PERFORMANCE OF FIG (*Ficus carica* L. cv. IPOH BLUE GIANT) FRUIT STORED AT VARIOUS STORAGE TEMPERATURES

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ABSTRACT

Ficus carica L. or fig which is a member of mulberry family (Moraceae) is believed to have originated in Southern Arabia. It has been widely cultivated all over the world especially in California, USA. Fig is a very perishable fruit with short shelf life. The optimum storage temperature is one of the compulsory factors in prolonging fruits shelf life. However, there is lack of study on optimum storage temperature of fresh fig fruits especially on the Ipoh Blue Giant (IBG) cultivar planted in Malaysia. Fig cv. IBG is a large, purple brown skin, pinkish flesh, sweet and rich flavour fruits. It is one of a famous fig variety that have been cultivated and consumed in Malaysia. Thus, a study was conducted to observe the postharvest performance of fig cv. IBG stored at 5, 10 and 15 ˚C. The postharvest performance of fig fruit was determined according to its visual appearance during storage which includes water loss, colour changes and also disease incidence. A 5-point hedonic scales was used to evaluate the fruit appearance during storage, where 0 = 0% area affected, 1 = 1-5% area affected, 2 = 6-15% area affected, 3 = 16-30% area affected, and 4 = 31-100% area affected. Observation was carried out for 5 weeks and the performance of fig fruits were recorded at weekly basis. Results showed that fig fruit that stored at 5 ˚C can be stored for 5 weeks as compared to fruit that stored at 10 and 15 ˚C which only lasted for 4 and 2 weeks, respectively. Fig fruits stored at 10 and 15 ˚C lost its shelf life mainly due to disease and water loss. From the results, 5 ˚C is recommended as optimum storage temperature for fig cv. IBG

Key words: Postharvest quality, water loss, disease incidence, colour changes.

INTRODUCTION

Ficus carica L. or fig which is a member of mulberry family (Moraceae) is believed to have originated in Southern Arabia (Stover et al., 2007a). It has been widely cultivated all over the world especially in California, USA. Fig cv. Ipoh Blue Giant (IBG) has been classified as common-type fig with dark skin (Condit, 1955). Fig cv. IBG or more widely known as Improved Brown Turkey, is a large, purple brown skin, pinkish flesh, sweet and rich flavour fruits. It is one of famous fig variety that have been cultivated and consumed in Malaysia (Tuan Musa Yaacob, 2015). Fig cv. IBG rather to be consumed fresh than dried because of poor colour development after dying (Condit, 1955).

Fresh fig fruit is very perishable and have a short shelf life (Stover et al., 2007b). Microorganism such as fungus can grow rapidly on the fresh fig fruit due to high sugar content in fig fruit (Vebditti et al., 2005). Besides, fig fruit also a climacteric fruit that sensitive to ethylene (Marei & Crane, 1971). Studies showed that these postharvest problems faced by fresh fig fruit can be overcome by edible coating, suitable packaging and low temperature storage (Allegra et al., 2017; Reyes-Avalos et al., 2016; Sozzi et al., 2005).

The optimum storage temperature is one of the compulsory factors in prolonging fruits shelf life (Wills et al., 2007). However, the study on the optimum storage temperature for fresh fig fruit especially cv. IBG is lacking and has not highlighted by any researchers yet. Thus, the objective of this experiment was to evaluate the performance of postharvest fresh fig fruit cv. IBG stored at various temperatures. The study of optimum storage temperature of fresh fig fruit will improve its shelf life and indirectly reducing the postharvest loss.

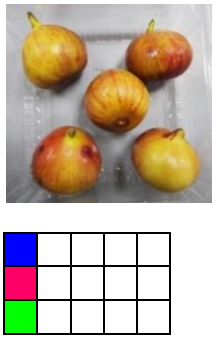
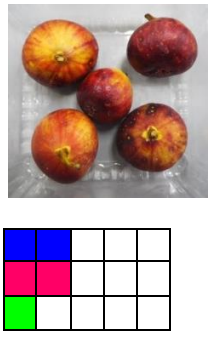
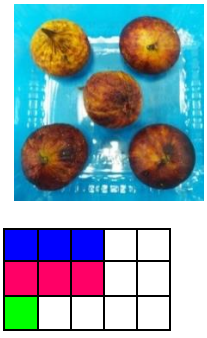
MATERIALS AND METHODS

Fig fruits cv. IBG that planted in the rain shelter at Selangor Fruit Valley were harvested. The fig fruit were stored at three different temperatures (5, 10 and 15 ˚C) with two replications for each temperature. Postharvest performance of fig fruits during

storage was observed based on changes in visual appearances which were water loss, colour changes and disease incidence. The visual appearance were evaluated according to 5-point hedonic scales, where 0 = 0% area affected, 1 = 1-5% area affected, 2 = 6-15% area affected, 3 = 16-30% area affected, and 4 = 31-100% area affected (Phebe & Ong, 2010). The observation was carried out for 5 weeks and the evaluation of fig fruits performance were recorded at weekly basis.

RESULTS

Table 1: Performance of postharvest fresh fig cv. Ipoh Blue Giant stored at 5, 10 and 15 ˚C during storage week 0, 1, 3 and 5

Storage temperature	Storage week 0	Storage week 1	Storage week 3	Storage week 5
5 ˚C				
10 ˚C				
15 ˚C				

Coloured box indicates the level of fresh fig fruit that have been affected based on 5-point hedonic scales.

Water loss Colour changes Disease incidence

DISCUSSION

The results of the study showed that fresh fig fruit cv. IBG experienced high water loss when stored at 10 and 15 ˚C. The fig fruit lost almost 100% of its water content after stored for 5 and 3 weeks at 10 ˚C and 15 ˚C, respectively. The fresh fig fruit stored at 10 and 15 ˚C was severely infected by diseases while those stored at 5 ˚C showed mild infection. The finding from this study indicates that low storage temperature is able to retard microbial growth. According to Caleb et al. (2013), low storage temperature could retard growth rate of yeast and mold in pomegranate arils.

The colour of fresh fig fruit skin changed gradually when stored at the three storage temperatures in the present study. Fig fruit that stored at 5 ˚C showed least colour changed as compared to fig fruit that stored at 10 and 15 ˚C. Fig fruit is a climacteric fruit which responds towards ethylene. Ethylene has stimulated the synthesis of pigment which causes colour changes of fig fruit during storage. Similar finding was also reported in dabai (*Canarium odontophyllum* Miq.) which ethylene caused colour changed in skin and flesh of dabai (Ding & Tee, 2010). However, the process was delayed when the fruit was stored at low storage temperature (Mutari & Debbie, 2011; Wills et al., 2007).

The fresh fig fruit that stored at 10 and 15 ˚C were discarded at week 3 and 5, respectively. However, fig fruit that stored at 5 ˚C can be consumed after storage for 5 weeks with minimal fungus infection. This is because ethylene in fig fruit tends to stimulate softening and decaying the fruit when storage temperature higher than 5 ˚C. The evaluations from visual appearance of fresh fig fruit shows that low storage temperature have improved the shelf life of fruit and reduced postharvest loss.

CONCLUSION

The results from the present study indicated that 5 ˚C is the optimum storage temperature for fresh fig fruit cv. IBG. This is because fig fruit that stored at 5 ˚C showed least water loss, colour changes and disease infection after 5 weeks of storage.

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REFERENCES

Allegra, A., Sortino, G., Inglese, P., Settanni, L., Todaro, A., & Gallotta, A. (2017). The effectiveness of *Opuntia ficus-indica* mucilage edible coating on post-harvest maintenance of 'Dottato'fig (*Ficus carica* L.) fruit. *Food Packaging and Shelf Life*, 12, 135-141.

Caleb, O. J., Opara, U. L., Mahajan, P. V., Manley, M., Mokwena, L., & Tredoux, A. G. (2013). Effect of modified atmosphere packaging and storage temperature on volatile composition and postharvest life of minimally-processed pomegranate arils (cvs.'Acco'and 'Herskawitz'). *Postharvest Biology and Technology*, 79, 54-61.

Condit, I. (1955). Fig varieties: a monograph. *Hilgardia*, 23(11), 323-538.

Ding, P., & Tee, Y.K. (2010). Application of exogenous ethylene on postharvest quality of dabai (*Canarium odontophyllum* Miq.) fruit. *African Journal of Agricultural Research*, 5(24), 3483-3492.

Marei, N., & Crane, J. C. (1971). Growth and respiratory response of fig (*Ficus carica* L. cv. Mission) fruits to ethylene. *Plant Physiology*, 48(3), 249-254.

Mutari, A., & Debbie, R. (2011). The effects of postharvest handling and storage temperature on the quality and shelf of tomato. *African Journal of food science*, 5(7), 340-348.

Phebe, D., & Ong, P. T. (2010). Extending 'Kampuchea'guava shelf-life at 27 ˚C using 1-methylcyclopropene. *International Food Research Journal*, 17(3), 63-69.

Reyes-Avalos, M. C., Femenia, A., Minjares-Fuentes, R., Contreras-Esquivel, J. C., Aguilar-González, C. N., Esparza-Rivera, J. R., & Meza-Velázquez, J. A. (2016). Improvement of the quality and the shelf life of figs (*Ficus carica*) using an alginate–chitosan edible film. *Food and Bioprocess Technology*, 9(12), 2114-2124.

Sozzi, G. O., Abraján-Villaseñor, M. A., Trinchero, G. D., & Fraschina, A. A. (2005). Postharvest response of 'Brown Turkey'figs (*Ficus carica* L.) to the inhibition of ethylene perception. *Journal of the Science of Food and Agriculture*, 85(14), 2503-2508.

Stover, E., Aradhya, M., Ferguson, L., & Crisosto, C. H. (2007a). The fig: overview of an ancient fruit. *HortScience*, 42(5), 1083-1087.

Stover, E., Aradhya, M., Crisosto, C., & Ferguson, L. (2007b). Overview of the California fig industry and new interest in varieties for fresh fruit. In *Proceeding California Plant Soil Conference: Opportunities for California Agriculture*, February (pp. 169-175). Sacramento, CA, USA.

Tuan Musa Yaacob (2015, February). Varieti Pilihan Bagi Yang Mahu Mula. Tin Oh Tin. Retrieved from http://www.tinohtin.com/2015/02/varieti-pilihan-bagi-yang-mahu-mula.html

Venditti, T., Molinu, M. G., Dore, A., D'hallewin, G., Fiori, P., Tedde, M., & Agabbio, M. (2005). Treatments with GRAS compounds to keep fig fruit (*Ficus carica* L.) quality during cold storage. *Communications in Agricultural and Applied Biological Sciences*, 70(3), 339.

Wills, R., McGlasson, B., Graham, D., & Joyce, D. (2007). *Postharvest: An introduction to the physiology and handling of fruit, vegetables and ornamentals*. Sydney, Australia: UNSW Press.