



## Preservation of Snake Fruit Cultivar Pondoh (*Salacca edulis* Reinw.) at Cold Temperature Storage

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### Abstract

This study was done to preserve snake fruit cultivar Pondoh cold temperature storage. Snake fruits was obtained from Turi, Sleman, Yogyakarta and transferred to the laboratory with the aseptic condition. The sortation based on the visual method was used to collect the proper snake fruit. The cleaning using aseptic cloth was done prior to storage. The snake fruit was collected individually in refrigeration containers at temperatures of  $10 \pm 5^\circ\text{C}$ . The storage was done for 30 days and it was stopped until appearance of physical damage in snake fruit. The result indicates that the storage using this method might extend the shelf-life of snake fruit until 28 days. However, snake fruit was hardly to peeled and dry. It can be concluded that cold temperature might extend the shelf-life of snake fruit.

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### Introduction

Snake fruit is one of the tropical commodities export in Indonesia to various countries in the form of stem and non-stemmed condition which is popular because it has a sweet, crisp and rich in nutrients (Wijanarti *et al.*, 2016; Zubaidah *et al.*, 2017). However, the problem is that fruit are easily infected with fungus *Aspergillus* spp., *Ceratocystis* spp. and *Fusarium* spp. also easily to get enzymatic browning reaction (Tian *et al.*, 2005; Wulandari and Ahmad, 2018) which can cause damage to nutritional quality, taste and aroma (Pan *et al.*, 2012; Dharmaputra *et al.*, 2013) also visual quality that can reduce consumer acceptance (Sagar and Kumar, 2010) which can occur during storage both at room and cold temperature (Chidtragool *et al.*, 2011). The enzymatic browning reactions is caused by the activity of the polyphenol oxidase enzyme (PPO) which converts phenol compounds to o-quinone which causes a brownish color (Rasouli and Saba, 2018).

However, fungal infections and PPO enzyme activity could be inhibited by various methods (Oms-Oliu

*et al.*, 2010; Al-Baarri *et al.*, 2018; Bafort *et al.*, 2014) for example atmosphere packaging and spraying antimicrobial and antibrowning compound as well (Rojas-Grau and Martin-Belloso, 2008; Ghidelli *et al.*, 2015). Antimicrobial compounds which came from essential oil such as kiwi fruit and citrus might inhibit microbial growth (Lanciotti *et al.*, 2004) because it caused degradation of cytoplasm and protein membrane of microorganism (Burt, 2004). However, essential oil had a low solubility and leave negative impact to taste (Gutierrez *et al.*, 2008). In order to inhibit the activity of PPO enzyme it also has been known using chemical compound based on ascorbate, calcium and thiol (Ioannou and Ghouli, 2013). However, chemical compound such as calcium chloride could leave negative impact to taste (Abd-Alhady, 2014). Thus, it requires a method that easy to applied without negative impact to taste. This study was done using cold storage condition as it could be applied to most food variants (Al-Baarri, 2016). Based on the knowledge, there was no documentation yet about refrigeration on snake fruits,

that why this study aim to know refrigeration to snake fruit. This study may provide information of snake fruit preservation using cold storage.

### Materials and Methods

This research used 5 months harvest time, that was obtained from Turi Village, Sleman Regency, Yogyakarta, the aseptic refrigerator was provided by Central Laboratory for Research and Services Diponegoro University (CORES DU). Plastic knife and latex gloves was used to determine the physical condition of snake fruits.

Snake fruit was transferred to laboratory without any preservation. The location of cultivation and laboratory was 3 hour in a distance by car. The aseptic container was provided to keep the quality of snake fruits. Container was also equipped using the soft materials to avoid the physical movement that may affected to the quality. The sortation was done based on visual method and only the non-physically damaged and non-moldy of snake fruits was collected. The cleaning using aseptic cloth was also done individually. Then, snake fruit was individually in aseptic refrigerator at temperature of  $10\pm 5^{\circ}\text{C}$ . The preservation was done for 30 days.

### Results and Discussion

This research used 5 months harvest time of snake fruit as the common duration for harvesting the snake fruits. During harvesting, snake fruits was treated in aseptic plastic bag to avoid microorganism contamination that may affect to the quality of snake fruit. Turi, Sleman, Yogyakarta was chosen as snake fruit cultivation since this area was the biggest snake fruits production in Yogyakarta.

The results indicate that storage in cold temperature might keep shelf-life of snake fruit life until 28 days without any damage on physical and no mold was found based on visual appearance. However, the skin of snake fruit was dry. This may be explained that snake fruit had a higher respiration rate in refrigerator. The greater rate of respiration causes the fruit more quickly damage that shorten the shelf-life (Adirahmanto *et al.*, 2013). Physical injury might contribute to the easily infection by microbe and enzymatic browning (Rawat, 2015; Wardhani *et al.*, 2016).

Snake fruit that stored in cold temperature generally had a shelf-life up to 1 month (Gunadnya, 2009). Thus to extend the shelf-life of snake fruits, may be achieved by avoiding the respiration rate in snake fruits through the modification on refrigerator or using the individual snake fruits container. Since the oxidase may contribute to the enzymatic browning on snake fruits, thus the preservation to inhibit this enzyme may also be required.

### Conclusion

Based on this study, it can be concluded that preservation in cold temperature might extend the quality of snake fruit up to 28 days but it provide the dry skin of the fruits.

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### References

- Abd-Elhady, M. 2014. Effect of citric acid, calcium lactate and low temperature prefreezing treatment on the quality of frozen strawberry. *Annals of Agricultural Science* 59: 69-75. DOI: 10.1016/j.aas.2014.06.010.
- Adirahmanto, K. A., Hartanto, R., Novita, D. D. 2013. Chemical change and shelf life fruit salak pondoh (*Salacca edulis* Reinw.) dynamic storage in the air-CO<sub>2</sub>. *Jurnal Teknik Pertanian Lampung* 2: 123-132.
- Al-Baarri, A. N. 2016. Daun tomat dan aplikasinya untuk antibakteri. Penerbit Indonesia Food Technologist, Semarang.
- Al-Baarri, A. N., Legowo, A. M., Widayat, Abduh, S. B. M., Hadipermata, M., Wisnubroto, Ardianti, D. K., Susanto, M. N., Yusuf, M., Demasta, E. K. 2018. Determination *hypoiodous acid* (HIO) by peroxidase system using peroxidase enzyme. In: IOP Conference Series Earth and Environmental Science 116: 1-4. DOI: 10.1088/1755-1315/116/1/012043.
- Bafort, F., Parisi, O., Perraudin, J. P., Jijakli, M. H. 2014. Mode of action of lactoperoxidase as related to its antimicrobial activity: a review. *Enzyme Research* 2014: 1-13. DOI: 10.1151/2014/517164.
- Burt, S. 2004. Essential oils: their antimicrobial properties and potential application in food-a review. *International Journal of Food Microbiology* 94(3): 223-253. DOI: 10.1016/j.ijfoodmicro.2004.03.022.
- Chidtragool, S., Kesta, S., Bowen, J., Ferguson, I. B., van Doorn, W. G. 2011. Chilling injury in mango fruit peel: Cultivar differences are related to the activity of phenylalanine ammonia lyase. *Postharvest Biology and Technology* 62: 59-63. DOI: 10.1016/j.postharvbio.2011.04.011.
- Dharmaputra, O. S., Kumiadi, R., Hasbullah, R. 2013. Ginger and turmeric extracts: their effects on *Thielaviopsis paradoxa* infection of salak Pondoh during storage. In: II Asia Pacific Symposium on Postharvest Research Education and Extension 319-324. DOI: 10.17660/ActaHortic.2013.1011.40.
- Ghidelli, C., Rojas-Argudo, C., Mateos, M., Perez-Gago, M. B. 2013. Effect of antioxidants in cotrolling enzymatic browning of minimally processed persimmon 'Rojo Brillante'. *Journal Postharvest Biology and Technology* 86: 487-493. DOI: 10.1016/j.postharvestbio.2013.07.034.
- Gulcin, I., Huyur, Z., Elmastas, M., Aboul-Enein, H. Y. 2010. Radical scavenging and antioxidant activity of tannic acid. *Arabian Journal of Chemistry* 3: 43-53. DOI: 10.1016/j.arabicjc.2009.12.008.
- Gunadnya, I. P. B. 2009. Determination of the modified atmosphere (MA) region for fresh snake fruit cultivar Pondoh storage. *Journal Agrotekno* 15:

54-60.

- Gutierrez, J., Barry-Ryan, C., Bourke, P. 2008. The antimicrobial efficacy of plant essential oil combinations and interactions with food ingredients. *International Journal of Food Microbiology* 124: 91-97. DOI: 10.1016/j.ijfoodmicro.2008.02.028.
- Iannou, I., Ghoul, M. 2013. Prevention of enzymatic browning in fruit and vegetables. *European Scientific Journal* 9 (30): 310-341. DOI: 10.1021/bk-1995-0600.ch004.
- Khurshid, S., Qureshi, M. Z., Ibrahim, A., Nawaz, Z., Sajid, A., Ikram, M. 2012. Production and purification of horseradish peroxidase in Pakistan. *International Journal of the Physical Sciences* 7: 2706-2712. DOI: 10.5897/IJPS11.724.
- Lanciotti, R., Gianotti, A., Patrignani, F., Belletti, N., Guerzoni, M. E., Gardini, F. 2004. Use of natural aroma compounds to improve shelf-life and safety on minimally processed fruits. *Trends in Food Science & Technology* 15: 201-208. DOI: 10.1016/j.tifs.2003.10.004.
- Oms-Oliu, G., Rojas-Grau, A., Gonzalez, L. A., Varela, P., Soliva-Fortuny, R., Hernando, I. H., Munuera, I. P., Fiszman, S., Belloso-Martin, O. 2010. Recent approaches using chemical treatments to preserve quality of fresh-cut fruit: a review. *Journal Postharvest Biology and Technology* 57: 139-148. DOI: 10.1016/j.postharvbio.2010.04.001.
- Pan, Z., Zhu, Y., Yu, X., Lin, Q., Xiao, R., Tang, J., Chen, Q., Liu, B. 2010. Synthesis of 4'-thiosemicarbazonegrisefulvin and its effect on the control of enzymatic browning and postharvest disease of fruits. *Journal of Agricultural and Food Chemistry* 60: 10784-10788. DOI: 10.1021/jf302356x.
- Rasouli, M., Saba, M. K. 2018. Pre-harvest zinc spray impact on enzymatic browning and fruit flesh color changes in two apple cultivars. *Journal Scientia Horticulturae* 240: 318-325. DOI: 10.1016/j.scienta.2018.06.053.
- Rawat, S. 2015. Food spoilage: microorganisms and their prevention. *Asian Journal of Plant Science and Research* 5: 47-56. In: IOP Conference Series: Earth and Environmental Science 197. DOI: 10.1088/1755-1315/197/1/012031.
- Rojas-Grau, M. A., Tapia, M. S., Martin-Belloso, O. 2008. Using polysaccharide-based edible coatings to maintain quality fresh-cut Fuji apples. *LWT-Food Science and Technology* 41: 139-147. DOI: 10.1016/j.lwt.2007.01.009.
- Sagar, V. R., Kumar, P. S. 2010. Recent advances in drying and dehydration of fruits and vegetables: a review. *Journal of Food Science and Technology* 47 (1): 15-26. DOI: 10.1007/213197-010-0010-8.
- Tian, S., Li, B., Xu, Y. 2005. Effects of O<sub>2</sub> and CO<sub>2</sub> concentrations on physiology and quality of litchi fruit in storage. *Food Chemistry* 91: 659-663. DOI: 10.1016/j.foodchem.2004.06.038.
- Wardhani, D. H., A. E. Yuliana dan A. S. Dewi. 2016. Sodium metabisulfite as anti-browning agent in enzymatic browning of bamboo shoot (*Bambusa arundinacea*). *Jurnal Aplikasi Teknologi Pangan* 5: 140 – 145. DOI: 10.17728/jatp.202.
- Wijanarti, S., Putram A. B. N., Nishi, K., Harmayani, E., Sugahara, T. 2015. Immunostimulatory activity of snake fruit peel extract on murine macrophage-like J774.1 cells. *Cytotechnology* 68: 1737-1745. DOI: 10.1007/s10616-015-9925-2.
- Wulandari, N. F., Ahmad, R. Z. 2018. *Thielaviopsis spp.* from salak [*Salacca zalacca* (Gaerntn.) Voss] in Indonesia. *International Journal of Agricultural Technology* 14(5): 797-804.
- Zubaidah, E., Putri, W. D. R., Puspitasari, T., Kalsum, U., Dianawati. 2017. The effectiveness of various salacca vinegars as therapeutic agent for management of hyperglycemia and dyslipidemia on diabetic rats. *International Journal of Food Science* 1-7. DOI: 10.1155/2017/8742514.