

SNACK BAR REDMUNG GREEN BEAN AND RED BEAN FLOUR AS SNACK WITH ISOFLAVON AND FIBER SOURCES

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ABSTRACT

Redmung Snack Bar is made from red bean flour and mung bean flour. Red bean flour and mung bean flour are food sources of Isoflavone and fiber. The purpose of this research is to get a balanced snack bar that is suitable for the receiving power, levels of isoflavones, and fiber levels required. The design of this research is experimental with a complete random draft (RAL). The research method uses the hedonic test for preference level, literature test for isoflavone levels, and enzymatic gravimetric for levels fiber. The research involved 30 somewhat trained panelist who is a student of nutrition department in Poltekkes Bandung. Data were analyzed using the Kruskal Wallis test and continued with Mann Whitney's test. The results of the hedonic test research show that formula 1 with a 90% balance of red bean flour: 10% mung bean flour has a preference highest in the aspects of color and aroma. Formula 3, with a balance of 50% red bean flour: 50% mung bean flour, has levels the highest preference for taste and texture aspects. Mann Whitney test Results show Formula 1 has a meaningful difference between the three formulas so that Formula 1 is set as the selected formula. In 1 food dose Snack Bar Redmung (35 g) contains Isoflavone of 3.1 mg and can adequately 25%-42% the need for Isoflavone and contains fiber of 5.495 G and able to adequately 88.63% fiber needs.

Keywords: *Snack Bar, Red Bean Flour, Mung Bean Flour, Isoflavone, Fiber*

ABSTRAK

*Snack Bar Redmung terbuat dari tepung kacang merah dan tepung kacang hijau. Tepung kacang merah dan tepung kacang hijau termasuk bahan pangan sumber isoflavon dan serat. Tujuan penelitian ini untuk mendapatkanimbangan snack bar yang sesuai dengan daya terima, kadar isoflavon, dan kadar serat yang dibutuhkan. Desain penelitian ini adalah eksperimental dengan Rancangan Acak Lengkap (RAL). Metode penelitian menggunakan uji hedonik untuk tingkat kesukaan, uji literatur untuk kadar isoflavon, dan enzimatis gravimetrik untuk kadar serat. Penelitian melibatkan 30 panelis agak terlatih yang merupakan mahasiswa Jurusan Gizi Poltekkes Bandung. Data dianalisis menggunakan uji *Kruskal Wallis* dan dilanjutkan dengan uji *Mann Whitney*. Hasil penelitian uji hedonik menunjukkan bahwa formula 1 denganimbangan 90% tepung kacang merah : 10% tepung kacang hijau memiliki tingkat kesukaan paling tinggi pada aspek warna dan aroma sementara pada aspek rasa dan tekstur, formula 3 denganimbangan 50% tepung kacang merah : 50% tepung kacang hijau memiliki tingkat kesukaan paling tinggi. Hasil uji *Mann Whitney* menunjukkan formula 1 memiliki perbedaan yang bermakna diantara ketiga formula sehingga formula 1 ditetapkan sebagai formula terpilih. Dalam 1 takaran saji *Snack Bar Redmung* (35 g) mengandung isoflavon sebesar 3,1 mg dan mampu mencukupi 25%-42% kebutuhan isoflavon, serta mengandung serat sebesar 5,495 g dan mampu mencukupi 88,63% kebutuhan serat.*

Kata kunci: *Snack Bar, Tepung Kacang Merah, Tepung Kacang Hijau, Isoflavon, Serat*

INTRODUCTION

Isoflavones are often found in nuts¹. Isoflavones function as antioxidants and have biological effects similar to estrogen. It can prevent Low-Density Lipoprotein (LDL) the oxidation.²

Epidemiological data show that people in Asia who consume soybeans are higher than in western countries, which has a lower prevalence of CHD³. Types of beans that contain isoflavones in addition to soybeans include red beans and green beans. When comparing the isoflavone content, soybeans have better isoflavones than red beans. Red beans contain isoflavones of 3,741 mg / g (374.1 mg / 100 g), which can significantly increase lipid profiles and do not produce unpleasant odors like soybeans⁴. In addition to red beans, 100 grams of fresh green beans contains 70.74 mg of isoflavones⁵. In addition to isoflavones, kidney beans, and green beans also contain fiber (soluble and insoluble), which is beneficial for health. Various studies have shown a relationship between fiber consumption and the incidence of various diseases, including colon cancer, cardiovascular disease, and obesity^{6,25}.

According to the Central Statistics Agency (2011), red bean production in Indonesia is quite high, reaching 116,397 tons in 2010. Because of the limited application and the short shelf life of legumes owned in raw form, it is necessary to make flour for easy application as a food ingredient. However, further technology is needed to increase the acceptability of consumers in consuming pulses flour.

The purpose of this study is to get a snack bar balance that is under the received power, isoflavone levels, and the required fiber content.

METHOD

This research is experimental research with a completely randomized

design (CRD). The level of preference is obtained from the hedonic test results. Isoflavone levels were obtained from the results of the literature tests. Fiber content is obtained from enzymatic gravimetry. The independent variables in this study were the balance of red bean flour and green bean flour. There are three balances, namely: a) Formula 1 with a balance of 90% red bean flour and 10% mung bean flour; b) formula 2 with a balance of 70% red bean flour and 30% green bean flour; c) formula 3 with a balance of 50% red bean flour and 50% mung bean flour which influences the dependent variable, namely the level of panelist preference on organoleptic properties (color, aroma, taste, texture) as well as isoflavone content and fiber content.

The study was conducted from September 2018 to February 2019. Research to determine the level of preference was tested on 30 rather trained panelists who were students of the Nutrition Department of the Health Ministry of Health, Bandung, and carried out at the Food Technology Laboratory of the Nutrition Department of the Health Ministry of Health, Bandung. Fiber content testing was conducted at the PT Saraswanti Indo Genetech Laboratory, Bogor. Data were analyzed using the Kruskal Wallis test and continued with the Mann Whitney test.

RESULT

Hedonic Test Results

Redmung snack bar products with three different formulas were given to 30 rather trained panelists and tested their preference level using a hedonic test.

Panelist Assessment of Redmung Snack Bar Color

Redmung snack bar hedonic test results on the colors are presented as follows

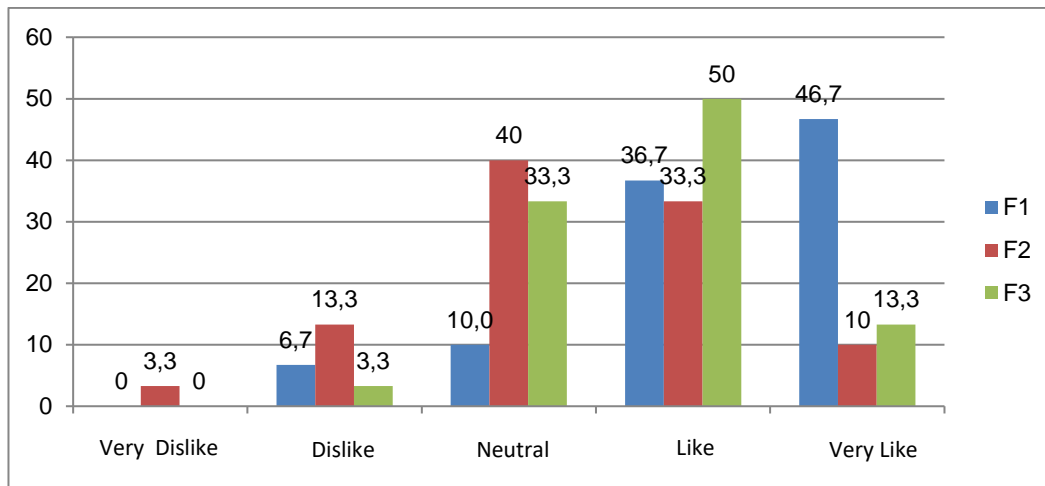


Figure 1. Distribution of Assessment of the Color of Snack Bar Redmung

Based on Figure 1, it can be seen that the formula most preferred based on the color aspect is F1. In the *Kruskal Wallis test* results obtained $p (0.001) \leq \alpha (0.05)$, which means the three Redmung Snack Bar formulas have significant differences based on color parameters so that it is continued with the *Mann Whitney test*.

From the *Mann Whitney test* results obtained information that there are statistically significant differences between F1 and F2 and F1 and F3 with $p \leq \alpha (0.05)$. While between F2 and F3,

there is no difference with the value of $p > \alpha (0.05)$. It can be concluded that the colors in F1 (90% red bean flour: 10% mung bean flour) have statistically significant differences. When viewed from the percentage of likes and very likes, F1 is superior in the color aspect.

Panelist Rating of Redmung's Snack Bar Aroma

Redmung snack bar hedonic test results on the aroma are presented as follows.

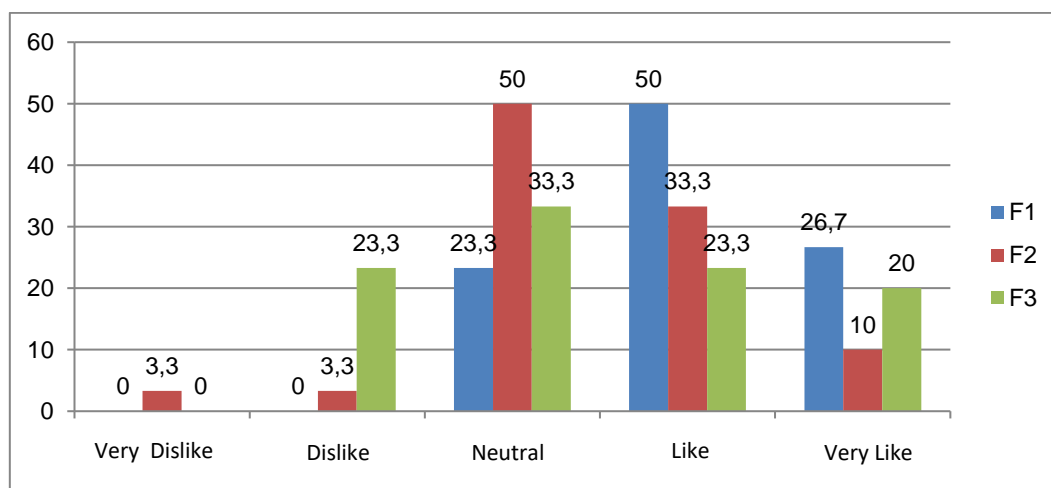


Figure 2. Distribution of Assessment of the Redmung Snack Bar Aroma

Based on Figure 2, it can be seen that the formula which is most preferred based on the aroma aspect is F1. In the *Kruskal Wallis test*, the results obtained $p (0.001) \leq \alpha (0.05)$, which

means that the three Redmung Snack Bar formulas have significant differences based on the aroma parameters so that it is continued with the *Mann Whitney test*. From the *Mann*

Whitney test results obtained information that there are statistically significant differences between F1 and F2 and F1 and F3 with p dengan α (0.05). While between F2 and F3, there is no difference with the value of $p > \alpha$ (0.05). It can be concluded that the aroma in F1 (90% red bean flour: 10% mung bean flour) has a statistically significant

difference. When viewed from the percentage of likes and very likes, F1 is superior in terms of aroma.

Panelist Assessment of Redmung Snack Bar Taste

Redmung snack bar hedonic test results on taste are presented as follows.

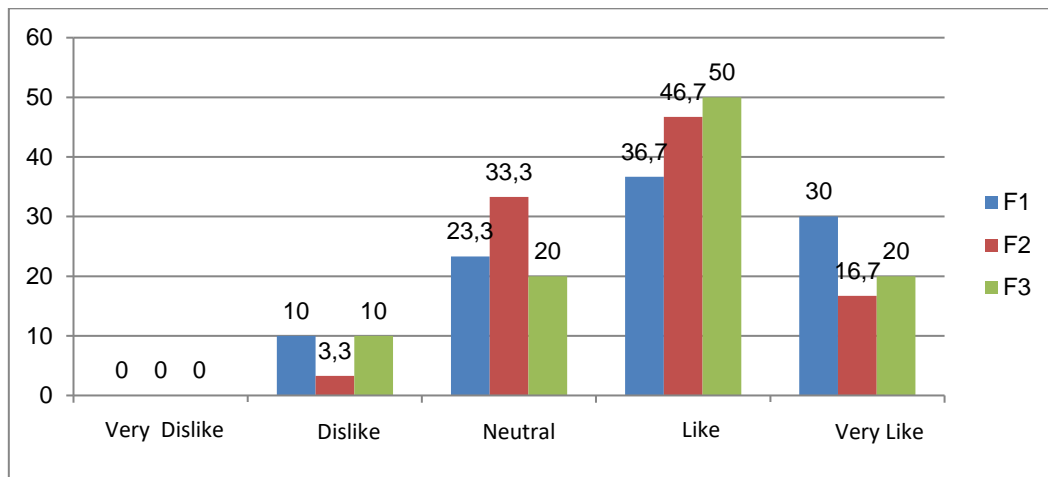


Figure 3. Distribution of Assessment of Redmung Snack Bar Taste

Based on Figure 3, it can be seen that the formula which is most preferred based on taste aspects is F3. In *the Kruskal Wallis test* results obtained p (0.884) $>$ α (0.05), which means there is no difference in organoleptic properties based on taste parameters between the three Redmung Snack Bar formulas so that the Mann Whitney test does not follow it. From the results of the panelist's assessment of

the taste of Redmung Snack Bar, most of the panelists stated they liked and liked F3 a lot, so F3 was declared superior in the taste aspect.

Panelist Assessment of Redmung Snack Bar Texture

Redmung snack bar hedonic test results on the texture are presented as follows.

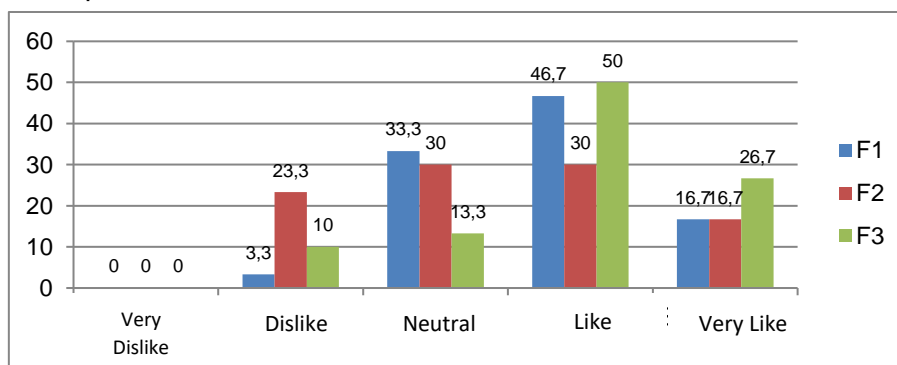


Figure 4. Distribution of Assessment of Redmung Snack Bar Texture

Based on Figure 4, it can be seen that the most preferred formula based on the texture aspect is F3. In *the*

Kruskal Wallis test results obtained p (0.082) $>$ α (0.05), which means there is no difference in organoleptic properties

based on texture parameters between the three snack bar formulas so that the Mann Whitney test does not follow it. From the results of the panelist's assessment of the texture of the Redmung Snack Bar, most of the panelists said they liked and liked F3 a lot, so F3 was declared superior in the texture aspect.

Determination of Selected Formulas

The determination of the chosen formula is based on the hedonic test results on all three formulas. From the results of the panelists' assessment, F1 had the highest preference percentage in the aspects of color and aroma. While in the aspect of texture and taste, F3 has the most favorite level percentage. Besides, the determination of the

chosen formula also considers the results of different tests. Based on the results of *the Mann Whitney test*, the color and aroma aspects of F1 have a significant difference between F2 and F3, but F2 is not different from F3. It shows that F1 has the most different characteristics of the three formulas. Based on this, F1 was declared superior and became the chosen formula.

Nutrition Value Analysis Results

The nutritional value of selected snack bar formulas is compared with the adequacy of energy and nutrients for a day. The contribution of energy and nutrient interlude per day is 20% of the average adequacy of 2100 kcal/day (WNPNG 2018).

Table 1. Contribution of Redmung Snack Bar Fire Fighting to Nutrition Adequacy

Nutritional Substances	Nutritional value per serving	Adequacy of snacks/day	% Adequacy
Energy	149,22 kcal	420 kcal	35,53%
Protein	5,27 gr	15,75 gr	33,46%
Fat	3,86 gr	11,7 gr	33,09%
Carbohydrate	23,37 gr	63 gr	65,7%

Based on the calculation of the contribution of energy and nutrients of Redmung Snack Bar to AKG, each serving of Redmung Snack Bar (1 bar = 35 grams) does not meet the energy and nutrient adequacy for intermittent food in a day. Still, this adequacy can be fulfilled by consuming as much Redmung Snack Bar 3 serving sizes (3 bars) / day.

Results of Isoflavone Level Literature Studies

Isoflavone content testing was performed on products with selected formulas, namely F1 (90% red bean flour and 10% mung bean flour) obtained by a literature study. In the literature, the content of isoflavones in fresh red beans is 152.76 mg / 100 g, while in red bean flour is 15.25 mg / 100 g⁷. The process of flouring and baking a snack bar causes the isoflavone content to

decrease by 90%⁷. The content of isoflavones in fresh green beans is 70.74 mg / 100 g; if processed into flour, then the content of the isoflavones becomes 7.074 mg / 100 g flour.

From the results of the analysis, the selected formula Redmung Snack Bar has isoflavone levels of 3.1 mg per serving size. Furthermore, the isoflavone levels are compared with the adequacy of nutrients. Adequacy is obtained from the recommended consumption of isoflavones 30-80 mg per day as much as 25 g of soy protein, equivalent to 37-62 mg of isoflavones⁸. The contribution of Redmung Snack Bar isoflavone levels to the adequacy of nutrients can be seen in table 2.

Table 2. Contribution of Redmung Snack Bar Isoflavone Levels to Adequacy of Nutrient

Nutritional Substances	Nutritional value per serving	Adequacy of snacks/day	% Adequacy
Isoflavon	3,1 mg	7,4-12,4 mg	25-42%

Adequacy of isoflavones 37-62 mg/day while contributing to the adequacy of isoflavones from snack foods is 20% per day. Isoflavones contained in Redmung Snack Bar of 3.1 mg per serving can only meet 25-42% of the adequacy in a day. Therefore, it is recommended to consume Redmung

Snack Bar of 2-3 serving sizes (2-3 bars) so that adequacy can be met.

The content of isoflavones is also compared with the basic ingredients used in making Redmung Snack Bar, namely red beans and green beans. The comparison can be seen in table 3.

Tabel 3. Perbandingan Kandungan Isoflavon Snack Bar Dengan Bahan Dasar

Zat Gizi	Snack Bar Redmung/100 gr produk	Kacang merah/100 gr	Kacang hijau/100 gr
Isoflavon	8,86 mg	152,76 mg	70,74 mg

Hasil perhitungan kandungan isoflavon pada *Snack Bar Redmung* lebih kecil dibandingkan dengan bahan dasar pembuatannya.

Fiber Content Test Results

Fiber content testing was conducted on Redmung Snack Bar with the selected formula, F1 (90% red bean flour: 10% mung bean flour), which was

conducted at the PT Saraswanti Indo Genetech Laboratory, Bogor. The test was conducted using the enzymatic gravimetric method. The fiber content is compared with the adequacy of nutrients. Adequacy of fiber for the general group of 31 grams/day (ALG 2018). The contribution of Redmung Snack Bar fiber levels to the adequacy of nutrients can be seen in table 4.

Table 4. Contribution of Redmung Bar Snack Fiber Levels to Adequacy of Nutrition

Zat Gizi	Snack Bar Redmung/100 gr product	Kacang merah/100 gr	Kacang hijau/100 gr
Fiber	5,495 g	6,2 g	88,63%

Adequacy of fiber is 31 grams/day (ALG 2018). contributing to the adequacy of fiber from distilled foods is 20% per day so that the adequacy of fiber is 6.2 grams. By consuming 1 bar,

Snack Bar Redmung, which contains as much as 5.495 grams of fiber per serving, can meet the adequacy of fiber up to 88.63% in a day.

DISCUSSION

Color of Snack

Based on the results, the colors in F1 are more preferred. The color produced by F1 is dark brown. Panelists stated that the snack bars F2 and F3 had a paler color. It may be the reason F1 color is more preferred. The use of red bean flour tends to make the snack bar darker. The brown color produced by the snack bar is caused by the heating process so that a caramelization reaction occurs from

Sugar and honey⁹. Also, the color of the Redmung Snack Bar is caused by the Maillard reaction that occurs due to heating in high temperatures a mixture of sugars along with proteins or amino acids derived from kidney beans and green beans. The Maillard reaction produces a pigment called melanoidin, which can cause a brown color¹⁰.

The initial treatment of making peanut flour affects the color of the snack bar product. A journal written by Pangastuti et al. (2013) stated that preliminary treatments such as soaking and boiling and stripping could affect the characteristics of red bean flour both in terms of chemical, physical, and functional characteristics. The decrease in brightness level in the immersion process occurs due to dissolution color pigments into the immersion medium. Preliminary treatment in the form of boiling for 90 minutes can reduce the brightness of the flour due to the intensity of heat received during the heating process. Stripping the skin can significantly increase the brightness of red bean flour in various preliminary treatments¹¹. The color of the snack bar with the balanced formula of red bean flour, which has a darker color because in its manufacture uses red bean flour

without stripping the skin. In flour without stripping the skin, 24-hour immersion treatment can reduce red and green colors due to red bean pigment that dissolves into the immersion media. However, boiling treatment for 90 minutes increases red and green colors because anthocyanin will be extracted and produce a darker color when boiling²⁴.

Aroma

Based on the results, the aroma of F1 is more preferred than the aroma of other formulas. Panelists stated that the aroma of peanuts in the Redmung Snack Bar was still present. The aroma produced by the snack bar formula is the aroma of margarine and the aroma of nuts. According to Habsari (2010), the roasting process affects the aroma, where the purpose of the roasting is to get an interesting taste and a distinctive aroma. In the roasting process, the resulting aroma is determined by a mixture of fat, amino acids, and sugar in food. The combination of margarine as fat and honey gives a distinctive aroma produced by the snack bar after the roasting process¹².

Taste

Based on the results, the three formulas which are more preferred in the aspect of taste is F3. The flavor produced in the three Redmung Snack Bar formulas is not much different, that is sweet, and the distinctive taste of beans is still tasted.

In F1, red bean flour content is more than mung bean flour, so that the intensity of the flavor of kidney beans is getting stronger. The strong taste of red beans is caused by the compound of saponin in red beans¹³. In a study conducted by Yuliana (2006) states that the distinctive taste of red beans affects the level of preference of panelists on the substitution of red bean flour biscuits. Based on the hedonic taste test, the more the ratio of red bean flour is used, the stronger the taste of red

beans produced¹⁴. It may be the reason the F3 taste is preferred.

The taste produced in snack bar products is also influenced by the addition of raw materials used, namely sugar, honey, and margarine. Sugar acts as a flavor enhancer forms texture and controls the distribution of the dough. Honey acts as a flavor enhancer and also as a binder¹⁵. Margarine is used as a source of fat in snack bars, which functions as an emulsifier and flavor enhancer and gives texture to the product¹⁶. The addition of margarine has fat and protein content, which causes a savory taste to the food bar produced. The increase in the taste of a food product is determined by the fat and protein content¹⁷.

Texture

Based on the results, the F3 texture is preferred over F1 and 2. Panelists stated that the texture of the Snack Bar Redmung produced is still hard and not like the snack bar texture in general. But when compared with the other two formulas, F3 has a softer texture and isn't too hard. The level of hardness of a food product can be influenced by the starch content found in the basic ingredients used¹⁸. Starch is composed of two main fractions, namely amylose and amylopectin. The higher the amylose and the lower the amylopectin, the higher the texture hardness of the product will increase¹⁸. Amylose and amylopectin content of red bean flour is 29% and 71%¹³, while in green bean flour are 28.8% and 71.2%¹⁹. The higher amylose content and lower amylopectin in red bean flour, compared to green bean flour, cause snack bars with the proportion of red bean flour that will increase the hardness of the snack bar.

Besides, the use of eggs in making snack bars influences the resulting texture. The use of eggs in the snack bar formula to obtain a soft texture and resembles bread. The ability of foam from eggs can be considered as a major

factor causing the decrease in the level of hardness of snack bars²⁰.

Nutrition Value

The nutritional content of Redmung Snack Bar is compared to the adequacy of nutrition for a day's interlude, with a percentage of 20% of the average nutritional adequacy (2100 kcal/day). Based on the calculation results, one serving (1 bar = 35 grams) Redmung Snack Bar does not meet the energy and nutrient adequacy for intermittent food in a day. Still, this adequacy can be fulfilled by consuming 3 Redmung Snack Bar as much as three servings (3 bars) / day.

Isoflavones

Red bean flour is the largest contributor to isoflavones in Redmung Snack Bar because red bean flour contains isoflavones of 15.25 mg / 100 gram²¹ while green bean flour is only 7.074 mg / 100 gram. In Redmung Snack Bar products, the isoflavone content decreases when compared to the basic ingredients of manufacture. Altered isoflavone levels can be affected by the processing, which can cause the isoflavone content in the product to be reduced. According to Utari et al. (2010), isoflavones are susceptible to high heat. Isoflavones are getting down with the cooking process due to damage or removal isoflavones from the basic ingredients²².

Fiber

Based on the results of the analysis, Redmung Snack Bar products contain 15.7% / 100-gram fiber or the equivalent of 15.7 grams in 100-gram products. The FDA (2009) states that food can be claimed to contain high fiber if it can meet the 20% Nutrition Adequacy Rate (AKG) per serving²³. European Union Regulation (E.C.) No 1924/2006 (OJ 409 p9 12/30/2006 on nutrition and health claims on food) stipulates that food can be claimed to contain high fiber if it contains at least 6

grams of total fiber per 100 grams of product or 3 grams of total fiber per 10 kcal. Based on this, Redmung Snack Bar, with raw materials of red bean flour and mung bean flour can be used as a high-fiber snack.

CONCLUSION

Redmung Snack Bar products made from the counterpart 90% red bean flour and 10% mung bean flour (F1) are the formulas that have the highest level of panelist preference on the aspect of color and aroma. In contrast, the taste and texture aspects of F3 have the highest level of preference. Redmung Snack Bar products can be used as a distraction source of isoflavones and fiber because they contain isoflavones of 3.1 mg per serving size (35 grams) and fiber of 5.495 grams per serving size (15.7 g / 100 grams). This study calculated the isoflavone content based on the literature. For further research, it is recommended that laboratory analysis of the isoflavone content be carried out.

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