04. Physicochemical And Sensory Properties Of Pedada Fruit (Sonneratia caseolaris) Bar

by Andre Yusuf Trisna Putra

Submission date: 06-Oct-2021 11:12AM (UTC+0700)
Submission ID: 1666576420
File name: 4_Putra_2020_J._Phys.__Conf._Ser._1569_032013.pdf (1,010.72K)
Word count: 3806
Character count: 19643

Physicochemical And Sensory Properties Of Pedada Fruit (*Sonneratia caseolaris*) Bar

Physicochemical And Sensory Properties Of Pedada Fruit (*Sonneratia caseolaris*) Bar

A Y T Putra[1], E K B Susiloningsih[1], and M A Susanti[1]

[1]Food Technology Departement, Universitas Pembangunan Nasional "Veteran" Jawa Timur, Surabaya, INA

Abstract. Food acceptability relates to the interaction food has with the consumer at a given moment in time. Physicochemical and sensory properties of food influence the way consumer select their food. Therefore, the main objectives of this study were to evaluate texture, calories value and sensory properties food bar made with lesser yam, mung bean base with pedada fruit. Eight food bars were produced: G1H1, G1H2, G1H3, G2H1, G2H2, G2H3, G3H1, G3H2, G3H3. Duncan multiple range test were performed with 5% significance for statistical analysis. The highest calorie value and fracture ability are sample G3H3, and G3H1, respectively, but it does not significant (p>0,05). The different composition of mung bean, lesser yam, and pedada fruit do not affect sensory properties. Therefore, in this study, sample evaluate is have similar physicochemical, and sensories properties.

Keyword: food bar, lesser yam, pedada fruit

Introduction

People have many reasons for consuming the foods. The most important is because of hunger or food needed. Food selection is not only determined by physiological or nutritional need but also biological factor, economic factors, physical factors, social factors, psychological factors, attitudes, beliefs and knowledge the consumers about food [1].

Sensory properties can affect the consumers on their food preference because it influences the food characteritics. People usually mentione "the taste" as the overall sensory stimulation that is produced by food ingestion on human body. In fact, "the taste" is not only about the taste itself but also include the flavor, appearance and texture. One example that shows influence of sensory properties on food chosing is the children more like the sweet food than the bitter one.[2].

Food Texture is described as the functional and sensory manifestation of surface, mechanical and structural properties of foods. Texture can be detected by kinesthetic, vision, hearing and touch. Food texture include creaminess, crunchiness, firmness, and smoothness [3]. Texture plays an important role in consumer acceptance. For example consumers like a bar with soft texture but remain crunchy [4], and panelist' prefer to have a bar with soft texture instead of the hard one [5].

Food bars are the food products made from a number of components, that easy to consume but have enough nutrition for health. Food bars include snack bars, fruit-based snack bars, cereal bars, wheat or soy snack bars. Food bars are the best solution for people to eat a snack and have good health such as weight loss, energy, protein and fiber source [6]. People can replace their meal and dessert with the food bars[7]. Moreover, food bars have potentially used as emergency food [5]. According to

Aramouni et al [4], Fajri et al [5], Dahri et al [8] , the source of carbohydrates as the main ingredient in the food bar includes wheat, rice and oat.

Food bar should have sufficient nutrition as a portion of diet food do to its function as meal replacement Based on nutritional value, food bars can be classified into fibrous, energy, diet, and protein bars. A high fiber and glucose content with an energy value near 100 kcal per unit as Fibrous bars. Diet bars suitable for diabetic consumers because of sugar free and low calory (only 65 calories). Energy bars contain 280 kcal and less fiber to make energy absorbtion become easier. It is recommended for energy recovery after heavy physical activity [9]. For instance, sorghum base snack bars provide 386.6 per 100g Kcal of energy [10], glutinous rice flour-based snack bars provide 454.51 kcal of energy [11].

Lesser yam (*Dioscorea esculenta*) is one of the edible yams grown in Asia, such as Indonesia, Thailand, China and some other countries in Africa such as Nigeria. Lesser yam has the potential to be a source of carbohydrates. Lesser yam flour showed that on a dry matter basis, have 79,54% carbohydrate, 6,50% protein, and 1% fat, 1,5% crude fiber [12].

Mung beans are one of nutritious food. Mung beans flour has 23,85% crude protein, 4,95% ash and 1,53% fat. In addition, mung beans provide complete amino acid such as lysine, threonine, phenylalanine, cysteine, valine tyrosine, serine, glutamine, proline and methionine [13]. Therefore, lesser yam has the potential as an energy source and mung bean has the potential to be a source of protein and amino acid in the food bar.

Pedada fruit is one of the mangrove plants in Surabaya, Indonesia. It has an appealing flavor and taste, high vitamins [14]. It contains 0,93% protein, 4,88% fat, and 0,135% total sugar. Moreover, it has phytochemical components such as flavonoid, tannins, polyphenols, saponins, and terpenoids [15]. Pedada fruit is getting interested in its nutritional value due to a significantly high in antioxidants content, such as ascorbic acid 40mg/100 g, beta-carotene 9,96mg/100mg and tanin 22,65%. [16]. Foods rich in antioxidant have potential to individuals suffering from impaired glucose tolerance as these foods are capable of reducing the glycemic response[17]. Thus, pedada fruit can be transformed into more convenient ready-to-eat food such as food bar would be an ideal food to eat as part of a meal.

Age, gender, and the nutritional knowledge of the consumers can affect consumption of the food bars. In addition, consumption of food bars is usually influenced by taste, aroma, texture, and appearance of food bars. Therefore, in this study, it is expected to produce not only the nutrition bar but also accepted by consumers. Therefore, the main objective of this research was to determine acceptably flavoured, calorie value and texture lesser yam- and mung beans-based bars additional with pedada fruit.

MATERIALS AND METHODS

Material: All ingredients (lesser yam, green bean, sucrose, lecithin, butter) were purchased in a local market in Surabaya. Pedada fruit was obtained form Wonorejo, Surabaya.

Methods

Lesser yam Flour Preparation: Lesser yam were washed then were soaked with water at 80^{0}C for 1 minute. using the fruit slicer. The lesser yam skin was peeled manually with a sterile knife. The pulps were then cut into small pieces prior to soaking in mixed of the sodium metabisulfite 0,3%, and salt 5% solution for 2 hours. Then, the pulps were rinsed using water. The lesser yam was dried in cabinet dryer at 60^{0}C for 8 hours. The dried slices were ground using a laboratory mill to a fine powder. The powder was sifted with 80 mesh and kept in an airtight plastic container and stored in chiller prior to use.

Mung bean Flour Preparation: Mung beans from the local market were soaked for 8 hours in clean water. The grains were steamed at 100^{0}C for 30 minutes. The mung green beans were dried in air drier at 60^{0}C for 8 hours. Using laboratory mill were milled dried green beans to a fine powder. The powder was sifted with 80 mesh. Mung bean stored in chiller prior to use.

Pedada Fruit Flour Preparation: Ripe pedada fruit (after sortation) were used to produce pedada fruit flour. Pedada fruit was blanched at 80^0C for 15 minutes then were crushed to be slurry. The slurry was separated between seeds and pulps. The slurry was dried at 60^0C for 18 hours using air dried. The dried slurry was milled to a powder. The powder was sifted with 80 mesh. Pedada fruit flour stored in chiller prior to use.

Food bar preparation: Foodbars were prepared according to the method as proposed by Ladamay and Yuwono [18] with minor modifications. Formulation of food bars could be seen in Table 1. Firstly dry ingredients, such as pedada fruit flour 20 grams, sucrose 30 grams, lecithin 0.5 gram, sodium bicarbonate 0,5 gram and formulation lesser yam flour and green bean flour (Table 1) were mixed using the blender for 5 minutes. Then Butter 30 grams, glucose syrup 20 grams, lecithin 0,5 grams was added into the mixture and blended until a uniform mixture was obtained. The mixture was shaped into shapes of the cuboid (10cm x 3cm x 0,5cm) to oven at 150^0C for 30 minutes. The food bars were then packed in aluminum foil container at ambient temperature prior to analysis.

Texture analysis

Texture analysis uses a universal testing machine that compiles readings of force during compression.

Calorie

Calorie value calculation was done according to Ho [11]. Macronutrients such as protein, fat, and carbohydrate were multiplied by their caloric equivalent to obatain the caloric value. The caloric equivalent for protein, fat and carbohydrate are 4, 9 and 4 respectively. It means, for each gram of protein and carbohydrate acquired 4 kcal of energy and every gram of fat provided 9 kcal of energy). Total energy was the summation of macronutrients multiplied by their caloric value.

Sensory evaluation

Sensory evaluation was prepared according to the method has been proposed by Ladamay and Yuwono [18]. Sensory evaluation of food bars involves 20 semi-trained panelists. This study evaluated nine products with different formula. Bar samples were presented with three-digit number codes. All samples were presented once time with sampling order was predetermined by the evaluation sheet order. Degree of liking br products was evaluate using 5 point hedonic sacle whereas the smallest number present extremlely dislike and vice versa. The evaluation points are acceptability, appearance, taste, flavor, and texture. Statistical significant different betwen samples then Analyzed using Analyses of variance (ANOVA)

Statistical Analyses: Statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS) version 16.0 software. The results are represented as the mean values of two replicates ± the standard deviation. Comparison between the mean values was determined using Duncan's multiple range tests (DMRT) at a significance level of $P<0.05$.

Table 1. Formulation of snack bar preparation

Type of food bar	Ingredients	
	Lesser yam flour (g)	Mung beans flour (g)
G1H1	30	50
G1H2	30	40
G1H3	30	30
G2H1	40	50
G2H2	40	40
G2H3	40	30
G3H1	50	50
G3H2	50	40
G3H3	50	30

Result and Discussion

Calorie

The evaluation results showed that amount calorie ranged between 369,31 and 414,66(kcal/100g) [Table 2]. There were no significant differences ($P>0.05$) among the samples. According to Silva [9],

from nutritional values, Food bars may be classified into four types: fibrous, energy, diet, and protein bars. The snack bar was included in the energy bar, which provides 280 kcal and easily absorbed. Energy bar could provide energy for daily activities or as a diet. This study close to the previous work as sorghum base snack bars provide 386.6 per 100g Kcal of energy [10], glutinous rice flour-based snack bars provide 454.51 kcal of energy [11].

The present study showed "energy" food bar had higher carbohydrates (data not shown) than wheat base bar (10%) [4], oat base bar (60%) [8] and had higher crude protein (data not shown) than glutinous rice flour base (6%) [1]. However, it shows lower crude protein than the "energy" bar reported by other researchers (19%) [8]. Lesser yam is a good source of carbohydrates, primary this starch that is very important to provide energy needs [11]. The use mung bean flour is good source of essential amino acid, [12] that it has been shown to offer some pharmacological benefits, such as antitumor effect, as well as antioxidant and antifungal activities [19], and pedada fruit is good source of polyphenol and other phytochemical compounds that are considered as functional foods and that when consumed properly may prevent diseases [15]. This type of bar has the potential to support energy for athletes, feeding starvation and give relief when natural disasters

Table 2 Means fractureability and calorie for eight varieties of snack bars

Type of fruit bar	Fractureability (N)	Calorie (kcal/100g)
G1H1	33,00[a]	369,31[a]
G1H2	31,25[a]	377,41[a]
G1H3	28,10[a]	390,94[a]
G2H1	35,10[a]	380,81[a]
G2H2	33,25[a]	390,19[a]
G2H3	29,60[a]	401,00[a]
G3H1	40,50[a]	397,96[a]
G3H2	40,00[a]	407,02[a]
G3H3	31,00[a]	414,66[a]

[a] Means with different superscripts in the columns are significantly ($P < 0.05$) different

Texture

The texture in terms of hardness and fractureability is a feature of prime importance in date bar quality parameters [20]. In this study, only fractureability was analyzed to evaluate the texture of pedada fruit bars (Table 1). From analysis result showed that the fractureability properties of snack bars values ranged between 31,25 and 40,50N. All samples (G1H1, G2H1, G3H1, G2H1, G2H2, G2H3, G3H1, G3H2, and G3H3) have close value without notable difference (P>0.05). This suggests that the force required to break the food bars into pieces when it is bitten using the incisors of teeth were similar. This results show the agreement with the previous research by Dany et all [21], fruit bars made from green banana flour showed no significant difference (P>0.05) among the samples.

Protein, starch, fat, water activity contribute on the texture of the snack bar. Protein has ability to maintain the ingredients of snack bars intact, set the structure, increase the strength, and contribute to water holding capacity. Water holding properties may contribute to bar firmness. This is appropriate with samples, G1H1, G2H1, G3H1, containing mung bean flour 50 g, has a high fractureability. Moreover, the migration of moisture between the carbohydrates (such as starches, and sugars,) and the proteins can cause an increase in firmness of bars [20].

Sensory evaluation

Sensory attributes viz. taste, color, aroma, and texture of the samples were evaluated. Hedonic rating test was used for the purpose of evaluation. The sensory evaluation was performed using 20 semi-trained participants in age 18-25. Summaries values for taste, color, aroma, and texture are given in **Table 3**.

Table 3 Means of rankings of snack bars

Treatment	Appearance	Taste	Aroma	Texture
G1H1	3,30 [a]	3,20 [a]	2,90 [a]	3,00 [a]
G1H2	3,00 [a]	2,95 [a]	3,05 [a]	2,80 [a]
G1H3	3,20 [a]	3,45 [a]	3,40 [a]	3,15 [a]
G2H1	2,55 [a]	2,45 [a]	2,40 [a]	2,75 [a]
G2H2	3,50 [a]	2,90 [a]	3,05 [a]	3,10 [a]
G2H3	2,60 [a]	2,90 [a]	2,90 [a]	2,80 [a]
G3H1	3,50 [a]	2,95 [a]	3,30 [a]	3,25 [a]
G3H2	3,30 [a]	2,85 [a]	3,20 [a]	3,40 [a]
G3H3	3,35 [a]	3,35 [a]	3,30 [a]	3,50 [a]

[a] Means with different superscripts in the columns are significantly ($P < 0.05$) different

According to Maina [3], sensory characteristics of food such as appearance, taste, aroma, and texture have important effects on food acceptability. When consumers consume the products, they will decide whether they like or dislike the product base on experience their sensory characteristics. Therefore, in this study sensory evaluation was carried out.

Appearance, appearance or color is one of an important attribute due to its contribution to acceptability or rejection by the consumer [11]. Consumers could imagine the visual quality, *i.e.* surface color and acceptability via color. Sample G3H1 had the highest value (3,50), whereas G2H1 had the lowest value (2,55). Among all sample showed just slightly differences (P>0,5). It was found that the composition of mung beans didn't effect on food bar color or appearance. Snack bar tends to be similar, brown. Brown color to be associated with Maillard reactions (non-enzymatic browning), which could have occurred during heating between protein and reducing sugars [21].

Taste and aroma, Taste related to the aroma of the food product. In terms of the parameter in taste and aroma, Sample G1H3 received score 3,45 and 3,40 respectively. For other samples showed only few scores different. The desired taste and aroma food bar might be due to caramelization process, a non-enzymatic browning, that caused by the reaction of reducing sugars with primary amine groups under heating condition [21]. Moreover, this might be due to amino acid content in a bean. Mung bean rich in lysine and the aromatic amino acids and limited in S-containing amino acids. In addition, mung beans contain approximately 140-160 mg of amino acid/gram protein L-glutamic acid [22]. Sano [23] reported that people tend to like glutamine and glutamic acid because it had umami taste.

Texture, the best score for texture parameter obtained by sample G3H3 with 3,5 point. Although the scores for all sample did not show the significant different (P>0,5)**.** In this study, panelist tends to choose soft texture snack bar. This result match with texture analysis, fractureability score was 31,00N. Presumably, snack bar with soft texture was favored by panelist due to the ease of product to be biten.

Conclusion

The highest calorie value and fractureability is sample G3H3 and G3H1, respectively, but it does not significant (p>0,05). The different composition of mung bean, lesser yam did not affect the physicochemical and sensory properties.

References

[1] Irala-Estevez, J D Groth M, Johansson L, Pratalla R, and Martinez-Gonzales R M A 2000 A systematic review of socioeconomic differences in food habits in Europe: consumption of fruit and vegetables (European Journal of Clinical Nutrition 54:706-714).

[2] Sorensen L B, Moller P, Flint A, Martens M, and Raben A 2003 Effect of sensory perception of foods on appetite and food intake: a review of studies on humans (International Journal of Obesity and Related Metabolic Disorders 27:1152-1166)

[3] Maina J W 2018 Analysis of the factors that determine food acceptability. (The Pharma Innovation Journal, Vol. 7(5): 253-257)

[4] Aramouni F M, and Abu-Ghoush M H 2010 Physicochemical and sensory characteristics of no-bake wheat–soy snack bars (J Sci Food Agric 20 91: 44–51)
[5] Fajri R, Basito, dan Muhammad D R A 2013 Karakteristik fisikokimia dan organoleptik *food bars* labu kuning (*Cucurbita máxima*) dengan penambahan tepung kedelai dan tepung kacang hijau sebagai alternatif produk pangan darurat. (Jurnal Teknologi Hasil Pertanian, vol. 6)
[6] Paiva A P, Barcelos M F P, Pereira J A R, EB Ferreira, S Ciabotti 2012 Characterization Of Food Bars Manufactured With Agroindustrial By-Products And Waste. (Ciênc. agrotec., Lavras, vol. 36 pp. 333-340)
[7] Constantin OE and Istrati DI 2018 Functional properties of snack bars DOI: http://dx.doi.org/10.5772/intechopen.81020. 2018.
[8] Dahri N C, Ho LH, Tan T C and Mustafa KA 2017 Composition, physicochemical, and physical properties of rolled oats snack bars formulated with green banana flour (World Applied Sciences Journal Vol. 35 (8): 1361-1372)
[9] da Silva E C, Sobrinho V S, Cereda M P 2013 Stability of cassava flour-based food bars (Food Sci. Technol, Campinas, 33(1 92-198)
[10] Ravindra M P and MD Sunil 2018 Development and quality evaluation of puffed cereal bar. *Int. J Pure App. Biosci*. 6 (5): 930-936, 2018.
[11] Ho L H, Tang J Y H, Akma S M, Aiman H M, and A Roslan 2016 Development of novel "energy" snack bar by utilizing local malaysian ingredients (International Food Research Journal 5): 2280-2285)
[12] Ukpabi U J 2010 Farmstead bread making potential of lesser yam (*Dioscorea esculenta*) flour in Nigeria (Australia Journals of Crop Science 4(2):68-73)
[13] Brishti F H, Zarei M, Muhammad S K S, Ismail-Fitry M R, Shukri R and Saari N 2017 Evaluation of the functional properties of mung bean protein isolate for development of textured vegetable protein (International food research journal 24(4): 1595-1605)
[14] Abeywickrama W S S, and Jayasooriya M C N 2010 Formulation and quality evaluation of cordial based on Kirila (*Sonneratia caseolaris*) fruit. (Tropical Agricultural Research & Extension, Vol.13 (1))
[15] Jariyah, Widjanarko S B, Estiasih Y T 2015 Phytochemical and acute toxicity studies of ethanol extract from pedada (*sonneratia caseolaris*) fruit flour (PFF). (International Journal Advance Science Engineering Information Technology. Vol.5)
[16] Analuddin K, Septiana K, Nasaruddin, Sabilu Y and Sharma S. (Mangrove fruit bioprospecting: nutritional and antioxidant potential as a food source for coastal communities in the rawa aopa watumohai national park, Southeast Sulawesi, Indonesia 2019 (International Journal of Fruit Science)
[17] Jariyah, Widjanarko S B, Estiasih Y T 2015 Hypoglycemic effect of Pedada (*Sonneratia caseolaris*) Fruit Flour (PFF) in alloxan-induced diabetic rats (International Journal of PharmTech Research, 7(1), pp 31-40)
[18] Ladamay, N A dan Yuwono S S 2014 Pemanfaatan bahan lokal dalam pembuatan foodbars (kajian rasio tepung tapioka : tepung kacang hijau dan proporsi cmc. (Jurnal Pangan dan Agroindustri, 2(1):67-78)
[19] Wang, S Y, Wu J H, Ng TB, Ye, X Y and Rao P F 2004 A nonspecific lipid transfer protein with antifungal and antibacterial activities from the mung bean. Peptides 25: 1235–1242
[20] Nadeem M, Rehman S U, Anjum F M, Murtaza M A, and Din G M 2012 Development, characterization, and optimization of protein level in date bars using response surface methodology (The ScientificWorld Journal).
[21] Malawat S, and Hidayah I 2013 The effects of the concentration of brown sugar and the comparison of cassava *(Dioscorea alata)* paste proportion to the making of "dodol" (Indonesian food) (Journal of Agriculture and Veterinary Science 6(2): 9–15)

[22] Widjajaseputra A I, Widyastuti T E W, and Trisnawati C Y 2109 Potency of mung bean with different soaking times as protein source for breastfeeding women in Indonesia (Food Research 3 18 : 501 – 505).
[23] Sano C 2009 History of glutamate production. (The american journal of clinical nutrition. 2009;90(suppl):728S–32S).

04. Physicochemical And Sensory Properties Of Pedada Fruit (Sonneratia caseolaris) Bar

ORIGINALITY REPORT

22%	%	%	22%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Udayana University Student Paper	4%
2	Submitted to Universiti Teknologi MARA Student Paper	2%
3	Submitted to Universitas Musamus Merauke Student Paper	2%
4	Submitted to STKIP Sumatera Barat Student Paper	1%
5	Submitted to Federal University of Technology Student Paper	1%
6	Submitted to Higher Education Commission Pakistan Student Paper	1%
7	Submitted to Laguna State Polytechnic University Student Paper	1%
8	Submitted to University of Reading Student Paper	1%

9	Submitted to University of Sydney Student Paper	1 %
10	Submitted to Universiti Malaysia Terengganu UMT Student Paper	1 %
11	Submitted to Iowa State University Student Paper	1 %
12	Submitted to Sekolah Tinggi Teknologi Garut Student Paper	1 %
13	Submitted to Universiti Teknologi Malaysia Student Paper	1 %
14	Submitted to University of the Philippines Los Banos Student Paper	1 %
15	Submitted to University of Newcastle upon Tyne Student Paper	<1 %
16	Submitted to Lincoln University Student Paper	<1 %
17	Submitted to National Tertiary Education Consortium Student Paper	<1 %
18	Submitted to University College London Student Paper	<1 %
19	Submitted to University of Venda	

	Student Paper	<1%
20	Submitted to Taylor's Education Group Student Paper	<1%
21	Submitted to Jabatan Pendidikan Politeknik Dan Kolej Komuniti Student Paper	<1%
22	Submitted to Universiti Malaysia Perlis Student Paper	<1%
23	Submitted to University of Bradford Student Paper	<1%
24	Submitted to University of Wales Institute, Cardiff Student Paper	<1%
25	Submitted to Waikato Institute of Technology Student Paper	<1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		