

APPROPRIATE RATIOS OF OKRA JUICE AND PANDAN LEAF JUICE ON SPORT DRINK PROCESSING

*Wattana Wirivutthikorn¹

¹Faculty of Agricultural Technology, Rajamangala University of Technology Thanyaburi (RMUTT)
Thailand

*Corresponding Author, Received: 19 July 2019, Revised: 24 Sept. 2019, Accepted: 16 Feb. 2020

ABSTRACT: The major advantages of Thai herbal plants are good bioactive ingredients and antioxidants that are beneficial to the body are possible when used to produce as a sports drink. There are possibilities to produce sports drinks by using Thai herb as raw materials. The objective of this research was to study the optimum ratios of okra juice and pandan leaf juice with vitamin C supplementation of mixed juice. Four ratios of okra juice and pandan leaf juice were performed into 4 experiments. Experiment 1: (control formula) okra juice 100 ratios, Experiment 2: blended okra juice and pandan leaf 70:30 ratio, Experiment 3: blended okra juice and pandan leaf 60:40 ratio and Experiment 4: blended okra juice and pandan leaf 50:50 ratio were obtained. The results from physical measurement (L , a^* , b^* and percent of transmittance) were significantly different ($P \leq 0.05$). The study chemical of measurements, i.e. pH, percentage of acidity and total soluble solids were performed. The results showed that Experiment 4 had the lowest pH and gave the highest percentage of acidity values of 3.15 and 0.28, respectively. The microbiological properties revealed that the number of microorganisms in each treatment was not found. The sensory evaluation on overall acceptability by using 9-point hedonic scale revealed that panelists accepted with the highest scores of 7.13 on okra juice (control). From the information obtained, the formulation of sports drink produced from Thai herbs can be developed to be accepted by consumers, which has increased steadily and expanded in the large future level in the beverage industry.

Keywords: Okra, Pandan leaf, Juice, Sport, Drink

1. INTRODUCTION

At the present, Thai society has seen the importance and pay attention to exercise more sports. In order to have a healthy, healthy body without the disease, athletes must pay attention to their health care. Health supplement products have become more active. Especially the use of vitamins and minerals enhances health and fitness [1]. Sports drinks, called electrolyte drinks, refer to beverages that contain minerals as the main ingredients. Includes dry mineral drinks as well as a liquid replacement drink that is lost during exercise or sport. The lost fluid is the loss of sweat. The sweat contains as much as 99 percent water and contains 1 percent more minerals. Drinking of sodium-containing solutions during exercise and recovery may help maintain the condition and normalize the amount of blood and also help maintain the water in the space between cells. But still have thirst, while drinking clean water will help suppress appetite [2]. The major components of sports drink according to the FDA requirements are that they should contain sodium chloride minerals and magnesium in quantities not exceeding 25 g / l. If the concentration of minerals and sugar is high, it will slow down the absorption, so drinking mineral drinks or other beverages need to be diluted before. To allow the absorption of

water to replace sweat quickly, Sport drink is a specific control food. It must have quality or standards as announced by the Thai Ministry of Public Health. Especially minerals controlled in 1-liter sports drink containing these minerals: sodium not less than 20 meq, glucose not less than 2 percent of weight or sucrose not less than 4 percent of weight, potassium not more than 5 meq (if any) and bicarbonate or citrate not more than 15 meq. In addition to previous components may use minerals other than 3 and 4 or other sugars to be approved by the Food and Drug Administration [3]. Chloride is one of the minerals that is controlled in sports drinks. The reason for having to control the amount of salt in food or chloride in sports drinks, if there is too much salt, it may be a major cause of high blood pressure. Chloride is the most important negative ion in the body. Most of the body gets it in the form of sodium salt. Chloride acts to balance the pH of the body and a component of hydrochloric acid in the stomach. If the body is absent, it will vomit. In general, the body gets chloride along together with sodium [4]. The utilization possibility of okra to be processed into sport drinks for those who lack nutrients and exercise Because, it is rich in nutrients that are nutritious, such as carbohydrates as fiber, protein, folate, calcium, phosphorus, potassium, magnesium, iron, vitamin A, vitamin B1, vitamin

B2 and vitamin C in sufficient quantities. Because okra is highly nutritious, in addition to food and the drink also has properties for the treatment of diseases such as fresh okra with high amounts of ginseng and pectin. Several compounds such as gum and pectin in high amounts cause mucus, which will help reduce the symptoms of gastroenteritis, prevent atherosclerosis, maintaining normal blood pressure, nourishing the brain and also being a good laxative [5]. Pandan leaf has a fragrant aroma of essential oils. The aroma of pandan leaf is very much from the chemical called 2-acetyl-1-pyrroline, which is the same smell that can be found in jasmine rice, white bread and flowers. Pandan leaf contains proteins, carbohydrates, fiber, calcium, phosphorus, iron, essential oils (containing linalil acetate, benzyl acetate, linoleol and ethyl vanillin, geranium, and kumarin fragrance). It contains chlorophyll pigment, making it green with β -carotene, which is the essence that is beneficial to the body, helps in excretion and can resist cancer as well [6]. There is research related to the comparison of chloride determination in 10 commercially available sports drinks by using the titration method and the sedimentation method for silver chloride analysis. The results showed that the values obtained in both methods are highly correlated ($r^2 = 0.9582$) and when analyzing results were tested with a t-test. It was found that both methods were not statistically different. When calculating the cost of chemicals used, it was found that the method of precipitation in silver chloride required a cost of 1.3 times higher than the titration method. The cost of chemicals is 7.1455 and 5.5424 baht, respectively. In addition, the titration method took 15 minutes per sample, whereas the settling silver chloride method took approximately 9 hours per sample [7]. But there was no information about the formulation of okra mixed with pandan leaf. For this reason, of okra and pandan leaf benefits, the researchers mentioned the importance of producing water-based okra and pandan leaf with the healthy sport drink by studying an appropriate amounts of okra and pandan leaf ratios on the physical, chemistry quality and sensory acceptance of the consumer towards the product in order to obtain the taste that is acceptable to the consumer, which help with the quenching of thirst and help relax or make the body. The data obtained from this research was an alternative to applying by making a sports drink containing both okra and pandan leaf as raw materials to improve the nutritional quality and good health. Sport drink that has benefits and suitable for people who love to exercise, love health and also solve the problems of bringing agricultural products that are processed with higher values.

2. METHODOLOGY

The research was carried out at the Division of Food Science and Technology, Faculty of Agricultural Technology, Rajamangala University of Technology Thanyaburi. (RMUTT) Pathum Thani Province Thailand. The samples used in this study were purchased from Rangsit Market which located in Pathum Thani Province Thailand.

2.1 Dried Okra Preparation

The okra was washed and cut into thin small pieces. Then 5 kg of okra was dried at 75°C for 3 hrs. Stored products that were packed in plastic zipper bags with desiccants [8].

2.2 Pandan Leaf Preparation

The pandan leaf was washed and cut into thin small pieces. Then 100 g of broken pandan leaf was dried at 75°C for 2 hrs. Stored products that were packed in plastic zipper bags with desiccants adapted from [8].

2.3 Production of Blended Dried Okra Juice and Pandan Leaf Juice with Vitamin C Supplementation

2.3.1 Okra Juice Preparation

Weigh 50 g of dried okra was placed in a stainless steel pot containing 1,000 ml of water and heated to 100°C. Then, put pandan leaf to reduce the green odor of okra. The aliquot was filtered through a cloth until there was no sediment and then stored its in the refrigerator [8].

2.3.2 Pandan Leaf Preparation

Weigh 10 g of dried pandan leaf was placed in a stainless steel pot containing 1,000 ml of water and heated to 100°C. The aliquot was filtered through a cloth until there was no sediment and then stored its in the refrigerator adapted from [8].

2.3.3 Blended Okra Juice and Pandan Leaf Juice Preparation

This research was performed as four experiments (three replications): 1) okra juice (control); 2) blended okra juice and pandan leaf juice 70:30; 3) blended okra juice and pandan leaf juice 60:40 and 4) blended okra juice and pandan leaf juice 50:50. Bring the okra juice mixed with pandan leaf juice to be homogeneous and add other ingredients as shown in Table 1 [8].

2.3.4 Production of Blended Okra Juice and Pandan Leaf Juice with Vitamin C Supplementation

Weigh 50 g of dried okra was placed in a stainless steel pot containing 1,000 ml of water and heated to 100°C for 5 minutes. The aliquot was filtered through a cloth until there was no sediment. Bring okra juice blended with pandan leaf juice. Addition of some detailed ingredients as shown (Table 1). (65 g of sucrose, 1.2 g of citric acid, 8g of sodium chloride and 0.5 g of vitamin C), then cooling and heated to 70°C for 15 minutes. The blended aliquots were placed in 250 ml of sterilizing colored glass bottles by means of cooling immediately and storage at 4°C adapted from [9].

2.4 Recording of Data

The numerical data were collected and recorded from experiments (three replications) for statistical analysis. The Experimental design for physical and chemical quality analysis was evaluated by using a completely randomized design (CRD). A randomized complete block design (RCBD) for sensory evaluation was used with the analysis of variance. Analysis of the mean differences of experiments was performed using Duncan's new multiple range test [10].

2.5 Physical Measurement

2.5.1 Observation by eyes

Observation of the external appearance of mineral drink products, okra juice, mixed with pandan leaf juice, vitamin C supplementation in all 4 experiments [11].

2.5.2 Measurement by using the instrument

The color brightness (L^*), color as green ($-a^*$) and yellow ($+b^*$) were measured by using Minolta CR-10 and recorded as values adapted from [11]. The sedimentation was detected by using Visible Spectrophotometer Metertech Model SP830 and the sedimentation value was recorded as values adapted from were recorded as a percent of transmittance values (% T) adapted from [11].

2.6 Chemical Measurement

The pH, total soluble solid (TSS) and percentage of total acidity (calculated as citric acid) were measured by using pH meter OHAUS ST3100-F, using hand refractometer (measured as °Brix and titration with 0.1N sodium hydroxide (phenolphthalein as indicator as values), respectively adapted from [12].

2.7 Microbiological Measurement

The total microbiology was measured as total plate count by using plate count agar adapted from [13].

2.8 Sensory Evaluation

The sensory evaluation was carried out by 30 untrained panelists in Rajamangala University of Technology Thanyaburi (RMUTT), Thailand. Panelists were asked to analyze their level of preference for each treatment by using a 9-point hedonic scale test based on the attributes of color, odor, taste, clarify and overall acceptability. A randomized complete block design was used with the analysis of variance. Analysis of the mean differences of experiments was performed using Duncan's new multiple range test [14].

3. RESULTS AND DISCUSSION

3.1 Physical appearances of okra juice and passion leaf

The characteristics of sport drink products, okra juice was mixed with pandan leaf juice and vitamin C supplementation. When considering the appearance, it was found that Experiment 1 and 2 had a lot of suspended sediments of okra. Experiment 3 showed that there was a little suspended okra and Experiment 4 was found that there was no sediment of okra. When considering the color, it was found that Experiment 1 had a light brown color, but Experiment 2 had an orange-brown color, whereas Experiment 3 was yellowish-brown, the last Experiment 4 had a clear yellow color. The results revealed that Experiments 1, 2 and 3 were brown in color from the okra juice in a ratio greater than pandan leaf [15]. The possible reason was that okra contains a soluble fiber pigment such as pectin and mucilage caused by acetylated acidic polysaccharide compounds and galacturonic acid. Experiment 4 had a clear yellow color due to the ratio of okra juice and pandan leaf juice in the same ratio. When considering the smell, it was found that the smell varies according to the amount of okra juice that was reduced and the amount of pandan leaf juice was increased. Compared to the control sample, when considering the taste, it revealed that all experiments had a slightly sour, sweet, salty taste due to flavoring with sucrose at the equal amount of sodium chloride and citric acid in all experiments [16].

3.2 Physical measurement

Table 2, The results revealed that all of (L^*), (a^*), (b^*) and percent of transmittance values and physical appearance depending on different ratios of okra juice and pandan leaf juice. The results showed that all values were different ($P \leq 0.05$). The physical characteristics of blended okra juice and pandan leaf juice products with vitamin C supplementation, comparing the differences between the experiments of color values (L^*), ($-a^*$), (b^*) and percent of transmittance. The results revealed that the brightness value (L^*) were of 27.61, 28.48, 29.78 and 29.58, respectively. The color values ($-a^*$) and (b^*) were -3.00, -2.67, -6.35 and -10.08, 10.59, 12.13, 12.51 and 13.55, respectively. The percentage of transmittance from all treatments with a value of 77.09, 74.02, 83.63 and 87.50, respectively [17]. This may be caused by the ratios between okra juice and pandan leaf juice with different amounts due to each experiment to have different values. The experiment with a large amount of pandan leaf ratio had a darker color and more brightness than the experiment with the ratio of the less amount of okra juice. One possible reason was both okra and pandan leaf have a chlorophyll (as green pigment), but increasing the amount of pandan leaf juice results in an increasing trend of all values [18].

3.3 Chemical Measurement

Table 3, The results indicated that the pH, total soluble solids and percentage of total acidity in okra juice products with pandan leaf juice, depended on the different ratios (Table 3) [18]. The result was found that the measured values were statistically significant differences ($P \leq 0.05$), while the total soluble solid was not statistically different. This value depends on the increasing okra juice and pandan leaf juice ratio, resulting in lower pH values (more acidity). The results indicated a tendency for the percent of total acidity did not decrease low values in comparison with the control samples. The values analyzed were consistent with the percentage of total acid content in the form of citric acid that was higher with the increase in vitamin C. The total soluble solid was not significantly different ($p > 0.05$) due to the number of solid ingredients added in all experiments [19],[20].

3.4 Microbiological Measurement

Based on the analysis of total microbial counts by using the total plate count method in blended okra juice, and pandan leaf juice with vitamin C supplementation. The results showed that microorganisms were not found in all experiments.

One reason the possibility was due to the pasteurization process of sports drink before packaging. This processing is a thermal processing method with the main purpose to destroy pathogenic microorganisms, including microorganisms and related enzymes that cause food degradation [21].

3.5 Sensory Evaluation

Table 4, The sensory characteristics It was found that the sensory scores on color, smell, taste, texture from the comparison of differences between experimental items were not statistically significant difference ($p > 0.05$) in which each experiment had not different on preference scores [22],[23],[24]. The experiment with the highest liking scores was Experiment 1. For one possible reason was the ratios of okra juice and pandan leaf juice were not significantly different, resulting in the consumer's acceptability for color, odor, taste and clarity [25],[26]. The other reason, maybe the amount of vitamin C that was added to each experiment may be too little, therefore almost panelists could not so clearly distinguished in each experiment. For overall acceptability, panelists preferred Experiment 1 than compared to the other experiments, since there was only okra juice. From the results of this research, it revealed that increasing the proportion of pandan leaf juice was likely to cause consumers to dislike it, possibly due to the pandan leaf smell that is too strong [27],[28].

Table 1 Different ratios of blended okra juice and pandan leaf with vitamin C supplementation

Ingredient	Experiment			
	1	2	3	4
okra juice)ml(	1000	700	600	500
pandan leaf)ml(	0	300	400	500
sucrose)g(	65	65	65	65
citric acid)g(	1.2	1.2	1.2	1.2
sodium chloride)g(	8	8	8	8
vitamin C)g(	0.5	0.5	0.5	0.5



Fig. 1 Fresh okra [8]



Fig. 2 Piece of okra (before drying) [8]

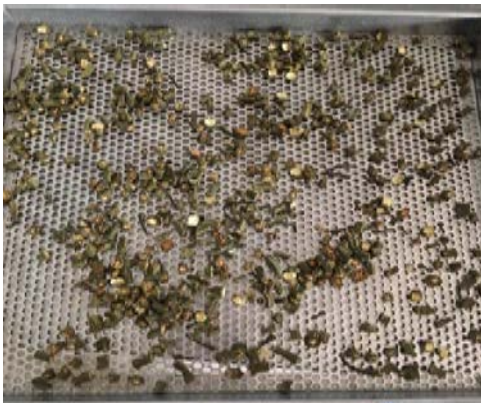


Fig. 3 Dried piece of okra (after drying) [8]



Fig. 4 Sliced pandan leaf [8]



Fig. 5 Dried pandan leaf [8]



Fig. 6 Okra boiling [8]



Fig. 7 Pandan leaf boiling [8]



Fig. 8 Aliquot filtration through filter cloth [8]



Fig. 9 Addition of mixed ingredients [8]



Fig. 10 Hot filling in plastic container [8]

Table 2 Physical measurement of blended okra juice and pandan leaf juice products with vitamin C supplementation

Experiment	physical values*			
	L*	-a*	b*	% T
1	27.61 ^b	-3.00 ^a	10.59 ^c	77.09 ^c
2	28.48 ^b	-2.67 ^a	12.13 ^b	74.02 ^d
3	29.78 ^a	-6.35 ^b	12.51 ^{ab}	83.63 ^b
4	29.58 ^a	-10.08 ^c	13.55 ^a	87.50 ^a

Note: *a-d The different letters in the same column mean significant difference ($P \leq 0.05$)

Table 3 Chemical measurement of blended okra juice and pandan leaf juice products with vitamin C

Experiment	chemical values		
	pH*	TSS (°Brix) ^{ns}	% total acidity*
1	4.01 ^b	9.00	0.13 ^b
2	4.08 ^a	9.10	0.21 ^a
3	3.65 ^d	9.08	0.23 ^a
4	3.71 ^c	9.07	0.14 ^b

Note: *a-d The different letters in the same column mean significant difference ($P \leq 0.05$) and ns non significant difference ($P > 0.05$)

Table 4 Mean score of preference for sensory properties of blended okra juice and pandan leaf juice products with vitamin C supplementation

Experiment	scores				
	color ^{ns}	odor ^{ns}	taste ^{ns}	clarify ^{ns}	overall acceptability*
1	7.03	6.77	6.63	6.83	7.13 ^a
2	7.30	6.57	5.91	6.57	6.77 ^{ab}
3	7.13	6.37	5.80	6.31	6.57 ^b
4	6.77	6.30	6.17	6.42	6.63 ^b

Note: *a-d The different letters in the same column mean significant difference ($P \leq 0.05$) and ns non significant difference ($P > 0.05$)

4. CONCLUSION

1. The uses of different ratios of raw material preparation had effects on the quality of mixed okra juice and pandan leaf juice.

2. The results of the physical properties analysis showed that all values were statistically significant differences ($P \leq 0.05$).

3. The results of the chemical analysis showed that percent of total acidity (except pH and total soluble solid) were significantly different ($P \leq 0.05$).

4. Blended okra juice (control) gave the most overall acceptability of 7.13 values from the panelists.

5. The results of total plate count indicated that no microorganism in each experiment was not found.

6. Based on this research, the researchers will be able to launch new sport drink products in the future by selecting the appropriate Thai local vegetables and fruits that are beneficial for antioxidants, an option for health-conscious consumers.

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