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Utilization of Local Food Sources From the Dayak Etnicity of West Kutai as Monggomas Analog Rice to Support of Food Security

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***Abstract*-Research objectives to determine of the effect addition of super red dragon fruit skin extract to Monggomas analog rice (Mocaf, banana weevil and Mayas) on nutritional value and functional properties. This research made use of Completely Randomized Design with 3 repetitions. The effect of addition of red dragon fruit skin extract with 6 treatments (0,5,10,15,20, 25%) was studied. Data were analysed with the use of analysis of variance. Hedonic data was processed by *Kruskal-wallis test*. To test for data that showed significant difference, *Tukey test with* α 5% was further applied. The results of the research showed that the addition of super red dragon fruit skin extract has a significant effect on water content, ash, protein, fat, carbohydrate, total energy, hedonic color and hedonic texture. It showed that there is no significant effect on hedonic aroma and taste. The best treatment was found in rice with the addition of super red dragon fruit skin extract as much as 25% with water content at 5.89%, ash at 1.94%, protein at 25.21%, fat at 5.65%, carbohydrate at 61.30%, total energy of 396.95 kcal, hedonic colors, aroma, textures and flavors were from neutral to rather like. The glycemic index and glycemic load of rice analog was 66 (medium) and 40 (high)**

Keywords:* analog rice, extract of super red dragon fruit skin, glycemic index, glycemic load

I. INTRODUCTION

Cassava is a food source that has energy and calories. It is also an available food source and most widely used by Dayak people in West Kutai district, East Kalimantan [1]. The results of the research show that cassava is utilized as the main food ingredient when people are faced with lack of rice, this means that rice is substituted with cassava in order to engage in food security [2].

Cassava food product produced by fermenting cassava for 48 hours, then shaped to be the same size as rice grains is locally known as *Namit jabau penyek*. This product has 13.40% moisture content, 0.45% ash content, 0.88% fat content, 4.53% crude fiber content, 0.79% protein content, carbohydrate content of 84.50% and energy of 349 kcal with a low glycemic index of 23.64 [3].

The yearly increase in population causes increase in the quantity of rice consumed. One solution to overcome this is to diversify through processing of local products that contain high carbohydrates such as cassava.

Analog rice is an artificial rice that is made from ingredients that have high carbohydrate content such as tubers, cereals, etc. so that the nutritional composition would be close to that of rice [4].

Mocaf is a fermented flour made from cassava, mocaf can be used as raw material in making analog rice. Mocaf flour as raw material in the development of "smart rice". Other ingredients that can be used as additional ingredients for making analog rice are bananas weevil and mayas rice [5].

Banana weevils and mayas can be processed into flour as part of the materials needed in making analog rice. Banana weevil has high fiber content of about 19.11-29.62% [6] Additives from vegetable can also be added as coloring to improve quality and this can be utilized from red fern extracts and other plants [7]. Additional ingredients to be used are super red dragon fruit peel extract. It (Hylocereus costaricensis) contains many antioxidants in the form of vitamin C, flavonoids, tannins, alkaloids, saponins, and anthocyanins [8]. The addition of super red dragon fruit skin extracts has possibility of increasing nutritional value and reducing the index and glycemic load on analog rice "MONGGOMAS".

II. METHODS

A. *Tools and materials*

The main ingredients used for making banana weevil flour were fresh kepok banana weeds obtained from the Lempake area. White rice was obtained from traditional markets in Samarinda Mocaf flour was obtained from BPTP or the Agricultural Technology Study Center in Samarinda while super red dragon fruit peels were obtained from one of the traditional markets of Samarinda city, glycerol monostearate other chemicals for proximate analysis. The tools used in this study were processing equipment such as ovens, Soxhlet, Accu Chek Active, Kjeldahl and other chemical analysis tools.

B. Experimental design

The experimental design used in this study was a non-factorial Completely Randomized Design (CRD) with 6 treatment levels and 3 repetitions. The treatment that was given to the addition of super red dragon fruit peel extract (1: 1) with a percentage: 0%, 5%, 10%, 15%, 20%, and 25% in 200 mL.

Parameters observed were proximate (water, protein, ash, fat, carbohydrates, total energy [9]. Hedonic tests [10] as well as the index and glycemic load test [11], based on the best treatment of the addition of super red dragon fruit peel extract in the manufacture of mocaf flour-based analog rice, banana weevil, and mayas rice (Monggomas). The data obtained was processed with variance, in situations where there were differences, an honest difference test, with a significance level of α 5% was applied. Hedonic data was processed using the *Kruskal-wallis* test.

C. *The Production of Banana Weevil Flour and Mayas Rice Flour* [6].

D. The Production of Super Red Dragon Fruit Skin Extract

The production of super red dragon fruit peel extract began by sorting super red dragon fruit peel, removal of dirt that was still attached to the skin of the fruit, removal of parts that are not used and cut into small pieces. After that, 100 pieces of dragon fruit peel were weighed. It was placed in a blender and mashed by adding 100 mL of water. Then, filtered using a filter cloth to obtain dragon fruit peel extract (1:1). The volume of extract that was added is 200 mL. The quantity of dragon fruit peel extract (1:1) used was calculated by dividing the percentage of extract according to the treatment (0, 5, 10, 15,20 and 25%) in 200 mL. The extract obtained was added to 200 mL of water.

E. The Production of Analog Rice

The processing of analog rice started through the preparation of the raw materials such as mocaf flour, banana weevil flour and mayas rice flour. Next, these raw materials were placed in a container. Water and dragon fruit peel extract according to treatment, 20 mL vegetable oil and Glycerol Monostearate (GMS) 2% were added.

The mixture was stirred until it becomes smooth for approximately 5 minutes. Then, it undergone a pre-gelatinization stage, which requires steaming the mixture at 100°C for approximately 5 minutes. The purpose of this steam process was to homogenize the water content in the material and make it more hygroscopic, thus the making the extrusion stage faster. Then, the dough was printed using a printer and then cut into pieces to resemble rice ± 1 cm long. The rice granules were dried in an oven at 70°C for 3 hours. It resulted in mocaf flour-based analog rice, banana weevil flour, mayas rice flour and super red dragon fruit peel extract. Analog rice that has not been cooked was tested for water content, ash content, protein content, fat content, and carbohydrate levels.

F. Analog Rice Cooking

The process of cooking this rice was done by steaming. Firstly, 100 mL of water was heated to boil, then 50 grams of analog rice was poured and left to cook for 20-30 minutes. Finally, cooked rice was removed and a preference test was carried out. Samples from the best treatment then continued the glycemic index and glycemic load testing.

TABLE I
RESULTS OF THE AVERAGE EFFECT OF SUPER RED DRAGON FRUIT PEEL EXTRACT ADDITION THROUGH THE NUTRITIONAL VALUE OF ANALOG RICE MONGGOMAS (100 G)

Parameter test	super red dragon fruit peel extract addition (*Hylocereus costaricensis*)					
	0%	5%	10%	15%	20%	25%
Water content (%)	4,89 ± 0,013a	5,16 ± 0,011b	5,25 ± 0,017c	5,43 ± 0,013d	5,83 ± 0,009e	5,89±0,005f
Ash content (%)	1,23 ± 0,002a	1,46 ± 0,007b	1,63 ± 0,003c	1,77 ± 0,016d	1,84 ± 0,018e	1,94±0,01f
Protein content (%)	17,42 ± 0,17a	21,28 ± 0,09b	23,20 ± 0,17c	24,19 ± 0,10d	25,09 ± 0,050e	25,21±0,09e
Fat content (%)	3,96 ± 0,030a	4,76 ± 0,003b	5,005 ± 0,003c	5,25 ± 0,003d	5,34 ± 0,006e	5,65±0,03f
Carbohydrate content (%)	72,49±0,153a	67,34±0,086b	64,91±0,193c	63,35±0,091d	61,88±0,051e	61,30±0,08f
Energy Total (Kkal)	395,32±0,151a	397,33±0,032b	397,52±0,040b	397,43±0,067b	396,01±0,131c	396,95±0,16d

Description: numbers followed by the same letter on the same line show unreal differences (Tukey test α 5%) ± Std Dev

III. RESULTS AND DISCUSSION

A. Water content

The value of water content in Table 1 shows that the higher addition of super red dragon fruit peel extracts, the higher the value of Monggomas analog rice water content. This happened because of the raw material used. The water content value is max 14% b / b (SNI 6128: 2015) [12]. The protein content value in Table 1 shows that the higher addition of super red dragon fruit peel extracts, the higher the Monggomas analog rice protein content. Protein content values range from (17.42 ± 0.175) % to (25.21 ± 0.088) %.

B. Protein

Protein content in analog rice is influenced by the raw materials used such as the use of mayas rice flour, mocaf, and dragon fruit peel extract which have protein content. This shows that the addition of super red dragon fruit peel extract helps to increase the level of protein produced. The protein content value is influenced by the processes carried out during the manufacture of the product. Differences in processing and different nutrient content in each ingredient have the probabilities of increasing or decreasing the level of protein in the product.

C. Fat content

The fat content value in Table 1 shows that the higher addition of super red dragon fruit peel extract extracts, the higher the Monggomas analog rice fat content value. This is influenced by the fat content of the raw material used.

D. Carbohydrate content

Table 1 shows that the higher addition of extracts of super red dragon fruit peels extract, the value of Monggomas analog rice carbohydrate content decreases. The carbohydrate content of food products is influenced by the starch content in the dominant composition of the raw materials used and the processing process undergone to manufacture the product. One of the treatment processes that can reduce carbohydrate levels in foodstuffs is by heating processes. Steaming was carried out at 100°C for 5 minutes and drying at 70°C for 3 hours in the production of the analog rice.

E. Energy total

The results gotten from the calculations and variance in the addition of super red dragon fruit peel extract in producing rice analog Monggomas show a significant effect on the total analog rice energy produced from (395.32 ± 0.151) kcal up to (397.52 ± 0.040) kcal. The highest total energy value was found in the addition of super red dragon fruit peel extract (Hylocereus costaricensis) as much as 10%, which is (397.52 ± 0.040) kcal. In the production of analog rice, the biggest carbohydrate source was from the use of mocaf flour and mayas rice flour

F. Color hedonic

Based on the results of variance tests carried out, it was discovered that the addition of super red dragon fruit peel extract to Monggomas analog rice had no effect on the hedonic value of analog rice color. The average value of the analog rice hedonic test results ranges from 4.10 ± 1.51 (normal) to 5.14 ± 0.96 (rather like). The treatment 25% super red dragon fruit peel extracts show that the panelist acceptance on hedonic of analog rice color was 5.14 ± 0.96 (rather like) (Table 2). V isually, the color of each treatment used in the experiment is almost the same. The color produced from the extract of dragon fruit peel is to cover the color of brown banana weevil flour. It is not in accordance with the expected color which is red for the analog rice. The color of dragon fruit peel extract derived from color pigments was in the form of anthocyanins [13].

G. Flavor hedonic

The flavor of analog rice produced resembles that of mocaf flavor flour. This is because the use of mocaf flour in analog rice production is 80%. Thus, it depends on the basic ingredients used during the analog rice production process. The flavor of analog rice that was made from cassava produces the flavor of rice like cassava.

H. Texture Hedonic

Based on the results of variance tests, it was discovered that the addition of super red dragon fruit peel extract significantly affected Monggomas analog rice. The average value of the analog rice hedonic test results added with super red dragon fruit peel extract ranges from 4.32 ± 1.43 (normal) to 5.14 ± 1.04 (rarely like).

I. Taste Hedonic

It was discovered from the results of variance that the addition of super red dragon fruit peel extract had no significant effect on the hedonic taste of rice analog Monggomas. The average value of the analog rice hedonic test produced ranges from 4.50 ± 1.25 (normal) to 5.00 ± 1.10 (somewhat like). People generally like rice with sweet taste. This taste is because of the starch content in the form of

TABLE II
RESULTS OF THE AVERAGE EFFECT OF SUPER RED DRAGON FRUIT PEEL EXTRACT ADDITION (HYLOCEREUS COSTARICENSIS) THROUGH THE HEDONIC VALUE OF ANALOG RICE

Super red dragon fruit peel extract (%)	Hedonic value			
	colour	flavor	Texture	Taste
0	5,00±1,07 bcd	4,61±1,41 a	4,92±1,29 abc	4,94±1,16 a
5	4,10±1,51a	4,57±1,38 a	4,32±1,43 a	4,50±1,25 a
10	4,96±1,05 bc	4,48±1,49 a	5,14±1,04 bcde	4,94±1,11 a
15	4,89±1,14 b	4,34±1,50 a	4,88±1,15 ab	4,61±1,39 a
20	5,05±1,21 bcde	4,66±1,53 a	5,10±1,24 bcde	4,68±1,42 a
25	5,14±0,96 bcde	4,58±1,43 a	4,96±1,27 abcd	5,00±1,10 a

Information :
- Hedonic test value:
- 1-7 (Very dislike, dislike, likes, ordinary, rather like, likes and very like)
- Each sensory score was obtained from 25 data and tested using the Kruskal-Wallis test α 5%.

Data on the same line and followed by the same letter indicate a non significant difference (Tukey α 5%.)

amylose and amylopectin. The resulting analog rice taste is not sweet. The analog rice produced has 80% mocaf flour in its make-up.

J. *Glycemic Index and Load*

The difference in the decrease of blood glucose in the respondents who consumed reference food (plain bread) (24 mg/dL) was lower than that of analog rice (57 mg/dL). Blood sugar response from respondents who consumed analog rice with mocaf flour ingredients, banana weevil flour, mayas rice flour, and super red dragon fruit peel extract 25% is as shown in the graph of figure 1. Based on the blood glucose reduction curve, the glycemic index value obtained is 66 (moderate). The addition of dragon skin extracts of 25% on Monggomas analog rice produced a glycemic load of 41 (high). Index and glycemic load is affected by the number of servings and carbohydrate content in the food consumed [14]. Foods with high GI can provide low GL values when consumed in small amounts [15]. On the other hand, low GI food values can provide high GL values if consumed in large quantities of white rice glycemic load 43 per 150 grams [16].

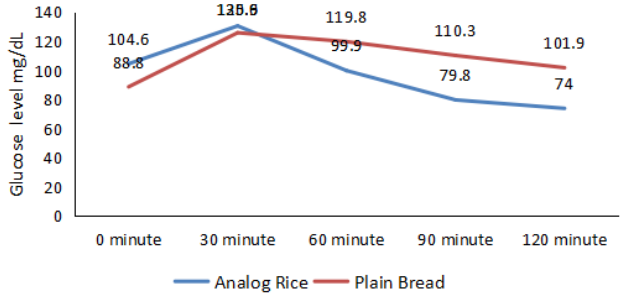

Fig. 1 Graph of blood glucose respondents after consuming analog rice and plain bread

VI. CONCLUSIONS

The addition of super red dragon fruit peel extract to the Monggomas analog rice production has a significant effect on nutritional value, total energy, and hedonic texture, but does not significantly affect the hedonic value of color, flavor, and taste. The best treatment obtained was the addition of 25% super red dragon fruit peel extract with water content of 5.89%, protein 25.21%, fat 5.65%, carbohydrate 61.30%, total energy 396.95 kcal, glycemic index 66 (moderate) and glycemic load 41 (high)

REFERENCES

[1] Saragih B, Prayitno NW, Emmawati A, Candra KP, Kurniadinata OF dan Mariyani, pemanfaatan singkong oleh etnis dayak kabupaten kutai barat sebagai namit jabau penyek dalam mendukung ketahanan pangan;inovasi teknologi dan indeks glikemiknya. Prosiding Seminar Nasional Peran Ahli Teknologi Pangan Dalam Mewujudkan Ketahanana Pangan Nasional. Indoensia, Bandar Lampung 10-11 Oktober 2017; 2: 929-938, 2017

[2] B.Saragih, Tropical Food Innovation Supporting Food Security, Nutrition and Quality of Life. Paper as Key Note Speech on International Conference on Tropical Studies and Its Applications "Tropical Studies and Aplication for Better Life" Hotel Aston Samarinda, 9-10 Nopember 2017

[3] Saragih B, Emmawati A, Kurniadinata OF and Mariyani. Analysis of Food Security and Identification of Dayak Local Food to Support Food Sovereignty. Paper as invite speakers on International Conference on Food Security Innovation Serang Banten Indonesia, 18-20 october 2017

[4] Budijanto, S., dan Yulianti. Studi Persiapan Tepung Sorgum (Sorghum biocolor L. Moench) dan Aplikasinya Pada Pembuatan Beras Analog. *Jurnal Teknologi Pertanian*. 13(3): 177-186, 2012

[5] Subagio, A., Y, Witono., D, Hermanuadi., A, Nafi., dan W, S, Indrati. Pengembangan "Beras Cerdas" Sebagai Pangan Pokok Alternatif Berbahan Baku Mocaf. Prosiding InSINasI. 157-160, 2012

[6] Saragih, B. Analisis mutu tepung bonggol pisang dari berbagai varietas dan umur panen panen yang berbeda. *Jurnal TIBBS Teknologi Industri Boga dan Busana*. 9(1):22-29, 2013.

[7] Saragih B, Prakoso HT, Rahmadi A, Emmawati A and Kurniadinata OF, Phytochemicals, Quality and Glycemic Response Fern Red Herbal (Stenochlaena palustris). Proceeding Asian Academic Society International Conference (AASIC) " Multidisciplinary Perspectives of Local Wisdom: Past, Present and Future Asia" Khon Kaen, Thailand 26-27 July 2017. Page 391-397

[8] Noor, M. I., Yufita, E., Zulfalina. 2016. Identifikasi Kandungan Ekstrak Kulit Buah Naga Merah Menggunakan Fourier Transform Infrared (FTIR) atau Fitokimia Identification Content of the Red Dragon Fruit Extract Skin Using Fourier Transform Infrared (FTIR) and Phytochemistry. Journal of Aceh Physics Society (JAcPS). 5(1): 14-16

[9] AOAC. *Official of Analysis of The Association of Analytical Chemistry.* Arlington. AOAC Inc, 2005

[10] Setyaningsih, D., Apriyantono, A., dan Sari, M. P. *Analisis Sensoris Untuk Industri Pangan dan Agro*. Ciampea (ID): IPB Press. Bogor, 2010

[11] JB, Miller, K.Foster-Powel and S Colagiuri. The GI Factors; *The GI Solution Hodder and Stougton. Hodder Headline.* Pty. Limitted. Australia, 1996.

[12] Badan Standarisai Nasional. *Standar Nasional Indonesia*. SNI 6128:2015. Beras. Badan Standarisasi Nasional. Jakarta, 2015

[13] Kwartiningsih, E., Agatha, P. K., dan Dian, L. T. 2016. Ekatraksi dan Uji Stabilitas Antosianin Dari Kulit Buah Naga Super Merah (Hylocereus costaricensis). Prosiding Seminar Nasional Teknik Kimia "Kejuangan". Pengembangan Teknologi Kimia Untuk Pengolahan Sumber Daya Alam Indonesia. Yogyakarta. 17 Maret 2016. Hal: 1-7

[14] Saragih, B. Glikemik respon cookies labu kuning (Cucurbita moschata Durch.). *Jurnal Boga dan Gizi.* 8(1): 11-15, 2014

[15] Veen, Bj., dan TJ., Green. Glycemic Index and Glycemic Load: Measurement Issues and Their Effect on Diet–Disease Relationships. *European Journal of Clinical Nutrition*. 61(1):122-131, 2007

[16] Roufiq, NA, *Nilai Indeks Glikemik VS Diabetes Mellitus (DM)*. BPTP KALTIM. http://kaltim.litbag.pertanian.go.id. 26 Juli 2018