

# Rice Bran for Diabetes Mellitus Prevention and Snackification

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**Abstract.** Snackification is a snack trend as a substitute for staple foods, meanwhile the increasing cases of Diabetes Mellitus in the community are related to consumption of unhealthy diet. The purpose of this research is to analyze the acceptability of target consumers related to organoleptic and hedonic tests at rice bran levels of 20%, and 30% and which product formulas to be recommended. Formula tested with bran level 20% and 30%. Products are made in the form of biscuits. Test is conducted in the form of organoleptic and hedonic test. The results obtained biscuit bar products that have a high sensory quality and most preferably panelists with 30% bran content, with an average or the total value of hedonic test results related to color is rather like, aroma is rather like, texture is somewhat like, and sweet potato taste is somewhat like, and contain carbohydrates of 68.569 gr / 100 gr.

**Keywords:** Rice Bran, Diabetes mellitus, Snackification, Biscuit Bar

## 1 Introduction

The consumption trend of snackification, which relies on snack that function as a substitute for large meals and snacks in the millennial community, requires the availability of healthy food, meets the body's energy needs and does not add to the case of Diabetes Mellitus (DM) in the community. DM is a common and chronic disease that has affected individuals worldwide. It is a disease that is a global health problem. Not only it causes complications of blindness, kidney failure, heart attacks, strokes and lower limb amputations, but DM also causes death to the people. In 2016, an estimated 1.6 million mortality were directly addressed to DM and 2.2 million deaths were caused by high blood glucose in 2012 and occurred before the age of 70 years. The World Health Organization (WHO) estimates DM ranks seventh as the cause of death in 2016.[1] By 2040 the number is predicted to reach 642 million, and by 2030, approximately 366 million adults will suffer from DM, of which 75% live in developing countries.[2,3]

Lifestyle or habit is a major factor causing an increase in DM [4-7] cases. One of it is in the form of habits whether it is related to 1) consumption of food that mainly high-carbohydrate or high-sugar contain including high fat which has a response to the potential for increased blood sugar, 2) physical activity, 3) habits in family health

services, is an important factor in the prevention and treatment of DM type 2.[8] The results of the study found several local foodstuffs such as rice bran (bran) and sweet potato have contribution to low blood sugar level.[9-13] Rice bran is a by-product of rice processing that is rich in nutrients such as fibers, minerals, vitamin B complex, vitamin E, essential fatty acids, amino acids, and antioxidants.[14-16] The effect of reducing blood glucose in sweet potato is associated with increased levels of adiponectin which is an adiposity hormone that functions as a process of insulin metabolism<sup>10</sup>. These local foodstuffs can be processed to be snacks in a preferred form, and the form of bars (stems) is selected. The purpose of this research is to find out and analyze the acceptability of target consumers for products related to organoleptic and hedonic tests at rice bran levels of 20% and 30%.

## 2 Methods

The basic ingredients are rice bran, while the additional ingredients consist of yellow yam, cornstarch, soy milk powder, eggs, honey, baking powder, margarine, and oats (Table 1). The VITABRAN formula tested consisted of 2 kinds of bran content (20% and 30%). Equipment used by Kris brand microwave ovens with specifications: 230V-50Hz, 1400W, frequency 2450MHz. Processing of bran flour, VITABRAN products, is done at the UNNES Nutrition Laboratory.

**Table 1.** VITABRAN Formula

<b>Ingredients</b>	<b>Formula 1</b>	<b>Formula 2</b>
Rice Bran	20 %	30%
Yellow sweet potatoes porridge	40 %	30 %
Maizena flour	14 %	14 %
Soy bean milk powder	10 %	10 %
Baking powder	1 %	1 %
Margarine	10 %	10 %
Honey	5 %	5 %
Eggs	1	1
Oats		

Making rice bran flour is done by: 1) fresh and clean rice bran in a sieve with a diameter of 80 Mesh 2) sterilized with a 121 C temperature autoclave for 3 minutes, dried in a 105 C oven for 1 hour.

The VITABRAN treatment process is carried out by mixing all ingredients according to the formula into one dough that can be formed. Furthermore, formed a bar (stem) with a size of 12x3x2 cm, and sprinkled with oats, then baked in the oven. Organoleptic analysis was carried out to determine the value of color, texture, taste, aroma, which was liked while the hedonic test to find out the preferred formula, which was carried out on all VITABRAN formulas. Sensory Analysis was conducted on trained panelists consisting of lecturers in the Department of Nutrition Study Program IKM, aged 25-40 years, as many as 10 people (5 men and 5 women), using a 9 point quality scale, (1 very low quality and 9 very very high quality good), and follow standard procedures. Aspects considered for analysis are color, texture, sweetness,

aroma, and overall quality. The assessment of product preference level was carried out by 80 consumptive panelists, with acceptance test with a preference scale of 1-9. Value of 1 was very disliked and value of 9 was very very fond. Proximate test is carried out related to carbohydrate content in biscuits.

### 3 Results and Discussions

The process of making biscuit bar begins by trying 6 formula combinations of ingredients to get a biscuit texture that is not easily broken (compact), the color is not too brown, but with a crispy taste, without changing the composition of the staples, namely 20% and 30% bran content with sweet potato levels of 40% and 30%.

The results of sensory quality scores carried out on 10 panelists (5 men and 5 women), get results, overall the biscuits bar 2 have a higher value of 53, as well as the total value of each aspect reviewed at 309, while the highest value on the aroma aspect was 55 (Table 2).

**Table 2.** Result of Sensory Quality Review (Organoleptic test)

Product Review	Overall	Color	Aroma	Texture/ crispness	Sweetness	Sweet potato taste	Total Score
	1	2	3	4	5	6	7
Biscuit Bar 1	49	46	48	44	45	45	277
Biscuit Bar 2	53	49	55	52	47	53	309

The result of preference value or hedonic test conducted on 80 consumer panelists as a whole has the highest value on biscuits bar 2 that is equal to 503, and the highest total of all aspects assessed is also found on biscuit bar 2 that is equal to 2962, and the highest value is found on aspects aroma with a value of 515 (Table 3). Proximate test results for carbohydrate content in biscuit bar 1 was 63,214 gr / 100 gr and in biscuit bar 2 was 68,569 gr / 100gr.

**Table 3.** Result of Hedonic Test

Product Review	Overall	Color	Aroma	Texture/ crispness	Sweetness	Sweet potato taste	Total Score
	1	2	3	4	5	6	7
Biscuit Bar 1	488	484	438	429	447	475	2761
Biscuit Bar 2	503	495	515	509	458	482	2962

Snackification food consumption trends, with the objective of replacing staple foods or large meals that are considered more practical, but can meet the needs of food substances both in terms of quality and quantity, require the availability of healthy food, among others, not adding to the case of DM in the community. The biscuit bar test results concluded that biscuit bar 2 with 30% bran content and 30% yellow yam was the formula chosen by the panelists as a whole assessment (color value, aroma, texture / crispness, sweet taste). Although the rice bran content in bis-

cuit bar 2 is higher (30%) than the rice bran content in biscuit bar 1 which is 20%, it is not a problem for panelists, this is possible because the composition arising from the added sweet potato content can create aroma and texture. / crispness become more acceptable to panelists. This is reinforced by the qualitative data as a complement that is obtained namely:

“Biscuit number one is a bit soft or less crispy, I really like number two. Is this made from rice bran? how come it doesn't taste, just like biscuits made from flour, if it doesn't cause a rise in blood sugar quickly, I want to also provide snacksbiscuit”

Based on the results of proximate test biscuit bar 2 has a higher carbohydrate content.

Higher carbohydrates in biscuit bar 2 than in biscuit bar 1, with a difference of 5.355 can still be tolerated because of the effect of rice bran given in more concentrations in biscuit bar 2, is expected to affect the lower Glycemic Index (IG). The Glycemic Index is the time needed for an increase or speed in which an increase in blood sugar levels occurs after consuming food equivalent to 50 g of carbohydrate.[19] As the results of research that states that the speed of increase in blood sugar levels differ in each food ingredient, in this case classified as low GI <55, moderate IG 55-70, and high IG > 70. Carbohydrates that are broken down quickly in the body during digestion have high IG values, whereas carbohydrates that are broken down slowly release glucose into the blood so slowly that it has a low IG.[20] Rice bran is a food that is widely obtained in the community at very cheap prices and has the potential as a functional food for preventing DM. Rice bran contains 34% -62% carbohydrates, 15% -20% fat, 11% -15% protein, 7% -11% fiber, minerals, such as Phosphorus, Potassium, Magnesium, Calcium, and strong anti-oxidants.[12,13] Magnesium in rice bran can cause increased glycemic control and prevent insulin resistance or resistance to work optimally<sup>14</sup>, while strong antioxidants in rice bran can help manage the onset of DM associated with oxidative stress.[12] Supporting research results suggest that the anti-diabetic effects arising after rice bran supplementation are synergistic effects of various compounds such as acylated steryl glycerides, flavonoids, resveratrol, oryzanol, ferulic acid, policosanol, tocotrienol, hydroxycinnamic acid derivatives and some bioactive peptides.[21]

Biscuit substitution in this research was added to other ingredients, especially food which is a local food ingredient, namely yellow yam (*Ipomoea batatas*) to add effects to product results related to taste, color, aroma, texture and especially its effect on blood sugar levels and to make products more acceptable. Proximate analysis of yellow yam per 100 grams are: energy 86 kcal, carbohydrate 20.12 g, protein 1.57 g, fiber 3 g, lipid 0.05 g, various kinds of vitamins and most are vitamins, various minerals such as Calcium 30.78 mg, Iron 0.61 mg, Magnesium 25.70 mg. The effect of reducing blood glucose in sweet potatoes is associated with increased levels of adiponectin which is an adiposity hormone that functions as a metabolic process of insulin.[10] Besides biscuits, soy milk also added with egg. Other ingredients are cornstarch to produce optimal shape, taste and nutritional content, and egg yolks to glue the oats to the biscuits.

The results of other research found that the originator of DM related to eating habits consumed was a fairly dominant factor,[22] so the selection of food ingredients for snackification should consider the benefits and side effects caused.

## 4 Conclusion

The biscuit bar test results concluded that biscuit bar 2 with 30% bran content and 30% yellow yam was the formula chosen by the panelists as a whole assessment (color value, aroma, texture / crispness, sweet taste), with a carbohydrate content of 68.569 gr / 100gr. Food ingredients for snackification must consider the benefits and side effects caused and likeness of the target consumer.

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