. Orthophenylphenate sodium (SOP) is often used for XCC disinfection and affects bacterial cell membranes. Furthermore, compounds such as sodium chloride (NaCl) could not only be used as a bacteriostatic to its effect on the bacterial membrane osmotic pressure rules, but also the inducible total resistance could not be used. Finally, sodium hypochlorite is widely used as a disinfectant for its efficacy, low cost, accessibility, and ease of use.

The epidemiology of CBC. Although thoroughly investigated in several studies by 2009, early events in the survival strategy of Xcc and the establishment of infection with Xcc are not yet fully understood. It is a risk assessment disease that spreads through infected plants and fruits [6]. Aggregation and biofilm formation by phytopathogens, including Xcc occur in the early stages of plant colonization when bacteria are under biological and abiotic stress. Therefore, the disinfectant treatment should consider the interaction with the biofilm, including the possibility that the disinfectant may destroy or enhance the biofilm.

Discussion

Xcc has been repeatedly detected in commercial fruits imported from subtropical citrus growing areas affected by cbc, but cbc has not been established in the eu. Therefore, xcc is a eu quarantine agency with strict regulations in place to address the risks of introducing xcc. This study evaluated the effectiveness of currently approved selected sterilization treatments and additional sterilization treatments that may be considered.

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