

**Title** Dual mode of action of ethanolic extract of Propolis (EEP) for the control of postharvest anthracnose in dragon fruits

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**Citation** Abstracts of 7<sup>th</sup> International Postharvest Symposium 2012 (IPS2012). 25-29 June, 2012. Putra World Trade Centre (PWTC), Kuala Lumpur, Malaysia. 238 pages.

**Keywords** Propolis; anthracnose; disease severity; PAL; PPO

### **Abstract**

Anthracnose caused by *Colletotrichum gloeosporioides* is the most important disease in tropical and sub-tropical fruits, including dragon fruit (*Hylocereus polyrhizus*). Synthetic fungicides, such as propineb and difenoconazole, are primarily used to control the fungus, but due to the possible hazardous effects to humans and the environment, several fungicides have been phased out from the market. The employment of natural resinous substances to control postharvest diseases of tropical fruits and vegetables has attracted the attention of the scientific community. Propolis collected by honeybees from different parts of plants is the most common and natural resinous substance, known to be used since ancient times because of its antimicrobial properties. Four concentrations of an ethanolic extract of propolis (EEP) were used in this study. All EEP treatments demonstrated a significant ( $P < 0.05$ ) decrease in mycelial growth and a delay in disease development. The onset of disease symptoms was slowed down and the quality of the fruit was maintained during 20 days of storage at  $20 \pm 2^\circ\text{C}$  and  $80 \pm 5\%$  relative humidity. These changes were also associated with enhanced activation of enzymes, such as peroxidase (POD), polyphenol oxidase (PPO), and phenylalanine ammonia lyase (PAL), indicating induction of anthracnose resistance in the fruit. It is concluded from the present investigation that EEP could be used for the management of postharvest anthracnose in dragon fruits.