Flower bagging effects on the α-mangostin content during mangosteen fruit growth

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Abstract

Mangosteen fruit (*Garcinia mangostana* L.) is consumed mainly for two purposes, i.e. its aril for fresh or minimally processed products and its rind for herb and other health-related products. In facts, due to high portion of rind compared to its whole fruit, its rind has a more important economical value, especially for its α-mangostin content. This study reported the effects of flower baggings on the α-mangostin content during mangosteen fruit growth.This field research was conducted in a farmer's field at Gisting village, Tanggamus district, Lampung Province, Indonesia.The study was arranged in a 2 × 3 factorial design. The first factor was bagging date [2 and 4 weeks after anthesis (WAA)], and the second one was bagging material (unbagged or control, banana 'Cavendish'- paper bag, and balloon). Fruit samplings were conducted in every two weeks during the periods of 8-16 WAA. . The α-mangostin content was analyzed with HPLC [Dionex-UltiMate® 3000, autosampler, column compartment, Ultimate 3000 pump, UV detector, column Enduro C-18 (250 mm × 4.6 mm, 5 µm) with C18 guard]. The results showed that the α-mangostin content was increased in a sigmoid pattern during fruit growth, and the increase was mostly not affected by bagging, bagging materials, and application periods. The α-mangostin content was increased tremendously during 10-14 WAA, regardless of bagging, bagging materials and application periods. Bagging slightly decreased α-mangostin content during the latest period of fruit growth, regardless of bagging materials and application periods.

Keywords: α-mangostin, bagging, fruit growth, mangosteen, preharvest

Introduction

Mangosteen (*Garcinia mangostana* L.) belongs to the family Clusiaceae or Guttiferae. Of the edible *Garcinia* species, mangosteen is believed to be the most important one from the economical standpoint of view. Its fruit is consumed mainly for two purposes, i.e. its aril for fresh, juice, or other processed products (Manurakchinakorn *et al*., 2005; Ngarmsak, 2007) and its rind for herb and other health-related products (Lim, 2012). In facts, due to high portion of rind compared to its whole fruit, its rind has a more important economical value, especially for its α-mangostin ($C_{24}H_{26}O_6$) content. Aizat *et al*. (2019) has reviewed its uses and came to the conclusion that the fruit has been utilized for various purposes, ranging from usage in industrially important products to applications in advanced technologies and biomedical innovation.

Most of the researcher efforts in mangosteen culture have been elaborated to find the cause and solution in preventing its fruit physiological disorders, in which research in yellow latex (gamboge) disorder has dominated (Cunha *et al*., 2014; Dorly *et al*., 2008; Dorly *et al*., 2011; Jarimopas *et al*., 2009; Jaritngam *et al*., 2001; Pludbuntong *et al*., 2007; Poovarodom, 2010). To inhibit physiological causes and insect attack that led to yellow latex disorder, Widodo *et al.* (2019) recomended that flower bagging should be applied, with the result was that paper bagging in 2 WAA resulted in the mangosteen fruit shelf-life of 29 days compared to 4 WAA which resulted in 14 days shelf-life. The question is does flower bagging affect the α-mangostin content in its rind tissues? Based on our knowledge, comparing to research in α-mangostin as potent medicinal uses that is easily accessed (Arrosyadi *et al*., 2016; Lim, 2012; Kurniawati *et al*., 2010 and 2011; Wang *et al*., 2011) informations on the effects of flower bagging to α-mangostin content are difficult to find. Therefore, this article reported the results of flower bagging on the α-mangostin content during mangosteen fruit growth.

Materials and Methods

This research that was conducted in July–December 2017, in a farmer's field at Gisting village, Tanggamus district, Lampung Province, Indonesia. The mangosteen crop samples were about 38 years old, and located at -5º27'30" NL 104º42'8" SL, ± 537.1 m above-sea-level. Fruit samples for α-mangostin were analyzed in the Laboratory of Pharmacy Analysis and Medicinal Chemistry, Fac. of Pharmacy, University of Pajajaran, Bandung, Indonesia. The research was started by tagging mangosteen flower at anthesis.

The field research used Completely Randomized Design (CRD) with three

replications in each sampling period of five samplings totally. It was arranged in a 2 × 3 factorial design. The first factor was bagging date [2 and 4 weeks after anthesis (WAA)], and the second one was bagging material [unbagged or control, banana 'Cavendish'- paper bag (later for easy writing on the figure, the words of cement paper bag was used), and balloon]. The reused banana 'Cavendish'- paper bags were received from Great Giant Foods, Co. Ltd., Terbanggi Besar, Central Lampung through Nusantara Tropical Farm, Co. Ltd., Labuhan Ratu, East Lampung, Indonesia. Three bagging materials (unbagged, banana 'Cavendish'- paper bag, and balloon) were applied to flowers of 2 and 4 WAA. The fruits were then sampled every 2 weeks during the fruit development periods of 8-16 WAA. Observations to α-mangostin content in the rind were conducted in every two weeks sampling in the sampling periods of 8-16 WAA. The α-mangostin content was analyzed with HPLC [Dionex-UltiMate® 3000, autosampler, column compartment, Ultimate 3000 pump, UV detector, column Enduro C-18 (250 mm × 4.6 mm, 5 µm) with C18 guard] based on (Muchtaridi *et al*., 2016). Data were analyzed statistically with an orthogonal polynomial contrast at 5% level, and then presented into line graphs.

Results and Discussion

Xanthone is a tricyclic isoprenylated polyphenol, with the most abundant one in mangosteen rind are α- and γ-mangostin. Our data showed that the α-mangostin content was increased in a sigmoid pattern during fruit growth and it was increased tremendously during 10-14 WAA (Figure 1). The result was similar to Gondokesumo *et al.* (2019) who reported that the mangosteen at maturity level 6 of mangosteen rind has the highest total xanthones. Kurniawati *et al*. (2011), however, reported differently that xanthone content of mangosteen fruit's rind was not affected by fruit age because the xanthone contents at a month up to four months after anthesis were not different significantly. Consequently, as Kurniawati *et al*. (2011) mentioned, that green fallen mangosteen fruits might be as good the fruits of latest maturity as the source of α-mangostin. Unfortunately, Kurniawati *et al*. (2011) did not discussed sufficiently.

To inhibit physiological causes and insect attack that led to yellow latex disorder, Widodo *et al.* (2019) recomended that flower bagging should be applied at 2 WAA. Data in Figure 1 showed that the increase of α-mangostin content was mostly not affected by bagging (Figure 1a), bagging materials (Figure 1e-g), and application periods (Figure 1b-d). In fact, the α-mangostin content was increased tremendously during 10-14 WAA, regardless of bagging, bagging materials, and application periods (Figure 1). That means when yellow latex disorder due to insect attack rises and flower bagging has to be applied, results in Figure 1 tells us that flower bagging will not affect α-mangostin content. Bagging slightly decreased α-mangostin content during the latest period of fruit growth (Figure 1a),

regardless of bagging materials and application periods.

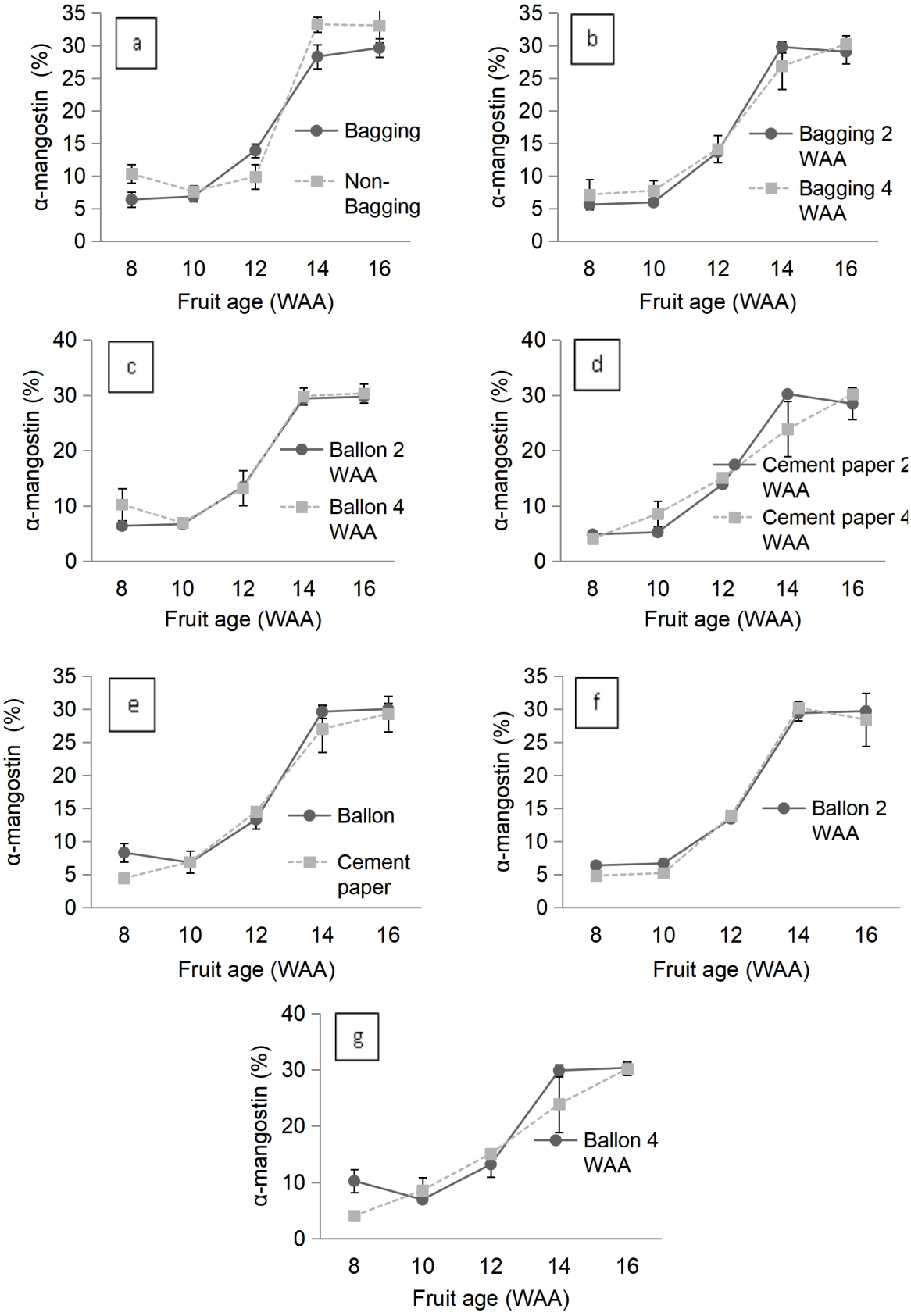

Figure 1. α-mangostin content in the mangosteen rind after pre-harvest baggings during fruit growth

Conclusion

The α-mangostin content was increased in a sigmoid pattern during fruit growth, and the increase was mostly not affected by bagging, bagging materials, and application periods. The α-mangostin content was increased tremendously during 10-14 WAA, regardless of bagging, bagging materials, and application periods. Bagging slightly decreased α-mangostin content during the latest period of fruit growth, regardless of bagging materials and application periods.

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