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Research note

# Efficacy of ethanolic extract of propolis in maintaining postharvest quality of dragon fruit during storage

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ABSTRACT

Significant ($P \leq 0.05$) differences were observed in dragon fruit quality when treated with different concentrations of ethanolic extract of propolis (EEP) (0.25, 0.50, 0.75 and 1.0%) and stored at $20 \pm 2$ °C and $80 \pm 5$% relative humidity (RH) for 20 days. Fruit treated with 0.50% EEP showed the most promising results, while fruit treated with 0.75 and 1.0% EEP showed some phytotoxic effects even after 8 days of storage. The results of gas exchange analysis also proved the efficacy of 0.50% EEP concentration. Thus, it can be concluded from the present investigation that EEP at 0.50% concentration could be used to extend the storage life of dragon fruit without any negative effects on the quality.



## 1. Introduction

Propolis is a natural glue produced by honey bees with main constituents being resins (flavonoids, phenolics and their esters), waxes, vitamins and essential oils (Juliano et al., 2007). Due to its chemical composition and antimicrobial properties, it is being widely used in the pharmaceutical industry.

Dragon fruit [(*Hylocereus polyrhizus*) (Weber) Britton & Rose] are gaining popularity in tropical and sub-tropical regions of the world. However, it has a short shelf-life which limits its storage time during transportation and marketing. The main factor which reduces this storage life is high temperature, which results in high respiration rates, rapid ripening and thus an early deterioration of the fruit quality occurs (Nerd et al., 1999).

Low temperature storage is one of the main techniques used to increase the shelf-life of fresh fruit and vegetables and it reduces thermal decomposition and respiration processes. However, prolonged storage at low temperature causes chilling injury and also contraction of the skin occurs as water from the skin of the fruit moves into the pulp which lowers down the taste and also damages the fruit physiology. In the literature, there has been no study reported on the use of propolis as a coating material to increase the storage life of dragon fruit. Therefore, the present study was conducted to analyse the effect of an ethanolic extract of propolis (EEP) on physicochemical changes, respiration rate and antioxidant activity of dragon fruit during storage.

## 2. Materials and methods

Crude Chinese propolis was obtained from Yi Wang Honey Garden (M) Sdn Bhd, Semenyih, Selangor, State of Malaysia. Dragon fruit were collected from a commercial orchard located at Puchong, Selangor, Malaysia. Extraction of propolis was done by using ethanol (Lu et al., 2005). Fruit of uniform size and free from defects were randomized to provide four replicates of 20 fruit for each treatment. Fruit were dipped into EEP of different concentrations (0.25, 0.50, 0.75 and 1.0%) along with 70% ethanol for 2 min, in order to uniformly coat the EEP and ethanol onto the fruit surface. Control fruit were dipped in purified water only. All the fruit were subjected to air drying at ambient temperature ($25 \pm 2$ °C) followed by packing and storage at $20 \pm 2$ °C, $80 \pm 5$% RH for 20 days.

Weight loss, fruit firmness, soluble solids concentration (SSC), titratable acidity (TA) and gas exchange analysis was done by the method given by Maqbool et al. (2011). Total phenolic contents, total flavonoids and ferric reducing antioxidant power (FRAP) were estimated by using spectrophotometric method of Ali et al. (2013). The decay percentage of the treated and untreated fruit was done using the formula given by El-Anany et al. (2009).

Statistical analysis was performed using the computer software MSTAT-C. The data were processed with the variance analysis (ANOVA) according to Fisher's least significant difference (LSD) test at ($P \leq 0.05$) to compare means between treated fruit and controls.

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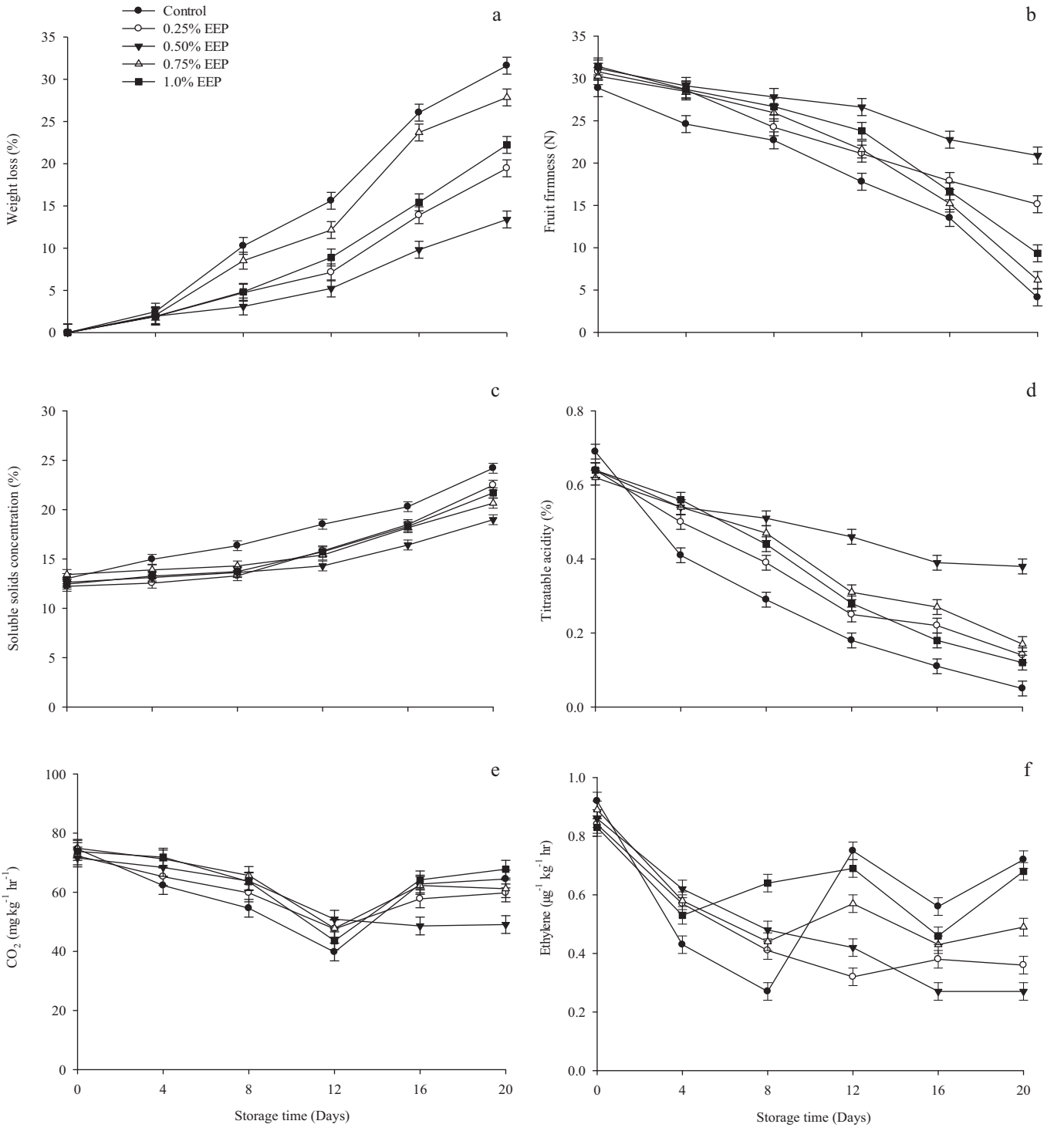


**Fig. 1.** Effect of different concentrations of EEP on (a) weight loss, (b) fruit firmness, (c) soluble solids concentration, (d) titratable acidity, (e) $CO_2$ production and (f) ethylene production of dragon fruit during 20 days of storage at 20 ± 2 °C and 80 ± 5% RH. Values are the mean ± SE.

## 3. Results

Fig. 1a indicates that the dragon fruit treated with EEP showed significantly ($P \leq 0.05$) lower weight loss than that of the control fruit. The weight loss increased gradually with an increase in storage time. However, the minimum weight loss (13.4%) was observed in the fruit treated with 0.50% EEP concentration after 20 days of storage. The highest weight loss was observed in control fruit (31.61%). On the other hand, the fruit treated with ethanol showed a similar weight loss to that in the control fruit (data not shown). The fruit treated with EEP showed significantly ($P \leq 0.05$) higher firmness than that of the untreated control fruit (Fig. 1b). The highest firmness (20.90 N) was recorded in fruit treated with 0.50% EEP. Similarly, significantly ($P \leq 0.05$) higher SSC value (24.20%) was recorded in the control fruit as compared to the fruit treated with EEP (Fig. 1c). While the lowest SSC value (18.98%) was recorded in 0.50% EEP treated dragon fruit. The results regarding titratable acidity (TA) showed that there was a significant ($P \leq 0.05$) decrease in TA