

CHILDREN SENSORIES ACCEPTANCE TO RICE CAKE ENRICHED WITH DEFATTED RICE BRAN

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ABSTRACT

Dietary fiber has many advantages for body's health and can be found in fruits and vegetables. Children are still rare in their daily consumption; therefore addition of dietary fiber is needed. Cake is one of meals that children like because of its characteristics, such as a smooth texture, sweet and milky taste. Cake made from wheat flour is prohibited for gluten intolerance and autism. It needs to be substituted with other non-gluten flour, that is rice flour. Rice flour made from rice, which is a staple food for Indonesian peoples. Dietary fiber added to rice cake is from rice bran, by product of rice milling with limited utilization. Rice bran has high fat so it needs to be defatted to minimize rancid flavor in rice cake. However, the addition of defatted rice bran could reduce consumers' acceptance, including children's, therefore the amount of defatted rice bran addition need to be observed. The research was applied by preference test on rice cake with addition of 0%, 10%, 20%, 30%, 40%, and 50% defatted rice bran. Children from four elementary schools in Surabaya were used as the panels. They have to give their overall preference to every rice cake with different treatments. The result gave that addition until 30% defatted rice bran was still accepted with a score 4 (slightly like) and it was not significantly different ($\alpha=5\%$) to rice cake with 0%, 10%, and 20% defatted rice bran additions.

Keywords: *children preference, rice cake, defatted rice bran*

INTRODUCTION

Dietary fiber has many advantages for body's health. Dietary fiber includes a number of nonstarch polysaccharide substances including cellulose, hemicellulose, b-glucan, pectins, mucilages and gums plus the nonpolysaccharide lignin. These fiber components have unique chemical structures and characteristic physical properties (e.g., bulk/volume, viscosity, water-holding capacity, adsorption/binding or fermentability) that determine their subsequent physiologic behavior (Schneeman & Tietzen 1994 and Burton-Freeman, 2000).

In the diets of humans, fiber sources include fruits, vegetables, grain products, legumes, nuts and concentrated plant sources such as oat and wheat bran. Fruits and vegetables are the usual source of fiber but still rarely use in children's daily consumption; therefore addition of dietary fiber is needed, especially among their favorite meals.

Cake is one of meals that children like because of its characteristics, such as a smooth texture, sweet and milky taste. Cake made from wheat flour which is prohibited for gluten intolerance and autism. It caused it need to be substituted with other non-gluten flour, rice flour. Rice flour made from rice which is staple food for Indonesian peoples. Rice flour is often used as a substitute for wheat flour and corn flour for batter system because of its perceived healthier

properties, and it contains fewer calories. Rice flour reduces oil absorption better than wheat flour although it is less effective as a thickening agent (Dogan *et al.*, 2005).

Dietary fiber that added to rice cake is rice bran. Rice bran, a by-product of rice milling process constitutes about 10 wt % of rough rice grain. According to Kahlon and Chow¹ (2000), total dietary fiber in rice bran is 18.35% (db) with 16.01% (db) insoluble dietary fiber and 2.35% (db) soluble dietary fiber. The bran layer contains 18-22% oil, making it the richest oil source from a grain by-product (Saunders, 1990). One highly important bran property is the instability of the oil in the bran.

During removal of the bran layer from brown rice, lipase from the testa and cross cells comes into contact with the oil in the aleurone layer and germ. In the milling process the active oil-splitting enzyme, lipase and the oil are released from their normally separate cellular containment and are intimately mixed. Lipase rapidly hydrolyzes the lipid to glycerol and free fatty acids (FFA). The free acids can then be acted upon more readily than the neutral oils by oxidative agents, with a resulting oxidative rancidity and the production of unpleasant odors and flavors and also unpalatable by-product (De Dios *et al.*, 2007; Sayre & Saunders, 1990 and Spears *et al.*, 2004).

Oxidation rancidity in rice bran potentially occurs. This makes a limited utilization of rice bran, therefore it should be made the oils reduced (defatted). Jiamyangyuen, Srijesdaruk, and Harper (2005) in their research explained that after defatting process, the fat content reduced from 21.13% to 1.92% (approximately 90% reduction). The addition of defatted rice bran could reduce consumers' acceptance, included children's, therefore the amount of defatted rice bran addition need to be observed.

MATERIALS AND METHOD

Rice Cake Preparation

Rice cake was prepared using formulation as shown in Table 1. At first, whipped measured amount of eggs and sugars (Gulaku) until form stable foam using mixer (Bosch) speed 2. Sodium CMC, rice flour (Rose Bran), and baking powder were added and mixed slowly, then continue with added the melting margarine (Blue Band). The batter baked at 180°C for 15-20 minutes.

Table 1. Rice Cake Formulation

Ingredients	Percentage (%) ^{*)}					
	T1	T2	T3	T4	T5	T6
Rice flour	100,00	90,00	80,00	70,00	60,00	50,00
Rice bran	0,00	10,00	20,00	30,00	40,00	50,00
Eggs	318,00	318,00	318,00	318,00	318,00	318,00
Sugar	100,00	100,00	100,00	100,00	100,00	100,00
Margarine	100,00	100,00	100,00	100,00	100,00	100,00
Baking powder	2,73	2,73	2,73	2,73	2,73	2,73
Sodium CMC	4,00	4,00	4,00	4,00	4,00	4,00

^{*)} based on total flour (rice flour and rice bran percentage)

Sensory Evaluation

Children Sensory Evaluation

The rice cake were evaluated by children panels at 4 (four) elementary schools in Surabaya for overall acceptability at 1 day storage. Those schools are SDK Santa Katarina Surabaya, SDK Santa Maria Surabaya, SDN Baratajaya and SDN Kertajaya IX and was carried out at the

classrooms. The total panels were 436 children. The children panels were chose random and every child should evaluate 6 (six) samples of rice cake individually. The evaluation applied by using 5 level score (1=dislike, 2=rather dislike, 3=neutral, 4=rather like, 5=like).

Adults Sensory Evaluation

Testing was carried out in a sensory laboratory equipped with individual booths. About 50 panels were employed by inexperienced judges from Agricultural Technology Faculty Students and other Faculty students. The 6 (six) samples of rice cake were evaluated for color, crumbliness, smoothness, and taste by using hedonic scale. (1= very dislike, 4=neutral, and 7= very like).

Statistical Analysis

Rice cakes containing different levels of rice bran were determined using analysis of variance (ANOVA). Further analysis to determine the difference between the treatments was using difference test *Duncan Multiple Range Test* (DMRT). The level of significance between treatments by using completely randomized design and their means were performed with SPSS (ver.12 for Windows®) software with the statistical significance set at $\alpha < 0.05$.

RESULT

Sensory evaluation was held at 4 schools and in the same condition. Mean acceptance levels of rice cake by children panels shown in Table 2.

Table 2. Sensory Characteristics of Rice Cake by Children Panels

Treatments	Children Panel Preferences*				
	SD Santa Maria	SD Santa Katarina	SDN Baratajaya	SDN Kertajaya IX	Overall
T1	3.9833 ^{cd}	3.8654 ^{ab}	4.0095 ^b	3.9211 ^{bc}	3.9656 ^{cd}
T2	3.6500 ^{bc}	3.9623 ^b	3.9569 ^b	3.5088 ^a	3.7982 ^{bc}
T3	3.8667 ^{cd}	3.8491 ^{ab}	3.9286 ^b	3.6696 ^{ab}	3.8437 ^{bcd}
T4	4.2000 ^d	4.1132 ^b	3.9810 ^b	3.8584 ^{abc}	3.9954 ^d
T5	3.1695 ^a	3.7547 ^{ab}	3.9429 ^b	3.6667 ^{ab}	3.7431 ^b
T6	3.2833 ^b	3.4340 ^a	3.0810 ^a	4.0526 ^c	3.4050 ^a

* Mean in the same column sharing the same letters are statistically no-significant at 5% level of significance Duncan's Multiple Range Test

T1 (0% Rice Bran), T2 (10% Rice Bran), T3 (20% Rice Bran), T4 (30% Rice Bran), T5 (40% Rice Bran), T6 (50% Rice Bran)

The addition of rice bran from 0% to 50% decreased the children sensory preferences to rice cake. Rice cake without rice bran (control) showed the average children acceptance level of 3.9056 (3=neutral and 4=rather like). Using 30% of rice bran gave score of 4.200 (4=rather like and 5=like), the highest level of the children acceptance level. That score was not significantly different to the use of 10% and 20% rice bran. Rice bran 40% and 50% in rice cake caused a significant decrease of children acceptance level of cake. The children acceptance level of rice cake also analyzed based on those schools and also gave a similar result. The use of rice bran of 30% was similar to result the rice cake without rice bran.

Adults' sensory evaluation was used four parameters (color, crumbliness, smoothness, and taste). Table 3 showed the preference score of rice cake without rice bran substitution for color, crumbliness, smoothness, and taste parameters were 3.9833, 3.854, 4.0095 and 3.9211 (3=rather like and 4=neutral).

These scores were not significantly different in four parameters to the rice cake with 10%, 20%, and 30% rice bran substitutions. Further, substitution 40% rice bran was significantly different color to rice cake without rice bran substitution but not for the other parameters. Substitution of 50% rice bran in rice cake gave the most decrease in color and smoothness' scores to the control. The sensory preference of 50% rice bran substitution scores for color, and smoothness were 3.2833 and 3.0810, means the panels rather dislike the products. According to those facts, it could be concluded that the using of rice bran until 30% in rice cake was still acceptable.

Table 3. Sensory Characteristics of Rice Cake by Adults Panels

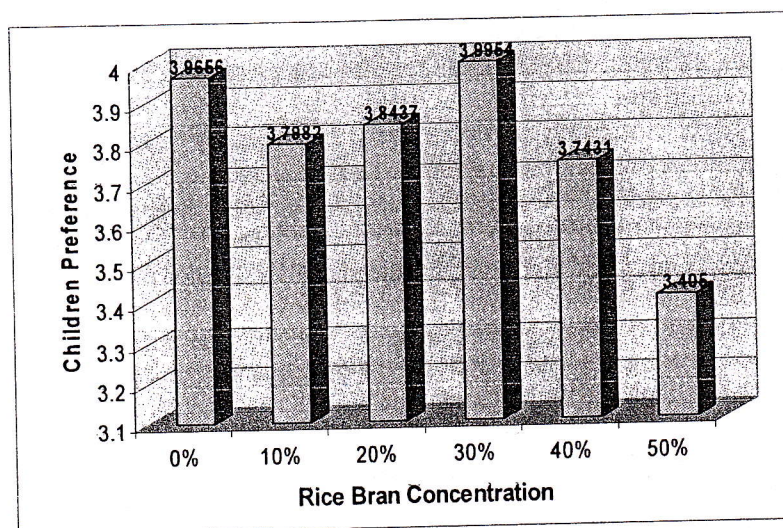
Treatments	Adults Panel Preferences*			
	Color	Crumbliness	Smoothness	Taste
T1	3.9833 ^{cd}	3.8654 ^{ab}	4.0095 ^b	3.9211 ^{bc}
T2	3.6500 ^{bc}	3.9623 ^b	3.9569 ^b	3.5088 ^a
T3	3.8667 ^{cd}	3.8491 ^{ab}	3.9286 ^b	3.6696 ^{ab}
T4	4.2000 ^d	4.1132 ^b	3.9810 ^b	3.8584 ^{abc}
T5	3.1695 ^a	3.7547 ^{ab}	3.9429 ^b	3.6667 ^{ab}
T6	3.2833 ^b	3.4340 ^a	3.0810 ^a	4.0526 ^c

* Mean in the same column sharing the same letters are statistically no-significant at 5% level of significance Duncan's Multiple Range Test

T1 (0% Rice Bran), T2 (10% Rice Bran), T3 (20% Rice Bran), T4 (30% Rice Bran), T5 (40% Rice Bran), T6 (50% Rice Bran)

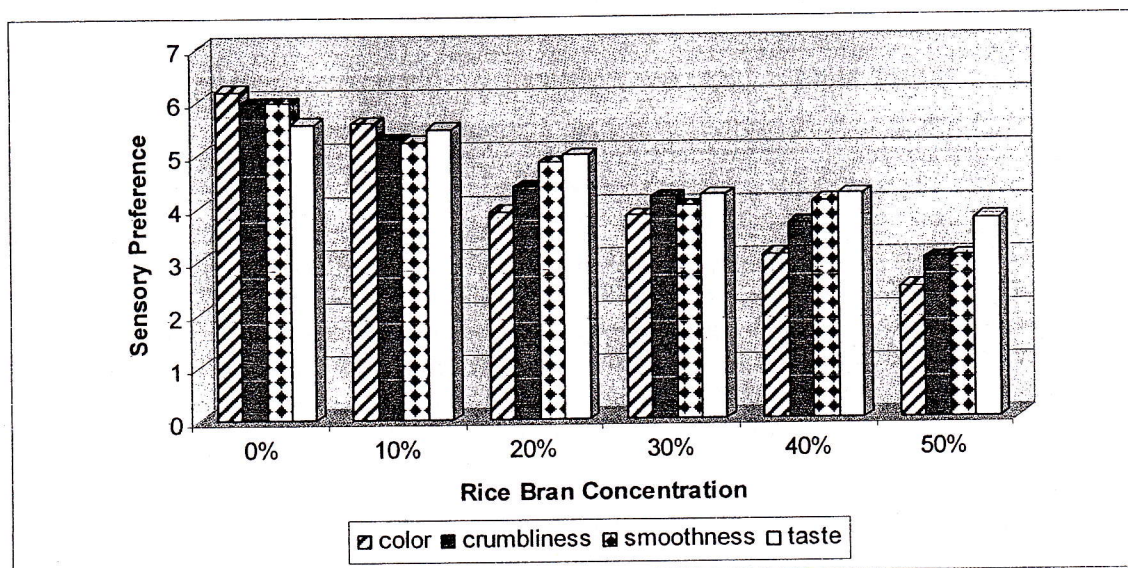
DISCUSSION

The rice bran substitution in rice cake made the rice cake characteristics change which could affect the consumers' preferences. Related to the main purpose of this research that the rice cake especially made for children therefore need sensory evaluation of this product to children as panels. Children sensory preference showed a children overall acceptance to the products. Children's responds to rice cake generally was influenced by the children preferable of taste. This was related to the easier way for children made a definition and response for the changes in products' taste than that of other sensory parameters, such as color, smoothness, and crumbliness.



Picture 1. Sensory Preference of Various Rice Bran Concentrations by Children Panels

Sensory evaluation of children panels (Picture 1) varied with rice bran substitution from 0% until 50%. Rice cake with 30% rice bran gave score of 4.200 (4=rather like and 5=like), and was not significantly different to the use of 0%, 10% and 20% rice bran. This means children would accept rice cake with rice bran until 30% because until 30% rice bran gave an acceptable taste for children although it would reduce the cake's smoothness. This was relevant to the sensory preference of adult panels (Picture 2).



Picture 2. Sensory Preferences of Various Rice Bran Concentrations by Adult Panels

The substitution more than 30% made a reduction of sensory preference. Some children argued about the rice cake that the rice cake texture was coarse and dry of throat so that had difficulty swallowing, and sweetness intensity was reduced. Adult panels identified that rice cake color changed significantly when the rice bran substitution more than 30%. Otherwise, until 40% rice bran substitution still gave insignificantly different preference in crumbliness, smoothness, and taste parameters.

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CONCLUSION

The 30% rice bran concentration in rice cake make the cake still accepted with score 4 (slightly like) and it not significantly different ($\alpha=5\%$) to rice cake with 0%, 10%, and 20% defatted rice bran additions. The addition of defatted rice bran can be used up to 30% substitution concentration.

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