



Alterations in the morphological, sugar composition, and volatile flavor properties of petai (*Parkia speciosa* Hassk.) seed during ripening



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ARTICLE INFO

Keywords:

Seasonal petai seed
Ripening process
CIE L*a*b* color space
Sugar composition
GC-O volatile flavor profile
Odor strength

ABSTRACT

Petai seeds are one of the well-known strong-smelling foods of the Southeast Asian region that have been harvested and commercially offered in different ripening forms. The current study focused on alterations in the size, color, sugar composition, and volatile flavor properties of petai seeds in the four ripening stages (unripe, mid ripe, ripe, and over-ripe). The ripening process was mainly indicated by the increase in size and weight as seed color turned paler and less greenish. The total sugar content gradually increased during ripening, and then elevated from 1.60 g/100 g (ripe seed) to the level of 2.82 g/100 g in the over-ripe seed. Ripening also altered the volatile flavor composition of petai seed, wherein the predominant aldehydes (hexanal and acetaldehyde) were decreased, and the sulfuric compounds (hydrogen sulfide, methanethiol, and 1,2,4-trithiolane) tended to increase. Additionally, gas chromatography-olfactometry (GC-O) analysis revealed alterations in the perceived odor strength and sensation of each volatile compound and demonstrated volatile flavor profiles, viz. detection percentages of volatile group odor strengths and descriptive odors, of petai seed. These results provide valuable information for monitoring alterations in the physical appearance, sugar composition, and aroma that represent the flavor quality in seasonal petai seed.

1. Introduction

Petai seeds (*Parkia speciosa* Hassk.), also known as stinky beans, chou-dou, u'pang, sataw, and sotor, are clustered green edible legumes, which have been widely consumed in Southeast Asia, including Indonesia, Malaysia, Singapore, Philippines, and Thailand. Petai is known for emitting strong sulfuric smells when consumed in domestic diets or processed into various food products (Frérot, Velluz, Bagnoud, & Delort, 2008; Gan & Latiff, 2011; Miyazawa & Osman, 2001; Tocmo, Liang, Wang, Poh, & Huang, 2016). Petai seed comprises about 52.9 g carbohydrate, 27.5 g protein, 13.3 g fat, and 0.27 g calcium per 100 g of edible portion, and also contains bioactive plant sterols (β -sitosterol and stigmasterol), phenolics, flavonoids, and several peptides (Jamaluddin, Mohamed, & Lajis, 1994; Maisuthisakul, Pasuk, & Ritthiruangdej, 2008; Siow & Gan, 2013). It also possesses various potent biological functions such as antioxidant, antibacterial, antitumor, and antihypertensive effects (Maisuthisakul et al., 2008; Murakami, Ali, Mat-Salleh, Koshimizu, & Ohigashi, 2000; Sakunpak & Panichayupakaranant, 2012; Siow & Gan, 2013). The cultivation of petai seeds often generates different ripening forms of the seeds that

can be offered commercially in different sizes and forms.

The maturation process of horticultural crops can be visibly seen by the alterations in their morphological changes such as size and color, and thus by their physical appearance (Menz & Vriesekoop, 2010). In many cases, the ripening process critically alters the chemical composition of postharvest crops, mainly the nutritional and biological properties, which contribute to their quality attributes, thereby becoming a major factor for determining the decision of the consumer to purchase the products (Bhagya, Sridhar, Raviraja, Young, & Arun, 2009; Iglesias & Echeverría, 2009; Xi et al., 2014). On the other hand, sugar accumulation and volatile flavor generation are often used as quality indicators for detecting the occurrence of ripening in the horticultural crops (Kheng, Ding, & Rahman, 2012; Menz & Vriesekoop, 2010; Xi et al., 2014). Such progression in the morphological alterations is also expected to occur in over-ripe crops that may lead to tissue softening and disruptions, insect and pathogen attacks, and post-harvest losses (Brummell, Cin, Crisosto, & Labavitch, 2004; Rattanapun, Amornsak, & Clarke, 2009). Collection of morphological and chemical alterations data of seasonal crops is very important for clarifying their quality traits in different maturity stages, and for determining the

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