RESEARCH ARTICLE

Nutritive Value and Antioxidant Activity of Mamao (*Antidesma thwaitesianum*) Fruit Juice

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ABSTRACT

The ripped "Mamao" (*Antidesma thwaitesianum*) fruit is naturally eaten and contained bioactive constituents with health promoting benefits to consumers i.e., antioxidant, anti-inflammatory, and hypoglycemic activities. Local-made juice was concerned on its quality, aims of this study were determined anthocyanin and tannin contents of mamao juice. The nutritional composition contained in juice and antioxidant activity were also evaluated. This juice was provided high calcium and dietary fiber, while low calories from fat. There was contained tannin content (3.64 mg/mL) and very high amount of anthocyanin (1,202.43 mg of cyanindin-3-glucoside equivalent, CE/L), which were implied that this juice was good taste by lack of astringent taste, and intensive red grape-like color with strong antioxidant activity. Mamao juice was possessed strong DPPH radical scavenging activity in both of fat soluble (879.38 mg of trolox equivalent, TE/100 mL) and water soluble (653.14 mg of ascorbic acid equivalent, AE/100 mL) environments, which were related to high content of anthocyanin. In this study, we were use anthocyanin content for monitoring of the quality of this juice. For further study, this research is need to conduct on application of phytochemical contents with sensory evaluation on process of juice production.

Keywords: *Antidesma thwaitesianum*, Antioxidant, Anthocyanins, Tannin, Nutrition.

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INTRODUCTION

Antidesma thwaitesianum namely "Mamao" is a tropical plant belonging to the *Euphorbiceae*, and is extensively planted in the North-Eastern of Thailand. The ripped fruit is red color and naturally eaten with sour sweet flavored. The fruits are preserved and processed as jam, wine and juice. Polyphenols and flavonoids are major active constituents in its fruits and there are revealed health promoting benefits to consumers i.e., antioxidant, anti-inflammatory, and hypoglycemic activities.[1,2] The juice of this fruit is also found high content of various bioactive constituents, including phenolics, ascorbic acid, anthocyanins, and flavonoids.[3,4] In addition, due to high anthocyanin content in these tropical fruits is strong anti-oxidant and anti-inflammation[5,6] and tannin is also may affected to astringent taste of juice. Our study was concerned on quality of juice products, which were made from locally harvested and processed fruits. Hence, we were determined anthocyanin and tannin contents of mamao juice, which was collected cultivating area, Udon Thani, Thailand. The nutritional composition contained in juice and antioxidant activity were also evaluated.

MATERIALS AND METHODS

Plant Material and Juice Preparation

The major area of mamao cultivation is located at Sakon Nakhon and nearby provinces, which can be produce good quality fruits due to an appropriate environment. The fruits were small spherical in bushy. The raw fruits are light green or dark green color, and sour taste. The ripe fruits were red and eventually purplish-black color. The ripe fruit has a sweet, sour and astringent taste. Fresh fruits (3.7 kg) were purchased from local markets, and pooled together. The fruits were cleaned thoroughly with distilled water and manually pressed, and the marc and seed were removed. The rose-color juice was stored at 4°C before analysis (Figure 1).

Nutritional Analysis

Chilled Mamao juice (1 L) was delivered to a laboratory within 24 hours. Nutritional analysis including calories, carbohydrate, dietary fiber, fat, sodium, calcium, iron, vitamin A, and vitamin B1 and B2, was determined by

The Central Laboratory Co., Ltd., Bangkok, Thailand according to AOAC International.[7] The nutrition value of juice

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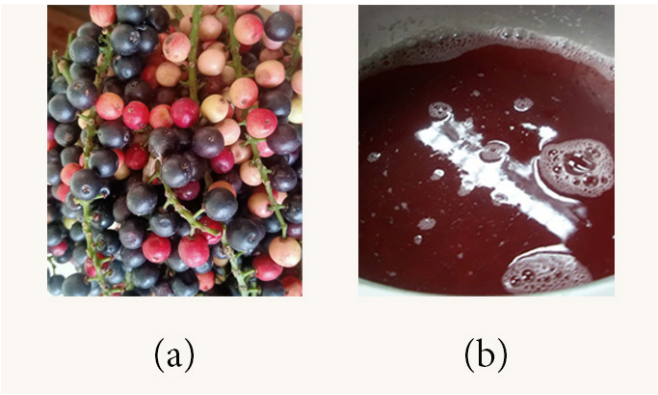

Figure 1: (a) The mixed of raw and ripe *A. thwaitesianum* fruits (b) characteristic of fruit juice

was reported as per 100 mL and per serving size, which was compared to Thai RDIs.[8]

Tannin Content

The mamao juice was determined the tannin content by using a spectrophotometric-based method (λ_{max} = 760 nm). This analytical approach was involved the use of Folin-Denis reagent (Sigma Alrich, USA) in accordance with the established by the Association of Official Analytical Chemists, AOAC (2005) 952.03. A standard curve was performed by utilizing of known concentration of tannic acid (Sigma-Aldrich, USA).[9]

Anthocyanin Content

The mamao juice was determined anthocyanin content by using pH differential method (λ_{max} = 520 and 700 nm, respectively), which was modified from AOAC, official method 2005.2. The content was calculated from both of absorbance and dilution factor, and reported as mg of cyanidin-3-glucoside equivalent (CE) per L.[10]

Antioxidant Assay

The mamao juice was determined antioxidant activity by the monitoring of 2,2-diphenyl-1-picrylhydrazyl, DPPH (Sigma Alrich, USA) radicals. The reduction of DPPH radicals in present of juice was monitored microplate reader at 550 nm. The scavenging activity of DPPH radicals was expressed in mg of trolox equivalent (TE) per 100 mL, and in ascorbic equivalent (AE) per 100 mL.[11]

Data Analysis

Nutritive value of mamao juice, tannin and anthocyanin content, and DPPH scavenging activity were calculated from triplicated measurements and results were represented as descriptive data.

Table 1: Nutritive value of mamao (*A. thwaitesianum*) fruit juice

Nutrition value	*Unit*	*Per 100 g*	*Per serving size*	*RDI (%) **
Energy	kcal	53.71	50	-
Energy from fat	kcal	2.07	0	-
Total fat	g	0.23	0	0
Saturated fat	g	<0.01	0	0
Cholesterol	mg	ND	0	0
Protein (%N × 6.25)	g	0.27	0	-
Total carbohydrate	g	12.64	13	4
Dietary fiber	g	0.58	<1	2
Sugar	g	9.83	10	-
Sodium	mg	1.45	0	0
Vitamin A	µg	261.14	(0.0)	35
Beta-carotene	µg	ND	(0.0)	-
Vitamin B1	mg	ND	(0.0)	0
Vitamin B2	mg	ND	(0.0)	8
Calcium	mg	23.19	(23.19)	2
Iron	mg	0.14	(0.14)	0

*Thai recommended dietary allowances (Thai RDIs) is according to Ministry of Public Health, Thailand;[8] ND = not determined

RESULTS AND DISCUSSION

The nutritive value of mamao juice was reported and compared with Thai RDIs (Table 1). This juice was provided high calcium and dietary fiber, while low calories from fat.[8] The utilization of mamao fruit in Thailand is processed to several product including soft drink, alcoholic beverages, as well as functional foods, and this finding was supported to its products from previous studies.[12] Fruit juice is a preserving juice product by decreasing water activity for prevention of its spoilage by inhibition of microbial growth and extending the product's shelf life. Generally, the quality of juice is depended on physical appearance and taste sensing. Therefore, the presence of phytochemical content and potential of health benefit associated with juice products are also need to consider.[13,14] Hence, we were evaluated phytochemical content including tannin and anthocyanin content, which were associated to its astringent taste and color of juice, respectively. This juice was contained tannin content (3.64 mg/mL) and very high amount of anthocyanin (1,202.43 mg of CE/L), which were implied that this juice was good taste by lack of astringent taste, and intensive red grape-like color with strong antioxidant activity (Table 2). Mamao juice was possessed strong DPPH radical scavenging activity in both of fat soluble (879.38 mg of TE/100 ml) and water soluble (653.14 mg of AE/100 mL) environments,

Table 2: Phytochemical contents and DPPH radical scavenging activity of mamao juice[a]

Sample	*Tannin[b*] (mg/100 mL)*	*Anthocyanin[c] (mg/100 mL)*	*DPPH radical scavenging activity*	
			mg TE/100 mL	*mg AE/100 mL*
Mamao juice	3.64	1,202.43	879.36	653.14

AE = ascorbic acid equivalent; TE = Trolox equivalent; [a] Data of all assay were calculated from triplicate experiments; [b] Tannic acid and [c] cyanidin-3-glucoside were used as standard curve

which were related to high content of anthocyanin. As previous studies, mamao fruit juice is contained high content various bioactive compounds i.e., phenolics, ascorbic acid, anthocyanins, and flavonoids.[3,15] In this study, we were use anthocyanin content for monitoring of the quality of this juice. For further study, this research is need to conduct on application of phytochemical contents with sensory evaluation on process of juice production.

CONCLUSION

Nutritive value of mamao (*A. thwaitesianum*) fruit juice was high calcium and dietary fiber, while low calories from fat. This juice was contained low tannin and high anthocyanin content, which was implied low astringent taste and strong radical scavenging activity.

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