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Effect of *Trichoderma* sp. on Anthracnose Disease of Stored Chilli

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ABSTRACT

Chilli is commonly used as spice in Malaysian culinary, principal ingredients in paste (*sambal*) and as the raw material in sauce industry. Anthracnose disease caused by *Colletotrichum capsici* is one of the major causes of economic loss to chilli production especially in Asia. Even a small lesion on chilli might affect the quality, thus the market value of the chilli. Disease symptoms caused by *C. capsici* include brown, circular and sunken lesion with concentric rings of black acervuli. Chemicals have been used to treat the chilli but they might cause environmental pollution, affect human health and lead to pathogen resistance to the chemicals. Therefore, an alternative method to chemical control is required. In this study, *C. capsici* was isolated from a naturally infected chilli fruit (*Capsicum frutescens*), and a species of *Trichoderma* was isolated from the rhizosphere of grasses. Pure cultures of both fungi were established then used in antagonism studies in *in vitro* and *in vivo*. Dual culture of pathogens and *Trichoderma* sp. indicated that *Trichoderma* sp. competed with *C. capsici* for space and nutrients, caused the loss of turgidity of the fungal hyphae, and reduced the fungal growth by producing volatile metabolites. *Trichoderma* sp. decreased disease severity on chilli artificially inoculated fruits up to 64% when *Trichoderma* mycelial plug was used and 55% when culture filtrate was applied. Field trials are recommended to examine the antagonism of *Trichoderma* sp. in real production conditions.

Keywords: Anthracnose, biological control, *Colletotrichum capsici*, *Trichoderma* sp.

INTRODUCTION

Capsicum frutescens L. or commonly known as bird eye chilli (Williams *et al*., 1991) belongs to the family Solanaceae and in the Plantae kingdom. Chilli is one of the most important spice crops in the world (Rahman *et al*., 2013) and in Malaysia it is used as one of the principal ingredients in paste (*sambal*) (Karim *et al*., 2011). Yet, chilli has been attacked by many diseases, and among them, fungal disease is the most important (Rahman *et al*., 2013).

Anthracnose or commonly known as ripe fruit rot is one of the major causes of economic loss to chilli production (Than *et al*., 2008a; Than *et al*., 2008b), especially in Asia (Sangdee *et al*., 2011). According to Pandey and Pandey (2003), anthracnose caused yield loss of more than 50% in chilli production in India. Initially, small and circular water-soaked spots will first develop on the skin (Naipagropediaraichur, 2012). The infected surface of the fruit will then sunken and dry up (Than *et al*., 2008a). Anthracnose is caused by *Colletotrichum* spp. (Than *et al*., 2008b). Kim *et al*. (2014) reported at least five species, which are *C. gloeosporioides, C. acutatum, C. coccoides, C. dematium* and *C. truncatum* were associated with the anthracnose in chilli.

Chemicals have been used to control the anthracnose of chilli (Benítez *et al*., 2004). However, resistance to the chemicals has been reported for the pathogen of anthracnose (Benítez *et al*., 2004). In addition, the extensive use of the chemicals might lead to the pollution of the environment and the health of both growers and consumers. In order to reduce the usage of chemicals on the control of chilli anthracnose, alternative control approaches are needed (Rahman *et al*., 2011).

Antagonists, also known as biological control agents, are mostly soil microorganisms that can interfere with pest's activities (Chernin & Chet, 2002). There are four mechanisms of antagonists, which are competition, antibiosis, induced resistance and parasitism. *Trichoderma* spp. are one of the popular fungi known for their antagonism against soil pathogen such as *C. truncatum* which causes anthracnose on chilli