

# Hedonic Test Of Bejabi Formula By Using Various Local Food In A Food Diversification Program

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**Abstract:** Bejabi is rice, corn and tuber which is the raw material of making analog rice. In this time, rice is the main food ingredient of the Indonesia people. Increasing demand for rice, causing the government still import rice to maintain the stability of food security. Though Indonesia has many sources of other carbohydrates as staple food. The government has also promoted the program to consume alternative staple food such as cassava, sweet potato, corn, taro and others as a substitute for rice. However, the community has not been able to run the program because it is used to consume rice, so the government must find a solution to change the habits of the Indonesia people. This study aims to convert alternative staple food into analogue rice where the shape and texture almost resemble real rice. And change the mindset of people about artificial rice that not all artificial rice is dangerous. So it is expected that the community is easier to accept and consume basic staple food. This type of research is experimental research with the manufacture of analog rice products that will be tested for hedonic. Data were obtained through experiments on panelists with hedonic test. The research design used was Completely Randomized Design with 1 treatment and 5 levels i.e Rice composition analogous to corn: sweet potatoes: cassava: taro; K1 (1: 1: 1: 1), K2 (2: 1: 1: 1), K3 (1: 2: 1: 1), K4 (1: 1: 2: 1), K5 (1: 1: 1: 2). Stages performed are formulation, precondition, extrusion and drying. The result of the hedonic test, the most preferred formula of BEJABI is the formula K2. Based on the results of laboratory analysis of the BEJABI nutrition, the highest carbohydrate was contained in cassava, the highest protein contained in corn, the highest fat contained by purple sweet potato, and the highest moisture and fiber contained in taro.

**Index Term:** analog rice, corn, tuber, food diversity, bejabi

## 1 INTRODUCTION

Rice is the main food in Indonesia. However, the availability of rice has not been able to meet the rice consumption needs of the Indonesian population so that the Government is still importing rice from outside. This shows that food self-sufficiency has not been achieved and if this is left unchecked it will certainly threaten national food security. According to the Food Security Council [1], food security can be realized if it can fulfill two aspects at once, namely the availability of adequate and even food for all people. Second, every community has physical and economic access to meet the adequacy of nutrition to live a healthy and productive life. Because of functional food which is currently starting to develop, along with the increasing demand for functional food and public awareness about health, increasing sufferers of degenerative diseases and the elderly population, commercial product development, scientific evidence of the benefits of functional food components, and the development of food technology. Upstream activities include crop development and cultivation.

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- One of the efforts in dealing with this problem is the manufacture of analog rice as a healthier alternative food. Analogous rice is artificial rice which is a form of diversification of food stuffs by utilizing local food ingredients.

Downstream activities include process optimization, machinery design, and developing analog rice with specific properties, such as low glycemic index, high fiber content with hypocholesterolemic activity, and chemo-preventive activity [2]. Analog rice can also be called BEJABI, namely rice, corn and tubers. Because rice is a source of carbohydrates, analog rice must be made from ingredients which are also known as carbohydrate sources which are usually stored in plants in the form of starch. Other ingredients needed in making analog rice are fiber or flour (starch containing fiber), water, lipids, binder and setting materials as well as optional additives such as coloring, flavor, fortification and antioxidants. In general, rice is consumed together with other food ingredients such as side dishes that have high protein content so that the value of analog rice protein intake can be increased. But if you want additional micronutrient ingredients such as vitamin B, vitamin A, iron and so on, fortification can be done at the time of formulation. Several analog rice fortifications carried out by several researchers such as rice fortification analogous to iron, zinc and vitamins, iron, zinc, thiamin and folic acid, and vitamin A [3,4,5,6]. Some local food ingredients that can be used are corn tuber taro, sweet potatoes, cassava, and the addition of beet tuber. The advantage of using substitute food ingredients is that raw materials are always available and inexpensive, easy to plant and good for health as it can reduce the number of diabetes due to reduced consumption of rice. The method commonly used to make analog rice is extrusion [7,8,9,10,11] and granulation methods [12,13,14,15].

## 2 MATERIAL AND METHODS

This research has been conducted at the Kopertis Region 1 Growth Center Laboratory, University of North Sumatra's Natural and Biochemistry Laboratory and the Pembangunan Panca Budi Laboratory from February to July in 2018. The tools used are basins, spoons, scales, stoves, steams,

knives, containers, aluminum foil, pumpkin kjeidhal, electric heaters (hot plates), erlenmeyers, glass beakers, furnaces, petridis dishes, water baths, mortars, measuring flasks, scales analytic, thermometers, analog rice printing machines and other tools that support the analysis of analog rice content. The ingredients used are corn, taro tubers, sweet potatoes, cassava, water and other materials that support the making and analysis of analog rice. This type of research is experimental research with the manufacture of analog rice products that will be tested for hedonic and analyzed for nutritional content. Data were obtained through trials on panelists with hedonic tests. The research design used was a Completely Randomized Design with 1 treatment and 5 levels namely:

- The composition of analog rice for corn: sweet potatoes: cassava: taro = 1: 1: 1: 1
- The composition of analog rice for corn: sweet potatoes: cassava: taro = 2: 1: 1: 1
- The composition of analog rice for c
- Rice composition analogous to corn: sweet potatoes: cassava: taro = 1: 1: 2: 1
- Rice composition analogous to corn: sweet potatoes: cassava: taro = 1: 2: 1: 1 : taro = 1: 1: 1: 2

This research was carried out with the stages of making analog rice which consists of four stages, including: formulation, preconditioning, extrusion and drying. The stages of the formulation aim to make a mixture of raw rice ingredients analogous to the desired composition. In this process the level of uniformity of the hydration of the particles will be the same and other additional ingredients such as micronutrients can be added to increase nutritional value, appearance and taste. In the extrusion stage the dough will undergo a heating process again at a temperature slightly higher than the previous process. In addition, the dough will also undergo a further process of homogenization, shearing and formation. The process of starch degradation into smaller molecules is minimized so that the function of analog rice as a source of carbohydrates can still be maintained. The analog rice produced has high water content so it must be dried to below 15% so that the analog rice shelf life can last a long time.

### 3 RESULTS AND DISCUSSION

#### 3.1 Hedonic Test Results Based on the results of statistical analysis obtained, showed that differences

in raw material composition did not affect hedonic in terms of the taste, aroma, texture and color of BEJABI. The data obtained can be seen in the table below

Note: The number followed by the same letter in each variable shows no significant based on the DMRT test at the level of  $\alpha = 0.05$ ; Treatment = Rice composition analogous to corn: sweet potatoes: cassava: taro; K1 (1: 1: 1: 1), K2 (2: 1: 1: 1), K3 (1: 2: 1: 1), K4 (1: 1: 2: 1), K5 (1: 1: 1: 2)

Based on the results of the average hedonic test, it can be seen that the most preferred taste, color and aroma of analog rice is K2, where the ratio of corn composition is

the most compared to other ingredients where the aroma of corn produces fragrant analog rice and a sweeter taste. The most preferred analog rice texture is K3 where the most widely used material is sweet potato. The texture of cassava which is relatively dense but not hard makes analog rice more like the texture of rice in general. Based on this, it can be seen that people tend to still have a mindset that analog rice must be the same as rice in general, especially in the appearance of rice without considering the nutritional content of the analog rice. People tend to not easily accept analog rice because of the mindset of the Indonesian people that staple food is rice derived from paddy. According to researched, visually the color factor appears first and sometimes is very decisive. A material that is considered nutritious, tasty, and has a very good texture will not be eaten if it has an unsightly color or gives the impression that it has deviated from the color that should be. Acceptance of the color of a material varies depending on natural, geographical and social aspects of the recipient community [16].

Texture is defined as the properties of a food that can be observed by the eyes, skin, and muscles in the mouth. Texture is a description of the attributes of food ingredients produced through a combination of physical and chemical properties, widely accepted by a sense of touch, vision, and hearing [17]. De Mann defines flavor or taste as stimulation caused by the material eaten, which is felt by the taste or smell senses, as well as other stimuli such as palpability and acceptance of the degree of heat by the mouth. In the organoleptic test of analog rice, color was the first thing seen by panelists [18]. Some things that need to be considered in the quality of analog rice as a substitute for rice are the ratio of amylose and amylopectin, protein content, starch gelatinization temperature, volume development, water absorption, gel viscosity, and starch gel consistency [19]. A comparison between amylose and amylopectin can determine the texture, the stickiness of the rice, and whether or not the rice hardens. The higher the amylose content in rice, the harder and the rice produced. Conversely, high levels of rice amylopectin, the more fluffy and sticky rice produced [20].

#### 3.2 Bejabi nutritional value

Based on the results of laboratory tests, the nutritional value obtained from each sample can be seen in the table below.

<i>Sampel</i>	<i>Carbohydrate (%)</i>	<i>Protein (%)</i>	<i>Fat (%)</i>	<i>Fiber (%)</i>	<i>water (%)</i>
<i>corn</i>	19,52	3,55	1,25	11,18	63,41

  

<i>Treatm</i>	<i>Taste</i>	<i>Aroma</i>	<i>Texture</i>	<i>Color</i>
<i>K1</i>	7,5 <sup>a</sup>	7,45 <sup>a</sup>	6,3 <sup>a</sup>	6,45 <sup>a</sup>
<i>K2</i>	7,55 <sup>a</sup>	7,55 <sup>a</sup>	6,2 <sup>a</sup>	6,6 <sup>a</sup>
<i>K3</i>	7,1 <sup>a</sup>	7,4 <sup>a</sup>	6,4 <sup>a</sup>	6,55 <sup>a</sup>
<i>K4</i>	7,15 <sup>a</sup>	7,35 <sup>a</sup>	6,35 <sup>a</sup>	6,5 <sup>a</sup>
<i>K5</i>	6,95 <sup>a</sup>	7,15 <sup>a</sup>	6,25 <sup>a</sup>	6,4 <sup>a</sup>

<i>cassava</i>	34,91	1,66	0,36	11,69	50,79
<i>Taro</i>	20,97	1,79	0,27	15,24	61,45
<i>sweet potatoes</i>	26,41	2,14	6,02	6,40	54,95

From the results of the nutritional value test it can be seen that, the highest carbohydrate content was contained by cassava with a value of 34.91%, the highest protein content contained in corn with a value of 3.55%, the highest fat contained by purple sweet potato with a value of 6.02% , the highest fiber contained in taro with a value of 15.24% and the highest water contained in taro with a value of 61.45%. Besides containing carbohydrates, proteins and fats, in staple foods usually also include vitamin B1 (thiamine), B2 (riboflavin) and some minerals. Minerals from these staple foods usually have biological quality or low body absorption. Whole cereals such as corn, brown rice, black rice, or whole grains that are not fed into the mill contain high fiber. This fiber is important for improving bowel movements and controlling blood cholesterol. Besides that, cereals also have carbohydrates that are slowly converted into blood sugar, which helps prevent high blood sugar. Some types of tubers also contain non-nutritive substances that are health-friendly such as purple sweet potatoes and yellow sweet potatoes that contain anthocyanins and others [2]. The lowest carbohydrate content from laboratory analysis is corn. In an old enough condition, corn seeds contain small amounts of carbohydrates. Total sugar in corn ranges from 1-3%. Sucrose is the main component and concentrated in the institution. Monosaccharides, disaccharides, and trisaccharides are present at fairly high concentrations in old corn seeds. At 12 days after pollination, sugar content is relatively high and starch levels are low. Along with increasing aging of corn kernels, sugar content decreases and starch levels increase. Therefore, young corn consumed directly is preferred over old corn, because it is sweeter.

### 3.3 BEJABI Nutrition Value Pre Cooking

Based on the results of laboratory tests, the nutritional value obtained from each sample can be seen in the table below.

<i>Sampel</i>	<i>Carbohydrate (%)</i>	<i>Protein (%)</i>	<i>Fat (%)</i>	<i>Fiber (%)</i>	<i>water (%)</i>
<i>K1</i>	14.45	12.21	4.28	34.54	18.11
<i>K2</i>	16.93	14.22	8.75	22.94	19.05
<i>K3</i>	15.91	10.89	2.48	25.11	16.69
<i>K4</i>	17.65	9.32	2.82	41.58	16.50
<i>K5</i>	16.98	6.08	13.18	37.11	16.56

From the results of the nutritional value test it can be seen that, the highest carbohydrate content contained by K4 with the highest cassava composition was 17.65%, the highest protein content contained by K2 with the highest composition of corn was 14.22%, the highest fat content contained by K5 with the highest taro composition 13.18 % , the highest fiber content contained by K4 with the composition of the most

cassava is 41.58% and the highest water content is contained by K2 with the composition of the most corn is 19.05%. Analog rice can be made using a mixture of rice flour with other non-rice foods [3] or all using non-rice foodstuffs [2]. Non-rice food as the main raw material for carbohydrate sources can be obtained from tubers and cereals. The carbohydrate source is chosen according to its composition and properties which will determine the nutritional content and characteristics of analog rice. Analog rice can be made using a mixture of rice flour with other non-rice foods [3] or all using non-rice foodstuffs [2]. Non-rice food as the main raw material for carbohydrate sources can be obtained from tubers and cereals. The carbohydrate source is chosen according to its composition and properties which will determine the nutritional content and characteristics of analog rice. Analog rice can be made using a mixture of rice flour with other non-rice foods [3] or all using non-rice foodstuffs [2]. Non-rice food as the main raw material for carbohydrate sources can be obtained from tubers and cereals. The carbohydrate source is chosen according to its composition and properties which will determine the nutritional content and characteristics of analog rice. Water is an important factor in the formation of analog rice because water plays a role in the gelatinization process. Corn flour is used to reduce adhesiveness because corn flour has a high fat content of 4.6%. Analog rice texture includes smoothness and friability influenced by the process of printing and drying. The drying process of the extrudate also affects the texture because the drying process takes place in the extrudate. The extrudate in making analog rice is dried with the sun's heat. The dried extrudate will change porosity because water also affects the texture of rice. The more water in the extrudate is evaporated, the more the shaft and the rough surface will make the rice. Rice whose shaft will be more fragile than rice which is not a shaft. However, the addition of water also affects the product gelatinization process.

### 3.4 Nutritional Value Post-Cooking

Based on the results of laboratory tests, the nutritional value obtained from each sample can be seen in the table below.

<i>Sampel</i>	<i>Carbohydrate</i>	<i>Protein (%)</i>	<i>Fat</i>	<i>Fiber</i>	<i>water (%)</i>
<i>K1</i>	15.03	8.36	11.	37.2	38.5
<i>K2</i>	16.95	8.53	12.	14.5	55
<i>K3</i>	18.84	5.64	9.	34.8	33.46
<i>K4</i>	14.20	8.01	10.	64.1	38.5
<i>K5</i>	16.63	7.44	13.	52.8	43.5

From the results of the nutritional value test it can be seen that, the highest carbohydrate content contained

by K3 with the highest sweet potato composition was 18.84%, the highest protein content contained by K2 with the highest composition of 8.53%, the highest fat content contained by K5 with the most taro composition 13.93 %, the highest fiber content contained by K4 with the highest cassava composition was 64.17% and the highest water content was contained by K2 with the highest composition of corn, which was 55%. The important thing to consider is why the processing of food needs to be done first, namely to get food that is safe to eat so that the nutritional value contained can be utilized maximally and the second is so that the food can be received especially in sensory ways which include aroma, taste, violence, tenderness, consistency, elasticity and crispness. The main key in the processing of foodstuffs is to optimize the processing process to produce processed products that are sensory interesting, high in nutritional value and safe for consumption. For this reason, the importance of knowledge about the effects of processing on nutritional value and food safety. Processing foodstuffs is the conversion of the original form into a form that is close to the shape to be eaten immediately. One process of processing food is using heating. Food processing using heating aims to get a better taste, a better aroma, a softer texture, to kill microbes and activate all enzymes. In many cases, the cooking process is needed before we eat a food. Cooking can be done by boiling and steaming (boiling and steaming at a temperature of 100°C), broiling (roasting meat), baking (baking bread), roasting (pengsangraian) and frying (frying with oil) with temperatures between 150° - 300° C. Use of heat in the cooking process is very influential on the nutritional value of the food [16]. In addition to the process of processing (cooking) can damage the nutrients contained in food, the processing can be beneficial for several components of the nutrient of these foods, namely changes in levels of nutrient content, increase digestibility and decrease in various antinutrient compounds. The process of heating food can increase the availability of nutrients contained in it. The processing factor is also very influential on carbohydrate content. Carbohydrate cooking is needed to get the right starch digestibility. When the starch is heated, the starch granules swell and break so that the starch is keratinized [16].

#### 4 CONCLUSIONS

Based on the results of the hedonic test, the most preferred BEJABI formula is K2 (analog rice composition of corn: sweet potato: cassava: taro = 2: 1: 1: 1) with the highest level of preference for flavor, color and highest aroma. While the most preferred BEJABI texture is K3 formula (rice composition analogous to corn: sweet potato: cassava: taro = 1: 2: 1: 1). Based on the results of laboratory analysis of the nutritional content of BEJABI raw materials, the highest carbohydrate content was contained by cassava with a value of 34.91%, the highest protein contained in corn with a value of 3.55%, the highest fat contained by purple sweet potato with a value of 6.02 %, the highest fiber contained in taro with a value of 15.24% and the highest water contained in taro with a value of 61.45%. Based on the results of

laboratory analysis of pre-cooked BEJABI nutrient content can be seen that, the highest carbohydrate content contained by K4 with the highest cassava composition is 17.65%, the highest protein content contained by K2 with the highest composition of corn, 14.22%, highest fat content contained by K5 with composition most taro is 13.18%, the highest fiber content contained by K4 with the composition of the most cassava is 41.58% and the highest water content is contained by K2 with the composition of the most corn is 19.05%. Based on the results of laboratory analysis of post-cooking BEJABI nutrient content can be seen that, the highest carbohydrate content contained by K3 with the highest sweet potato composition is 18.84%, the highest protein content contained by K2 with the highest composition of 8.53%, the highest fat content contained by K5 with the composition the highest taro was 13.93%, the highest fiber content contained by K4 with the composition of the most cassava was 64.17% and the highest water content was contained by K2 with the composition of the most maize was 55%.

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