Effect of Ratios of Okra Gac Fruit and Passion Fruit on Color and Preferences of Mixed Juice

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***Abstract*—The objective of this research was to study the optimum ratios of okra, gac fruit and passion fruit on beverage production. Four ratios of okra, gac fruit and passion fruit were performed into 4 experiments. Experiment 1: (control formula) okra: gac fruit: passion fruit 50:50:0 ratio. Experiment 2: okra: gac fruit: passion fruit 50:40:10 ratio. Experiment 3: okra: gac fruit: passion fruit 40:40:20 ratio. Experiment 4: okra: gac fruit: passion fruit 40:30:30 ratio. Study physical measurements, i.e. color measurement and sensory evaluation were performed. The results showed that all values from all experiments were statistically significant differences. ($P \leq 0.05$) Sensory evaluation test was done by using 9-point hedonic scale showed that Experiment 3 was the most acceptable from panelists.**

***Index Terms*—okra, gac fruit, passion fruit, color, preference**

I. Introduction

The aspect and color of the food surface is the first quality parameter evaluated by consumers and is critical in the acceptance of the product. The color of this surface is the first sensation that the consumer perceives and uses as a tool to accept or reject food. The determination of color can be carried out by visual (human) inspection or by using a color measuring instrument. Color additive is any dye, pigment or substance that imparts color when it is added to food or drink. Many fruits and vegetables contain important active pigment that affects the quality of beverage production [1]. Thailand has many medicinal plants. The major advantage is that there are bioactive ingredients and antioxidants that are beneficial to the body are possible when used as a drink. There are previous research reports related to the production of various herbal drinks such as gac fruit, mushroom and okra [2]-[4]. Okra is a popular health food due to its high fiber, vitamin C, and folate content. It is also known for being high in antioxidants have a good source of calcium and potassium and the mucilage contains soluble fiber. Some people prefer to minimize the sliminess; keeping the pods intact, and brief cooking. Some of the advantages of okra are aids in improving digestion, help to relax blood vessels and arteries and protect heart against clotting [5]-[9]. Gac fruit has been used as both food and medicine in the regions. It is also used for its medicinal and nutritional properties. Gac fruit and seed oil contain high contents of carotenoids, particularly provitamin A, β- carotene and lycopene. Fatty acids in the seed oil may facilitate absorption of fat-soluble nutrients, including provitamin A, β –carotene. High content of β -carotene and lycopene, gac extracts may be sold as a in a blended juice. However, because it has no sweetness, gac fruit juice is typically mixed with other fruit juices and sugar to make it tastes better [10], [11]. Passion fruit is a popular health food due to in a 100 gram amount, fresh passion fruit contains 36% of the Daily value (DV) of vitamin C, 42% dietary fiber, riboflavin (11% DV) and niacin (10% DV), 12% iron and 10% phosphorus. No other micronutrients are in significant content. It is used on shaved ice, and the fruit is also eaten raw, sprinkled with sugar and fruit juice [12]. Researchers have launched new herbal drinks from okra, gac fruit and passion fruit. Because they are cheap local Thai herbs [13]. The data obtained from this research was an alternative to make okra, gac fruit and passion fruit as raw materials for beverage production to improve the nutritional quality and good health of consumers.

The objective of this research was to study different ratios of okra, gac fruit and passion fruit that affected on color, weight sediment measurement and sensory evaluation.

II. Materials and Method

The research was carried out at Division of Food Science and Technology Laboratory, Faculty of Agricultural Technology, Rajamangala University of Technology Thanyaburi. (RMUTT) Pathumthani Province Thailand. The raw materials used in this study were purchased from Rangsit Market Pathumthani Province Thailand [13].

A. Materials and Procedures [13]

1) Okra preparation

Wash of okra and slice into small pieces and boiling in hot water for 15 minutes. Blend of 100 g okra and 120 ml of water by using electrical blender for 1 minute. Separation of aliquot through filter cloth.

2) Gac fruit preparation

Split the arillate gac fruit by squeezing the juice out by hand. Blend aliquot homogeneous with the water

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gradually mixed with water to squeeze out with filter cloth.

3) Passion fruit preparation

Take the ripen passion fruit, wash in clean water and cut two pieces, use the spoon, seeds and the juice out. Crush the filter with a colander with filter cloth. To extract seeds and fibers separate juice could be kept.

Bring all above of three mixed juices to 4 of experiments as detailed: (two replications)

Experiment 1: okra: Gac fruit: passion fruit 50:50:0 (control experiment)

Experiment 2: okra: Gac fruit: passion fruit 50:40:10

Experiment 3: okra: Gac fruit: passion fruit 40:40:20

Experiment 4: okra: Gac fruit: passion fruit 40:30:30

The ingredients were listed in Table I.

TABLE I. BLENDED OKRA GAC FRUIT AND PASSION FRUIT

Ingredient (g)	Experiment			
	1	2	3	4
okra	50	50	40	40
gac fruit	50	40	40	30
passion fruit	0	10	20	30
sucrose	30	30	30	30
lime juice	11.88	11.88	11.88	11.88
salt	0.4	0.4	0.4	0.4
water	450	450	450	450

After that, blending of juices were performed continuously until homogeneous by using an electric blender and heat to a temperature of 65 °C for 30 minutes. Filter through a filter cloth to separate the sediment, reduce the bottled temperature for further analysis. Completely Block Design (CRD) experiment was used to analyze ANOVA ($P \leq 0.05$), Analysis of mean difference of experiment was performed by Duncan's new multiple range test.

B. Color Measurement [13]

The sample of mixed okra, gac fruit and passion fruit from each experiment were prepared for color measurement by using a Spectro Dens A407077 Premium. (D-61462, Germany)

Color was recorded data and shown from recorder as term:

-brightness (L*)

-redness (+a*), greenness (-a*)

-yellowness (+b*) and blueness (-b*)

C. Sediment Weight Measurement [13]

The sample of mixed okra, gac fruit and passion fruit from each experiment was prepared for sediment weight by using centrifuge.

D. Sensory Evaluation [13]

The sensory evaluation was carried out 30 of panelists in Rajamangala University of Technology Thanyaburi, (RMUTT) Thailand. Sensory evaluation was done by 30 of panelists. Panelists was asked to analyze the level of preferences on each treatment by using 9- hedonic scale test based on attributes of color, odor, taste, sediment and overall liking. Randomized Complete Block Design (RCBD) experiment was used to analyze ANOVA. ($P \leq 0.05$) Analysis of mean difference of experiments were performed by using Duncan's new multiple range test. (DMRT)

III. RESULTS AND DISCUSSION

A. Color Measurement

Four of samples were tested for Color Measurement. The results were shown in Table II.

TABLE II. COLOR VALUE OF OKRA BLENDED WITH GAC FRUIT AND PASSION FRUIT

Experiment no.	Values*		
	L*	a*	b*
1	+23.70a	-9.30a	+12.3a
2	+21.76a	+1.20d	+4.7b
3	+16.60b	-3.41c	+4.3b
4	+20.50ab	+7.80b	+13.5a

*The different letters in the same column mean significant difference ($P \leq 0.05$)

From the above results, the values of L* (brightness), a*(redness) and b*(yellow) and physical appearance depending on different ratios of okra, gac fruit and passion fruit. The results showed that all values had differences. ($P \leq 0.05$) For L* value, Experiment 1 had the highest values and did not differ from Experiment 2, but Experiment 3 gave the lowest values. For a* value of Experiment 2 and 4 revealed tendency to be reddish, while Experiments 1 and 3 were likely to be greenish. For b* value, all measurement values were yellow. Experiments 1,4 and 2,3 were not different values. Experiment 4 showed the highest yellow values and did not differ from Experiment 1. The possibilities of reason might be different ratios among okra, gac fruit and passion fruit and chemical compositions such as chlorophyll, caroteinoid, vitamin C and some macrominerals, micromineral or differences of varities and seasons of post harvest [13].

B. Sediment Weight Measurement

Sediment weighing is very important parameter. It can indicate the amount of dissolved solids or undissolved solids in bulk or in the analyzed sample. In this research, four of analyzed samples were tested for sediment weight measurement after centrifuge by using centrifuger, after that, the sediment was weighed by using an electric balance. (four digitals) Record the obtained values. The results from all experiments were shown in Table III

TABLE III. SEDIMENT WEIGHT VALUE OF BLENDED OKRA WITH GAC FRUIT AND PASSION FRUIT

Experiment no.	Sediment weight (g)
1	0.3153
2	0.5345
3	0.3677
4	0.5388

From the above results, the values of sediment depending on different ratios of okra, gac fruit and passion fruit. For the sediment weight value, Experiment 4 had the highest values and did not differ from Experiment 2. One reason might be different ratios among okra, gac fruit and passion fruit and chemical compositions or the special technique of separating the solution by filtration using a centrifuger, rotating speed was not enough high speed.

C. Sensory Evaluation

The results were shown in Table IV.

TABLE IV. MEAN SCORE OF PREFERENCE FOR SENSORY ANALYSIS

Experiment no.	Scores*				
	color	odor	taste	sediment	overall liking
1	6.60^{a}	6.10^{b}	6.33^{b}	5.23^{b}	6.36^{b}
2	6.00^{b}	6.33^{b}	4.03^{c}	3.40^{c}	4.10^{c}
3	6.30^{b}	6.56^{a}	6.53^{a}	6.10^{a}	6.83^{a}
4	6.10^{b}	6.50^{b}	6.06^{b}	5.96^{b}	6.36^{b}

*The different letters in the same column mean significant difference ($P \leq 0.05$)

From the above results, The results of the sensory analysis by using 9-point hedonic scale, i.e. 9=like extremely,8=like very much, 7=like moderately, 6= like slightly, 5= neither like nor dislike, 4= dislike slightly, 3= dislike moderately, 2= dislike very much and 1=dislike extremely (for 30 panelists)

E1 E2 E3 E4

Figure 1. Product of different ratios of okra blended with gac fruit and passion fruit.
E1 okra: gac fruit: passion fruit 50:50:0 (control experiment)
E2 okra: gac fruit: passion fruit 50:40:10
E3 okra: gac fruit: passion fruit 40:40:20
E4 okra: gac fruit: passion fruit 40:30:30

From the Fig. 1. The images could be seen that the color is E1 was darker than in all experiment. The results were concerned with the L* values (+23.70) measured in Table I. As a result of the ratio of okra and gac fruit in E1 was equal and no passion fruit was added. Color measurable impacted on the quality of the sensory packaging and storage products [13]. Possible reasons were that E1 had the same amount of okra, gac fruit and the two major pigments (chlorophyll, carotenoid) were quite distinct and different chemical compositions and structures such as carotenoid in gac fruit [14], [15] and chlorophyll in okra [16]. But color of other experiments (E2, E3 and E4) were not different. The result might be due to the addition of different passion fruit, which made slightly color. research. application of beverage production using similar materials to produce new products [17].

Different sensory results could indicated overall preference. The occurred results might be accepted or rejected the characteristics of each experiment. Summation of data revealed what results made different values. Different ratios and qualities of okra, gac fruit, passion fruit and natural characteristics such as color, flavor, shape and defect affected on their acceptabilities. When considering the average all attribute tests, Experiment 3 was the most commonly accepted in comparison to other experiments. Experiment 3 was accepted overall, except for the colors from the most panelists. One possible reason might be due to the proportions of okra and gac fruit were equal and no taste. Natural Passion Fruit is a fruit that has a little sour, sweet taste and helps to adjust pH, acidity in the drink to have a good taste. Quantity of ratios were not too much that acted on the acceptance of consumer products [18].

IV. CONCLUSIONS

1. The uses of different ratios of raw material preparation had effects on color of mixed okra, gac fruit and passion fruit.
2. Brightness and color values (L*,a* and b*) had differences for all experiments. ($P \leq 0.05$)
3. Experiment 4 got the highest sediment values (0.5388 g)
4. Experiment 3 revealed that gave the most acceptable from the panelists.
5. Based on this research, researchers will be able to launch new Thai herbal beverage products in the future by selecting Thai local herbs that are beneficial for antioxidant activities, an option for health conscious consumers.

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