

กระบวนการผลิตน้ำผลไม้ผสมสมุนไพรจากฝรั่งและตะไคร้

The Production of Fruit Herbal Juice from Guava and Lemon Grass

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บทคัดย่อ

ในปัจจุบันผู้บริโภคคำนึงถึงสุขภาพกันมากซึ่งสมุนไพร เป็นทางเลือกหนึ่งที่ผู้บริโภคให้ความสนใจ และมีการบริโภคในหลายรูปแบบ แต่การบริโภคในรูปแบบของเครื่องดื่ม ยังมีผู้บริโภคบางส่วนไม่สามารถยอมรับในด้านของรสชาติได้ ดังนั้น งานวิจัยนี้ จึงทดลองนำน้ำผลไม้จากฝรั่งมาผสมกับน้ำสมุนไพรจากตะไคร้ เพื่อให้ผู้บริโภคสามารถบริโภคน้ำตะไคร้ได้ง่ายขึ้น โดยแบ่งการทดลองเป็น 3 ส่วน คือ ในขั้นแรกศึกษากรรมวิธีที่เหมาะสม ในการสกัดน้ำฝรั่ง และน้ำตะไคร้ โดยแปรเวลา และอุณหภูมิในการสกัด จากนั้น ศึกษาอัตราส่วนระหว่างน้ำฝรั่ง และน้ำตะไคร้ที่เหมาะสม โดยแปรอัตราส่วนการผสมเป็น 30 : 70 50 : 50 และ 70 : 30 (ปริมาตรโดยปริมาตร) พร้อมทั้ง แปรปริมาณความเข้มข้น เป็น 13 16 และ 19 องศาบริกซ์ และศึกษาอายุการเก็บโดยบรรจุในขวดแก้ว แล้วให้ความร้อนที่อุณหภูมิ 60 องศาเซลเซียส 30 นาที ทำให้เย็น เก็บที่อุณหภูมิ 4 องศาเซลเซียส วิเคราะห์ผลการทดลอง ที่ระยะเวลาเก็บ 0 2 4 6 และ 8 วัน ผลการทดลองพบว่า อุณหภูมิ และ เวลาที่เหมาะสมในการสกัดน้ำฝรั่งและน้ำตะไคร้ คือ 85 องศาเซลเซียส เป็นเวลา 7 นาที และ 75 องศาเซลเซียส เป็นเวลา 7 นาที ตามลำดับ และอัตราส่วนของน้ำฝรั่งต่อน้ำตะไคร้ ที่เหมาะสม คือ 30 : 70 ที่ความเข้มข้น 16 องศาบริกซ์ โดยเครื่องดื่มที่ผลิตได้มีอายุการเก็บ 6 วัน ที่อุณหภูมิ 4 องศาเซลเซียส

คำสำคัญ : เครื่องดื่ม, สมุนไพร, ฝรั่ง, ตะไคร้, น้ำผลไม้

Abstract

This research was proposed to mix guava juice and lemon grass extract as healthy beverage. The experiment was divided into 3 parts. Studied the conditions for guava juice and lemon grass extraction by varying temperature and time were primarily studied. Then, the ratio of guava juice and lemon grass extract at 30:70, 50:50 and 70:30 (V/V) and varying cut out brix at 13, 16 and 19° Brix were investigated. At last, the storage time of suitable pasteurized beverage in glass bottle at 4 °C were evaluated every 2 days for 8 days. The results showed that guava juice and lemon grass extract could be prepared at 85 °C for 7 minutes and 75 °C for 7 minutes, respectively. While the suitable ratio of guava juice and lemon grass extract was 30:70 at 16° Brix, the beverage could be kept at 4 °C for 6 days.

Keywords : Beverage, Herb, Guava, Lemon Grass, Juice

Introduction

Nowadays consumers admire healthy food since the pollution has been increased. It leads to make life expectancy shorter than before. Besides these people lifestyle also has been influenced by Western country. Thus, the herbs are alternative that consumer use for strengthening their immunology. The herbs are consumed in various forms not only as parts of foods but also as beverages. In addition, herbs are medical crops and contain an essential oil, which present good smell. Similarly, fruit juice is always healthy food and should be consumed in stead of consuming added color and flavour syrup or carbonated soft drink (Muenwongyart, 1981). While it is tasty and also good for health, epidemiological studies indicate that frequent consumption of fruit is associated with lower risk of stroke and cancer (Beecher, 1999). Meanwhile, Fahey et al. (1999) and Temple (2000) suggested that plant food phytochemical may have potential health beneficial effects. Recent literatures study about the beverage from juice such as Shukla et al. (2003) which developed beverages by blending fruit juice/pulp from apple, banana, guava, litchis and mangoes with skim milk and reported that consumer accepted the products that contained different ratio of fruit. While McDonald et al. (2000) reported that electric field strength of 30 and 50 KV/cm were effective in inactivating microbial growth in orange juice below 50°C. Besides, Shugarman (2002) said that the consumption of seven to ten millilitres of purple grape juice per kilogram of body weight could reduce harmful, artery-clogging LDL (bad cholesterol) and decrease clotting factors in blood. In addition, a lot of fruit juice products such as guava, grape, lemon, tomato, pineapple, mango, etc. were found in supermarket (Tropico Industrial Fruit Division, 2002). Similarly, herb beverage products such as ginger, lemon grass, rosella, gotu kola, bael fruit, holy mushroom, safflower are very popular (The development of Thai traditional medicine and alternative medicine-Supanburi, 2005). However, if they are individually eaten, a lot of consumers do not like their taste. So in this research, the production of fruit juice with herb prepared from guava and lemon grass was investigated. Guava (*Psidium guajava* L.) is not only a tropical fruit with low price and delicious taste but also is a suitable source of natural antioxidant (Jimenez-Escrig et al., 2001) and rich in minerals and vitamins such as potassium, vitamin C, vitamin A, vitamin E, niacin and folate (USDA, 2005). Lemon grass (*Cymbopogon citratus*) is aromatic herb as native crop in Thailand with good smell and cheap price. In addition, it is medicinal crop that helps in digestion as well as relieves spasms, muscle cramps, rheumatism headaches and reduces fever (Rosengarten, 1969).

Objective

The aim of this research was to determine the suitable temperature and time to extract guava juice and lemon grass. Besides, the ratio of guava juice mixed with lemon grass extract and their physico - chemical properties were studied and also the storage time of selected product without any preservatives was investigated.

Hypothesis

Panelist can accept the fruit herbal juice from guava and lemon grass at suitable ratio and the shelf life of the pasteurized beverage at 4°C must be more than shelf life of guava juice in preliminary test (4 days).

Significance of Study

- Guava and lemon grass have added value as health food for consumer.
- Consumer can drink lemon grass extract more than before.
- This research will offer the new trend of health drink.

Material and Methods

Sample : Guavas (*Psidium guajava* L.) and lemon grass (*Cymbopogon citratus*) were obtained from local supermarket.

Experimental Methods : Experiment was divided into 3 parts , as follows;

Part I The conditions for preparation of guava juice and lemon grass extraction.

Guava juice extraction : Guava was washed with tap water , separated defects completely , cut into small pieces and blended with cooling boiled water by blender (National model MX-T2GN). The ratio of guava and water for blending was 1 : 3. The blended guava was pasteurized by varying temperature at 60 , 70 and 80°C for 5 , 7 and 9 minutes* before filtering.

Lemon grass extraction : Lemon grass was washed and steamed for 5 minutes to inactivate enzymes involved in browning reaction. Then it was sliced into small pieces and blended with cooling boiled water by blender (National model MX-T2GN). The ratio of lemon grass and water for blending was 1 : 4. The blended lemon grass was pasteurized by varying temperature at 75 , 85 and 95°C for 5 , 7 and 9 minutes* before filtering.

The guava juice and lemon grass extract were analysed for total soluble solid by refractometer , pH by pH meter. In addition, sensory evaluation was carried out using a panel of ten trained panellists by assigning 5-points Hedonic scale for each quality attribute , such as color , odour and flavour.

* The temperature and time in this experiment was obtained from preliminary test.

Part II The ratio of guava juice and lemon grass extract, and cut out Brix of the mixed beverage. Various ratio of mixed guava juice and lemon grass extract were studied by varying ratio of guava juice and lemon grass extract at 30:70 , 50:50 , 30:70 (v/v) and varying cut out brix(Total soluble solid) by sucrose at 13 ,16 , and 19° Brix and acidity was fixed at 0.4 % (w/v). Sensory evaluation was carried out by ten trained panelists by assigning 9-points Hedonic scale test for each quality attribute such as color, odour, flavour, body taste, appearance and acceptability.

Part III The storage time of suitable beverage.

The suitable beverage that was selected from the experiment part II was filled into 130 steriled glass bottles. Then, it was pasteurised at 60°C for 30 minutes and stored at 4°C. The pasteurized beverage was taken for investigating every 2 days for 8 days as follows :

1) The 20 glass bottles of beverage were investigated for sensory evaluation using 9-points Hedonic scale as in experiment part II.

2) The 3 glass bottles of beverage were used for microbiological analysis by using Plate Count Agar , Potato Dextrose Agar , Yeast Malt Extract Agar, and Lactose broth (AOAC , 1990).

3) The 3 glass bottles of beverage were determined for chemical and physical properties consisting of pH, total soluble solid, acidity, ascorbic acid, viscosity (by Brookfield digital viscometer) and color (L* , a* and b* by Huter color difference meter D25M).

Statistical analysis

Analysis of variance was performed and mean comparisons were accomplished using Duncan's New Multiple Range Test. All determinations were performed in duplicate.

Results and Discussion

Part I The total soluble solid and pH of lemon grass extraction by varying temperature and time were 1° Brix and 5.6 ,respectively, in all treatments. The reason was that each sample was extracted in one go so the Brix and pH were not affected. The pH of guava juice was rather steady at about 4.2, while its total soluble solid was increased when extraction period was increased (3.0 , 3.2 and 3.5° Brix for 5 , 7 and 9 minutes, respectively). The variation of temperature and time affected in sensory evaluation . According to Table 1, when temperature and time for extracted guava juice were increased from 75°C to 95°C, the color, odour and flavour scores were increased until at 95°C for 7 and 9 minutes, that the scores were reduced. These were due to the heat effects to cell wall of the fruit. Consequently, as the cell wall was damaged, then, cell components of guava were extracted easier (Borgstrom,1971). This results supported

the result of total soluble solid of guava juice extraction. However, when temperature and time were increased to 95°C for 7 and 9 minutes, the browning reaction caused the change of color and gave effect to flavor by evaporation of volatile acid (Fabian and Winslow,1992). So the sensory score was decreased. Therefore, 85°C for 7 minutes was selected as suitable temperature and time to extract guava juice. Because, the sensory scores at 85°C and 7 minutes was not significantly different ($p>0.05$) from sensory score at the longer time and higher temperature for the use of lower energy.

Table 1 Effect of temperature and time on sensory evaluation (5-points scoring test) of guava juice extraction.

Temperature (°C)	Time(minutes)	Sensory score		
		color	odour	flavour
75	5	2.4 ^a	2.4 ^a	2.6 ^a
	7	2.9 ^c	2.3 ^a	3.3 ^d
	9	2.8 ^{bc}	2.4 ^a	3.1 ^c
85	5	2.8 ^c	2.8 ^c	3.4 ^d
	7	3.3 ^d	3.1 ^d	3.5 ^d
	9	3.5 ^d	3.0 ^d	3.5 ^d
95	5	3.3 ^d	3.3 ^d	3.4 ^d
	7	2.9 ^c	2.7 ^{bc}	3.4 ^d
	9	2.7 ^b	2.6 ^b	2.9 ^b

a,b,c.... There is no significant difference at the level of 0.05 (α value) among sample with the same letters in the same column by DMRT.

The sensory evaluation of lemon grass extract was shown in Table 2. It was shown that when temperature and time were increased the sensory scores were not significantly different ($p>0.05$), until at 95 °C extraction temperature that odor and flavor scores were decreased significantly ($p\leq 0.05$). Because, in the first stage of extraction, the components in the cells of lemon grass were extracted completely. But in the last of extraction, volatile acid was evaporated the same as occurred with guava juice extraction, so the scores were reduced. Therefore, the 75°C extraction temperature and 7 minutes extraction time were selected for extracting lemon grass which provided an acceptable in color ,odor and flavor scores and used less energy.

Table 2 Effect of temperature and time on sensory evaluation (5-points scoring test) of lemon grass extraction.

Temperature (°C)	Time(minutes)	Sensory score		
		color	odour	flavour
75	5	2.6 ^a	3.4 ^b	3.4 ^b
	7	3.4 ^b	3.5 ^b	3.5 ^b
	9	3.3 ^b	3.4 ^b	3.4 ^b
85	5	3.3 ^b	3.3 ^b	3.2 ^b
	7	3.5 ^b	3.5 ^b	3.4 ^b
	9	3.5 ^b	3.4 ^b	3.3 ^b
95	5	3.4 ^b	3.1 ^a	3.0 ^a
	7	3.3 ^b	3.1 ^a	3.1 ^a
	9	3.4 ^b	3.1 ^a	2.9 ^a

a,b,c..... There is no significant difference at the level of 0.05 (α value) among sample with the same letters in the same column by DMRT.

Part II The results of the sensory evaluation of the mixed guava juice and lemon grass extract (Table 3) showed that the variation of cut out brix did not affect the color score, but when the amount of guava juice increased and lemon grass extract decreased, the hedonic score of color was decreased. It indicated that panelist accepted the color of mixture rather yellow -brown color of lemon grass extract more than green color of guava juice. This result agreed with appearance score, obtained from the ratio of 30 : 70 (Guava juice : Lemon grass extract). While the score of flavor and odor in the ratio of 50:50 was approached to 70:30, but lower than 30:70, it implied that panelist accepted odor and flavor of lemon grass more than guava juice. Therefore, the ratio of guava juice and lemon grass extract at 30:70 was selected. However, the acceptability score of this selected ratio was higher at 16 and 19° Brix and were not significantly different. Therefore, 16° Brix was also selected as suitable condition.

Table 3 Effect of ratio of guava juice and lemon grass extract and cut out brix on sensory evaluation (9 - point Hedonic scale test)

Ratio of guava juice and lemon grass extract	cut out brix	Sensory score (Hedonic score)				
		color	odour	flavour	appearance	acceptability
30:70	13	7.2 ^c	6.4 ^c	7.2 ^c	7.1 ^d	6.9 ^b
	16	7.3 ^c	6.6 ^c	7.5 ^c	7.0 ^d	7.9 ^c
	19	7.4 ^c	6.3 ^c	7.2 ^c	6.6 ^c	7.5 ^c
50:50	13	6.2 ^b	6.3 ^c	6.2 ^b	5.8 ^b	6.8 ^b
	16	6.1 ^b	5.6 ^b	6.3 ^b	5.9 ^b	6.9 ^b
	19	6.1 ^b	5.4 ^b	5.7 ^a	5.7 ^b	5.2 ^a
70:30	13	5.1 ^a	5.2 ^{ab}	5.4 ^a	5.5 ^a	5.0 ^a
	16	5.0 ^a	5.3 ^b	5.6 ^a	5.6 ^{ab}	5.4 ^a
	19	5.1 ^a	5.1 ^a	5.5 ^a	5.6 ^{ab}	5.2 ^a

a,b,c..... There is no significant difference at the level of 0.05 (α value) among sample with the same letters in the same column by DMRT.

Part III According to the study of storage time in Table 4 and 5, it was found that when storage time was increased from 0 to 8 days, the total soluble solid, viscosity and color L*, a* and b* were not significantly different ($p > 0.05$). While the amount of vitamin C decreased because ascorbic acid (vitamin C) can be destroyed by air, enzyme or ultraviolet (Fellow, 1990) so ascorbic acid in the beverage that was kept in transparent glass bottle was destroyed by ultraviolet. Also, it provided an effect to reduce acidity and increase pH. For sensory evaluation, the results were not significantly different ($p > 0.05$) until 6 days storage. However, the sample were not evaluated at 8 days storage, because, it had positive result in total plate count (more than 1×10^4 colony/ml) and yeast (more than 100 colony/ml) were found. Although, coliform bacteria and mold were not found during storage time.

Table 4 Effect of storage time on physico-chemical properties of beverage.

Storage time (days)	pH	Total Soluble solid (°Brix)	Acidity (%)	Ascorbic acid (mg/ml)	Viscosity (centipoises)	color		
						L*	a*	b*
0	3.4	13	0.3	0.084	14.31	35.10	-2.46	0.30
2	3.4	13	0.3	0.078	14.30	34.86	-2.21	1.48
4	3.5	13	0.3	0.066	14.18	34.80	-2.29	1.41
6	3.5	13	0.3	0.058	14.00	34.74	-2.37	1.37
8	3.6	13	0.3	0.052	14.30	34.57	-2.27	1.42

Table 5 Effect of storage time (at 4°C) on sensory evaluation (9 - point Hedonic scale test) of beverage.

Storage time (days)	Sensory score ^{ns}					
	Color	odour	flavour	body taste	appearance	acceptability
0	7.5	6.6	7.3	5.6	6.9	7.5
2	7.3	6.7	6.9	5.4	6.4	7.3
4	7.2	6.9	7.2	5.7	6.6	7.3
6	7.3	7.2	6.8	5.3	6.4	7.2
8	-	-	-	-	-	-

^{ns} = There is no significant difference at the level of 0.05 (α value) in the same column by DMRT.

Conclusion

The beverage of fruit herbal juice from guava and lemon grass could be produced by extraction of guava juice at 85°C for 7 minutes and mixed with 75°C for 7 minutes extracted lemon grass at the ratio 30 : 70 (V/V) with cut out brix 16°Brix. The pasteurized beverage in glass bottle could be kept at 4°C for 6 days.

Recommendation

The panelist accepted the product from this research at rather high cut out brix. So, further research should be done to reduce cut out brix, because high sugar can cause obesity.

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