

## Effect and Psychological Analysis of Obese Teenagers Psychology by Addition of Sorghum and Edamame to the Fiber Content of Organoleptic Food Bar Tofu Dregs Flour as a Snack

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### Abstract

**Background:** Obesity is included in the three burdens of malnutrition that Indonesia is currently facing. Diet plays a major role in increasing the risk of obesity, especially in adolescents. The incidence of obesity can be associated with fiber intake obtained from food, such as snacks. Food bar is one type of snack bar that can be added with various ingredients such as sorghum and edamame. These ingredients are added to increase fiber levels in food bars and as an alternative snack for teenagers, especially obese teenagers.

**Objective:** This study aims to analyze the fiber and organoleptic levels of tofu pulp flour food bars with the addition of sorghum and edamame.

**Method:** Quantitative research with experimental research design, true experimental research type and posttest only control design. Analysis of fiber content using gravimetric methods and organoleptic tests on 25 respondents in Kaliwates District, Jember Regency. Statistical data analysis of organoleptic testing uses the Friedman Test, while fiber content uses the Tukey test.

**Results:** Analysis of fiber content of tofu pulp flour food bar without or with the addition of sorghum and edamame by 2.29%, 2.52%, 2.57%, and 3.59%. The results of statistical data analysis of fiber content of the tukey test showed a significant difference, while the friedman test with a p value of  $\leq 0.05$  showed significant results on the color, taste, and texture of the food bar. The best formula is obtained in the treatment of adding 40% sorghum and 60% edamame ( $X_3$ ) with a recommendation of consuming 2 bars per snack.

**Conclusion:** There is an effect of the addition of sorghum and edamame on the fiber and organoleptic content of food bars. Treatment  $X_3$  is a food bar that can be recommended as a distraction from an organoleptic point of view and has the highest crude fiber content of 3.59%.

**Keywords :** crude fiber, organoleptic, sorghum, edamame, food bar.

### 1. Introduction

Obesity is an abnormal condition of fat accumulation in the body so that it can interfere with health [1]. Obesity is one of the three burdens of malnutrition that Indonesia is currently facing. Triple burden of malnutrition itself is a condition of overnutrition problems or obesity simultaneously with malnutrition and micronutrient deficiencies. In 2018, the prevalence of obesity aged  $\geq 15$  years in Indonesia was 31% [2]. The prevalence of obesity at the age of  $\geq 15$  in East Java reached 30.38% in 2013-2018 [3]. In Jember Regency, the prevalence of central obesity in 2018 reached 28.14%. The prevalence of obesity in children aged 13-18 years in Jember Regency is 12.30% [4]. The top three with the highest incidence of obesity in adolescents aged 10-19 years in Jember Regency have increased from 2020 to 2021, namely in Kaliwates District with 1510 people, then Panti District with 629 people, and Patrang with 202 people.

Diet is one of the causative factors that play a major role in increasing the risk of obesity, especially in adolescents [5]. The incidence of obesity can be associated with fiber intake obtained from daily food consumption [6]. Fiber intake can help prevent obesity by curbing hunger, reducing macronutrient absorption, and altering hormone secretion in the intestine. Daily food consumption not only consists of three main meals, but there are also food interludes between these times that act as an effort to fulfill nutritional intake as well.

There are various types of snacks that can be consumed, one of which is a food bar. Food bar is a snack or snack bar that contains sufficient water content, easy to swallow, does not cause a dry taste in the throat, and lasts long [7]. This snack is one of the commercial products that can be found in the market but generally still uses imported basic ingredients such as, wheat and soybeans [8]. The abundant and potential production of agricultural products in Indonesia such as edamame and sorghum can be one of the optimizations of local raw materials and food diversification efforts.

This food bar product is based on tofu pulp flour with the addition of sorghum and edamame as snack foods for obese adolescents who are rich in dietary fiber. Tofu pulp is the remaining production from tofu processing which contains high nutrients, but generally only used as animal feed. The nutritional content in 100 g of tofu pulp, including 17.4 g protein, and 12.2% water soluble fiber [9]. Sorghum ranks fifth as an important commodity globally, after barley. The nutritional content of sorghum includes, protein by 12%, starch 72%, lipids 4%, crude fiber 6.5%-7.9%, and water-soluble fiber 1.1%-1.23% [10]. Edamame is a type of green soybean vegetable horticultural plant with a larger size than grain soybean (soybean) [11]. The nutritional content in 100 g of edamame, including protein by 21%, dietary fiber 19%, fat 7%, and energy 5%.

In this study, a tofu pulp flour food bar was made in the hope that it could improve the quality of tofu pulp flour in terms of nutritional value and price. In addition, tofu pulp flour food bar can be used as a snack for obese teenagers who are rich in fiber due to the addition of sorghum and edamame in the manufacturing process. This study aims to analyze the fiber content and organoleptic food bar of tofu pulp flour with the addition of sorghum and edamame.

## 2. Method

### Tools and Materials

Tools used in making food bars include digital scales, basins, spatulas, measuring spoons, plastic containers, mixers, blenders, sieves, electric ovens, cake pans, spoons, and knives. In testing fiber content with gravimetric methods using tools that include, analytical balances, coolants, buchner funnels, vacuum pumps, and Whatman 54 filter paper. The ingredients in making food bars include, tofu pulp flour, wheat flour, eggs, margarine, java sugar, vanilla, sorghum, and edamame. Materials in fiber content analysis include Sulfuric Acid (H<sub>2</sub>SO<sub>4</sub>) 1.25%, Sodium hydroxide (NaOH) 3.25%, and Ethanol 95%.

### Stages of Research

#### 1) Making Tofu Dregs Flour

The processing of tofu pulp into tofu pulp flour is carried out on a home scale by steaming for 15 minutes, then continued with roasting to reduce the langu smell on tofu pulp for ±20 minutes with continuous stirring. After that, the tofu pulp is placed on a baking sheet, then put in an oven with a temperature of 150°C for 60 minutes to dry and reduce the moisture content in the tofu pulp. Tofu pulp that has been in the oven is put in the blender to become tofu pulp flour. The last stage in this process is to sift the tofu pulp flour to obtain a smooth flour texture.

#### 2) Sorghum Processing

Sorghum that has been soothed will be soaked first for 24 hours to reduce tannin levels. These tannins if the concentration is excessive can become antinutritional substances thereby reducing the nutritional value of a product. Sorghum that has been soaked is washed under running water to separate it from the sorghum skin. Then, the sorghum goes through a steaming process for 30 minutes to reduce the smell of langu. After that, the sorghum is cooled at room temperature and can be used for subsequent processing.

### 3) Edamame Processing

Raw Ryokkoh frozen edamame before mixing into a food bar will be thawed first at room temperature, then peeled for contents and chopped into small shapes.

### 4) Food Bar Making

The making of food bars begins with the liquefaction of Javanese sugar. The liquefied java sugar is then cooled at room temperature. After that, put the margarine, melted palm sugar, and salt in a container. All ingredients are mixed using a high-speed mixer for 5 minutes. Then, add the terlur and mixer again for 5 minutes until the dough is mixed. After mixing, add the wheat flour and tofu pulp flour, then mix with a mixer at medium speed until the dough is mixed. Enter sorghum and edamame according to a predetermined formula. Mix the dough using a spatula. When the dough has been mixed, put the dough in a baking dish and then oven at 120°C for 55 minutes. Cool the food bar before cutting.

## 3. Research Design

This study used RAL (Complete Randomized Design) with one factor (X) which is a formulation of adding sorghum and edamame. X factors include, X<sub>0</sub> (0% sorghum and 0% edamame), X<sub>1</sub> (60% sorghum and 40% edamame), X<sub>2</sub> (50% sorghum and 50% edamame), and X<sub>3</sub> (40% sorghum and 60% edamame). There were three treatments (X<sub>1</sub>, X<sub>2</sub>, and X<sub>3</sub>) and one control (X<sub>0</sub>) with three replications (replications) in each treatment. The total sample in this study was 12 experimental units consisting of three control samples and nine treatment samples. The table below is the proportion of adding sorghum and edamame to the tofu pulp flour food bar.

**Table 1** Proportion of Sorghum and Edamame Addition

Sample	Tofu pulp flour food bar							Addition of Sorghum and Edamame		Sum
	T. Flour	T. Tofu dregs	Margarine	Liquid Java Sugar	Egg	Salt	Vanilli	Sorghum	Edamame	
X <sub>0</sub>	60 g	40 g	30 g	65 ml	55 g	3 g	1 g	0 g	0 g	254 g
X <sub>1</sub>	60 g	40 g	30 g	65 ml	55 g	3 g	1 g	60 g	40 g	354 g
X <sub>2</sub>	60 g	40 g	30 g	65 ml	55 g	3 g	1 g	50 g	50 g	354 g
X <sub>3</sub>	60 g	40 g	30 g	65 ml	55 g	3 g	1 g	40 g	60 g	354 g

**Source:** Prepared by author, 2023.

## Data Analysis

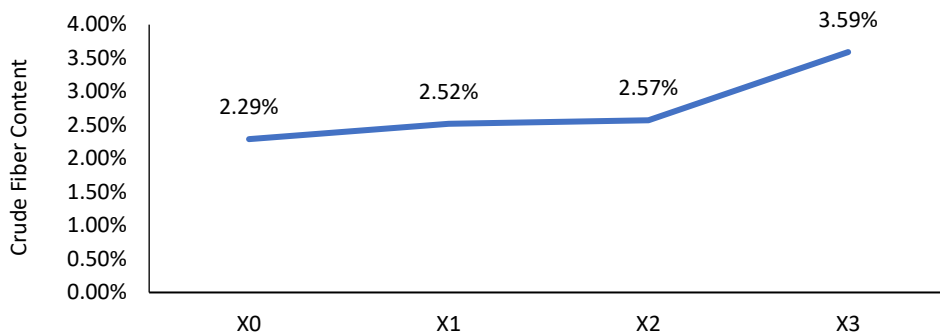
The data analysis process uses SPSS (Statistical Product and Service Solutions) which is a computer statistics application program. The results of organoleptic food bar testing which includes aroma, color, taste, and texture will be analyzed by the Friedman test with a significance value of  $\leq 0.05$ . The test will continue with the Wilcoxon Signed Rank Test, if it shows significant results to find differences between each sample group. The data from the analysis of crude fiber content will begin with the normality test and homogeneity of the data, if the normally distributed data is continued with the Anova test ( $\alpha = 0.05$ ). The test continues with the Tukey test if it shows a real difference.

## 4. Results and Discussion

### Food Bar Fiber Content

The fiber analyzed in this study is crude fiber. Crude fiber is part of carbohydrates in food called insoluble carbohydrates that cannot be digested by the digestive system and are not degraded in acid-base treatment [12]. Crude fiber is different from dietary fiber which when compared only one-fifth of the part is [13]. This is because the components of crude fiber are leftovers from the hydrolysis of a food by acids and bases, thus reducing the percentage of cellulose by 50% and hemicellulose by 85%, while in food fiber there are still missing components. The average results of fiber content analysis in tofu pulp flour food bars without or with the addition of sorghum and edamame can be seen in the figure below.

**Figure 1.** Average Crude Fiber Content of Food Bars



**Information:**

- X<sub>0</sub> = No addition of sorghum and edamame
- X<sub>1</sub> = There is an addition of 60% sorghum and 40% edamame
- X<sub>2</sub> = There is an addition of 50% sorghum and 50% edamame
- X<sub>3</sub> = There is an addition of 40% sorghum and 60% edamame

The results of fiber content testing using the gravimetric method on tofu pulp flour food bars with four treatment groups in units of percent (%), namely X<sub>0</sub>, X<sub>1</sub>, X<sub>2</sub>, and X<sub>3</sub> are 2.29%, 2.52%, 2.57%, and 3.59%. The crude fiber content in food bars if in grams, namely X<sub>0</sub> of 0.046 g, X<sub>1</sub> of 0.050 g, X<sub>2</sub> of 0.051 g, and X<sub>3</sub> of 0.072 g. The graph has increased as the percentage of sorghum additions decreases and the percentage of edamame additions increases. This is because the crude fiber content in 100 grams of sorghum is 2 grams [14] and 100 grams of edamame 5.2 grams [15].

This study is similar to research related to the increase in fiber content in muffins because the fiber content in sorghum is lower than red bean flour [16]. Another study stated that the crude fiber content in cookies increased with the increase in sorghum flour with the highest percentage of 11.82% [17]. The percentage of crude fiber content also increased with the addition of edamame to the manufacture of wet noodles with a high crude fiber content of 4.28% [18]. In the snack bar study, there was an increase in food fiber content, often increasing the percentage of adding edamame flour [11].

Statistical data analysis using anova test with the results of a significant influence on fiber content in food bars, then continued with homogeneity test. The data is homogeneously distributed, then analyzed with the Tukey test to find out the real difference in each sample. The results of the Tukey test can be seen in the Tukey test table below:

**Table 2.** Tukey Food Bar Fiber Content Test

Treatment	X <sub>0</sub>	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>
X <sub>0</sub>		0,122	0,058	0,000*
X <sub>1</sub>			0,948	0,000*
X <sub>2</sub>				0,000*
X <sub>3</sub>				

**Source:** Prepared by author, 2023.

**Information:**

(\*)= There is a significant difference in p value ≤ 0.05

- X<sub>0</sub> = No addition of sorghum and edamame
- X<sub>1</sub> = There is an addition of 60% sorghum and 40% edamame
- X<sub>2</sub> = There is an addition of 50% sorghum and 50% edamame

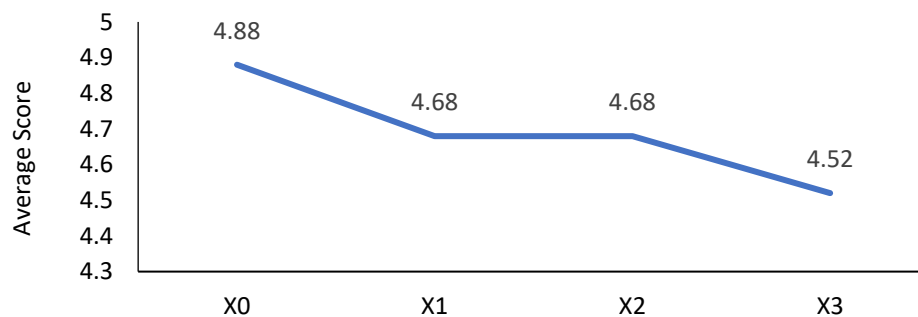
X<sub>3</sub> = There is an addition of 40% sorghum and 60% edamame

The results of the Tukey test showed that there were three groups that were significantly different or different with a p value of less than 0.05. The treatment groups in question include X<sub>0</sub> X<sub>3</sub>, X<sub>1</sub> X<sub>3</sub>, and X<sub>2</sub> X<sub>3</sub>. The treatment groups X<sub>0</sub> X<sub>1</sub>, X<sub>0</sub> X<sub>2</sub>, and X<sub>1</sub> X<sub>2</sub> were not shown to differ markedly because the p value was greater than 0.05.

### Organoleptic Food Bar Tofu Dregs Flour Without or with the Addition of Sorghum and Edamame Aroma

Organoleptic testing begins with an organoleptic test of the aroma of tofu pulp flour food bars. Aroma is one of the assessment indicators in organoleptics whose observation uses the help of the sense of smell [19]. There are five categories of assessment, among others, not langu with a score of 5, quite langu with a score of 4, langu with a score of 3, very langu with a score of 2, and very very langu with a score of 1 whose results will be shown in the picture below.

**Figure 2.** Results of Organoleptic Average Score of Food Bar Aroma



Information:

- X<sub>0</sub> = No addition of sorghum and edamame
- X<sub>1</sub> = There is an addition of 60% sorghum and 40% edamame
- X<sub>2</sub> = There is an addition of 50% sorghum and 50% edamame
- X<sub>3</sub> = There is an addition of 40% sorghum and 60% edamame

In Figure 2. is the result of the calculation of the average organoleptic test on the aroma of the food bar. The highest average score of the four treatment groups, namely in the treatment of food bars without the addition of sorghum and edamame (X<sub>0</sub>) was 4.88. In the treatment with the addition of sorghum and edamame, the highest average score was found in 2 treatment groups, namely tofu pulp flour food bar with a percentage of addition of 60%: 40% (X<sub>1</sub>) and a ratio of 50%: 50% (X<sub>2</sub>) of 4.68 which was included in the "no langu" category because it was close to a score of 5. The lowest average value was obtained in the tofu pulp flour food bar with the addition of 40% sorghum and 60% edamame (X<sub>3</sub>) of 4.52.

The aroma of langu (off flavor) is caused by the use of tofu pulp flour and edamame in the food bar. Langu according to KBBI (Big Dictionary Indonesian) is an unpleasant smell or taste. The lipoxygenase enzyme contained in both ingredients produces a langu aroma that can reduce the assessment of food bar [20]. Langu or rancid odor is caused by the catalyzing process of unsaturated fatty acids by the oxidized lipoxygenase enzyme [21].

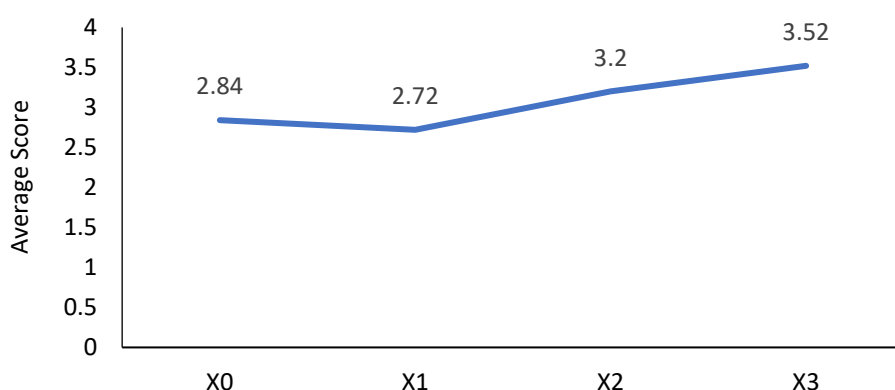
In this study, the aroma of langu was reduced by processing tofu pulp flour through the process of steaming, roasting, and roasting with temperatures above 100°C. There are other additives such as margarine, gula java, salt, and vanilla to reduce the aroma of langu from the food bar. Similar research states that the addition of margarine, salt, honey, and pineapple juice can mask the aroma of langu, resulting in a fragrant aroma [22]. Other studies state that the use of margarine, sugar, and salt can increase the aroma of products made [23].

Data analysis using a friedman test on the aroma of tofu pulp flour food bars with the addition of sorghum and edamame showed a significance value of 0.127. The result is greater than the predetermined significance, which is 0.05. Therefore,  $H_0$  is accepted and it can be stated that there is no significant difference from tofu pulp flour food bars with the addition of sorghum and edamame to organoleptic aromas.

### Color

The second assessment is in organoleptic tests, namely colors that can act as attractiveness, quality attributes, and characteristics of a food product [24]. Therefore, influential colors are important to attract the attention of consumers and give the impression that the product is liked or not. There are five assessment categories which include dark brown with a score of 5, brown with a score of 4, light brown with a score of 3, brownish yellow with a score of 2, and yellow with a score of 1. The average results of organoleptic tests in the form of color can be seen in the following figure:

**Figure 3.** Food Bar Color Organoleptic Average Score Results



Information:

- X<sub>0</sub> = No addition of sorghum and edamame
- X<sub>1</sub> = There is an addition of 60% sorghum and 40% edamame
- X<sub>2</sub> = There is an addition of 50% sorghum and 50% edamame
- X<sub>3</sub> = There is an addition of 40% sorghum and 60% edamame

Figure 3. is the result of calculating the average score of organoleptic tests on color. The calculation results showed the highest average score of the four food bar treatments (X<sub>0</sub>, X<sub>1</sub>, X<sub>2</sub>, and X<sub>3</sub>), obtained in the treatment with the addition of 40% sorghum and 60% edamame (X<sub>3</sub>), which is 3.52 which is included in the "chocolate" category because it is close to a score of 4. The lowest average score was obtained in the food bar treatment with the addition of 60% sorghum and 40% edamame, which is 2.72 which is included in the "young coklat" category because it is close to a score of 3. The results showed that the lower the percentage of addition of sorghum and the higher the percentage of addition of edamame, the closer to the "dark brown" color.

The brown color is caused by a maillard reaction that occurs between reducing sugars and amine groups of proteins (amino acids) [19]. The brown color produced in this study was caused by the use of Javanese sugar as a sweetener. This is in accordance with research on the brown color of snack bars due to the use of Javanese sugar and yellow pumpkin flour [25]. Another study, mentioning the brown color is due to the presence of tannin compounds in the addition of sorghum flour [16].

Organoleptic results on the color of food bars with the addition of sorghum and edamame using the friedman test showed a p value of 0.000, so it can be stated that there is at least one of the four food bar samples that differ significantly or there is an effect of adding sorghum and edamame to the food bar Tofu pulp flour against organoleptic in the form of color. Therefore, data analysis continued by conducting a

Wilcoxon signed rank test to determine organoleptic differences in the form of color in each treatment of tofu pulp flour food bars which will be displayed in the following table:

**Table 3.** Wilcoxon Signed Rank Test Analysis Results of Food Bar Color

Treatment	X <sub>0</sub>	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>
X <sub>0</sub>		0,585	0,058	0,006*
X <sub>1</sub>			0,005*	0,002*
X <sub>2</sub>				0,046*
X <sub>3</sub>				

**Source:** Prepared by author, 2023.

Information:

(\*)= There is a significant difference in p value  $\leq 0.05$

X<sub>0</sub> = No addition of sorghum and edamame

X<sub>1</sub> = There is an addition of 60% sorghum and 40% edamame

X<sub>2</sub> = There is an addition of 50% sorghum and 50% edamame

X<sub>3</sub> = There is an addition of 40% sorghum and 60% edamame

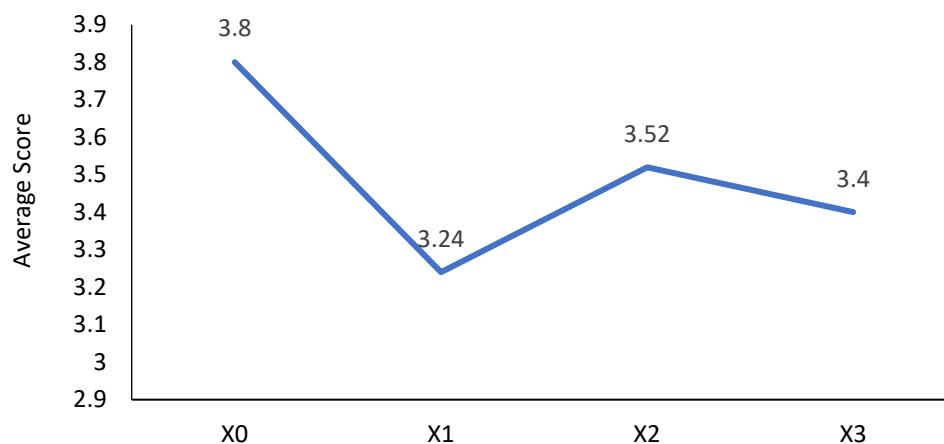
The table above shows that there are several significant differences with p values  $\leq 0.05$ , namely in the practice of X<sub>1</sub> X<sub>2</sub>, X<sub>0</sub> X<sub>3</sub>, X<sub>1</sub> X<sub>3</sub>, and X<sub>2</sub> X<sub>3</sub>. There were no significant differences other than the treatment groups (X<sub>0</sub> X<sub>1</sub> and X<sub>0</sub>X<sub>2</sub>).

### Taste

Taste is the second factor after the appearance of food to determine taste that requires the help of the sense of taste [26]. An eye-catching appearance will increase the feeling of wanting to try the food then the sense of taste will determine the taste. The primary taste receptors on the tongue include sour, salty, sweet, and bitter [27].

There are 5 assessment categories which include very good with a score of 5, good with a score of 4, rather good with a score of 3, not good with a score of 2, and very bad with a score of 1. The average results of organoleptic tests in the form of taste can be seen in the following figure:

**Figure 4.** Food Bar Flavor Organoleptic Average Score Results



Information:

X<sub>0</sub> = No addition of sorghum and edamame

X<sub>1</sub> = There is an addition of 60% sorghum and 40% edamame

X<sub>2</sub> = There is an addition of 50% sorghum and 50% edamame

X<sub>3</sub> = There is an addition of 40% sorghum and 60% edamame

In Figure 4. The results of calculating the average score of the food bar organoleptic test on taste have been presented. The results showed that the food bar treatment without the addition of sorghum and edamame (X<sub>0</sub>) received the highest average score, which was 3.8 which was included in the "delicious" category because it was close to a score of 4. In the treatment with the addition of sorghum and edamame, the highest average score was obtained in the treatment of adding 50% sorghum: 50% edamame (X<sub>2</sub>) with a value of 3.52 which is included in the "delicious" category because it is close to a score of 4. The lowest average score of 3.24, which is included in the "somewhat delicious" category because it is close to a score of 3, was obtained in the tofu pulp flour food bar treatment with the addition of 60% sorghum and 40% edamame (X<sub>3</sub>).

The use of sorghum and edamame can affect the taste of the food bar. Sorghum has a strong taste due to the tannin content in it. Tannins can produce a strong taste and dull color in the resulting product [28]. The increasing addition of sorghum flour decreases the taste preference level of snack bar [10]. Another study in making cookies states that the more the addition of sorghum flour and canna tuber flour, the level of liking decreases due to the emergence of bitter and bitter taste due to phenol compounds and tannins [29]. In the study of making pastries with sorghum flour substitution, the lowest results from the favorability level were obtained at the percentage of sorghum flour substitution of 100%30.

In a similar study by [11], the proportion of edamame flour and mung bean flour increased the level of liking for snack bar flavors at the lowest percentage of edamame, which was 70%. Edamame has a sweeter taste than yellow soybeans [31]. The sweetness is caused by the content of sucrose, but the content of the lipoxygenase enzyme can cause a bitter taste in edamame [32]. Another study stated that modisco pudding with the highest percentage of edamame addition (50%) elicited a slightly bitter taste and became langu, causing acceptability to decrease by [32].

Analysis of organoleptic testing data on taste using the friedman test showed a p value of 0.043. The result is lower than 0.05 so that it can be stated that there is an effect of adding sorghum and edamame to the tofu pulp flour food bar on organoleptic in the form of taste and analysis can be continued with the Wilcoxon signed rank test. The results of the Wilcoxon signed rank test can be seen in the table below:

**Table 4.** Wilcoxon Signed Rank Test Analysis Results on Food Bar Taste

Treatment	X <sub>0</sub>	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>
X <sub>0</sub>		0,022*	0,165	0,048*
X <sub>1</sub>			0,167	0,538
X <sub>2</sub>				0,527
X <sub>3</sub>				

**Source:** Prepared by author, 2023.

Information:

(\*)= There is a significant difference in p value ≤ 0.05

X<sub>0</sub> = No addition of sorghum and edamame

X<sub>1</sub> = There is an addition of 60% sorghum and 40% edamame

X<sub>2</sub> = There is an addition of 50% sorghum and 50% edamame

X<sub>3</sub> = There is an addition of 40% sorghum and 60% edamame

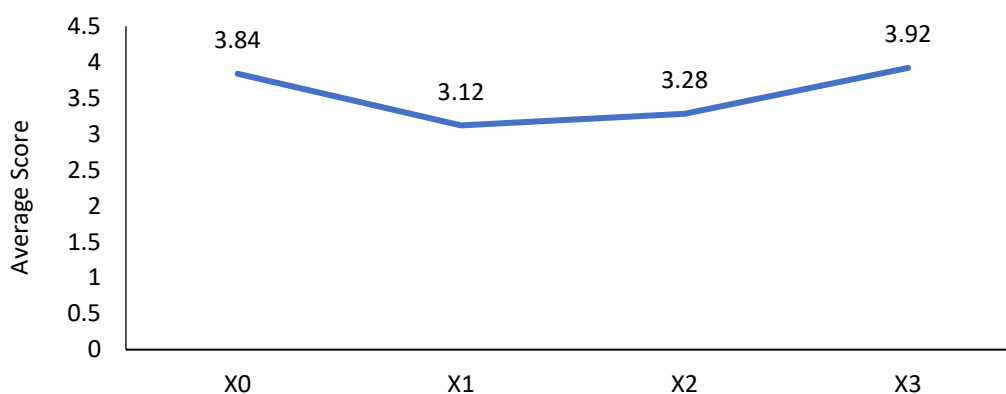
The real difference can be seen as the table above is found in the treatment groups X<sub>0</sub> X<sub>1</sub> and X<sub>0</sub>X<sub>3</sub>. There was no significant difference other than the two treatment groups (X<sub>0</sub> X<sub>2</sub>, X<sub>1</sub> X<sub>2</sub>, X<sub>1</sub> X<sub>3</sub>, and X<sub>2</sub> X<sub>3</sub>) because the results did not show a p value of ≤ 0.05.



## Texture

Texture is the result of the sense of touch or the sensation of pressure on a stimulus when there is physical contact between several parts of the body (oral cavity) with food [24]. Human perception of the texture of a food can be determined through three parameters, namely through sight (visual), touch or touch, and hearing (audio) [33]. Vision parameters can be connected with previous experience with the same food. The parameters of touch or touch are associated with the perception of the texture on the tongue and the touch of the hand. Hearing parameters can be related to food sounds (such as crunchy, crisp, and cracked textures). There are five assessment categories which include, very not hard with a score of 5, not hard with a score of 4, a bit hard with a score of 3, hard with a score of 2, and very hard with a score of 1. The average results of organoleptic testing in the form of texture can be seen in the following figure.

**Figure 5.** Results of Organoleptic Average Score of Food Bar Texture



Information:

(\*)= There is a significant difference in p value  $\leq 0.05$

X<sub>0</sub> = No addition of sorghum and edamame

X<sub>1</sub> = There is an addition of 60% sorghum and 40% edamame

X<sub>2</sub> = There is an addition of 50% sorghum and 50% edamame

X<sub>3</sub> = There is an addition of 40% sorghum and 60% edamame

Figure 5. is the result of calculating the average score from organoleptic tests on food bar texture. Tofu pulp flour food bar with the addition of 40% sorghum and 60% edamame (X<sub>3</sub>) received the highest average score than the other treatment group, which was 3.92 which was included in the "not hard" category because it was close to a score of 4. The lowest average score was obtained in the food bar treatment group with the addition of 60% sorghum and 40% edamame (X<sub>1</sub>), which is 3.12 which is included in the "rather hard" category because it is close to a score of 3. The food bar treatment group of tofu pulp flour without the addition of sorghum and edamame (X<sub>0</sub>) received an average score of 3.84 which was included in the "not hard" category because it was close to a score of 4.

The sorghum used in this study is still slightly hard textured because the processing is by steaming method not by boiling. This is intended to get a crunchy sorghum texture. Processing edamame as an addition to the food bar is done by chopping coarsely using a blender to get the original texture of edamame. High levels of crude fiber can affect the texture of the resulting product. The higher the crude fiber content, the texture of the snack bar cannot be a solid bar shape [23].

Texture can also be affected by the selection of materials and the way they are processed [34]. In the study, potato donuts added edamame can reduce the level of hardness along with the addition of edamame [35]. Along with the increase in the addition of edamame flour also increases the preference for snack bars served [11].

Analysis of organoleptic data of tofu pulp flour food bar with the addition of sorghum and edamame in the form of texture using the friedman test showed a p value of 0.001 or less than the significance value of 0.05. This stated the effect of adding sorghum and edamame to the texture of the food bar, so it was continued with the Wilcoxon signed rank test to find out the real difference between each sample. The table below is the result of Wilcoxon signed rank analysis organoleptic test in the form of texture.

**Table 5.** Wilcoxon Signed Rank Test Analysis Results on Food Bar Texture

Treatment	X <sub>0</sub>	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>
X <sub>0</sub>		0,009*	0,055	0,729
X <sub>1</sub>			0,346	0,000*
X <sub>2</sub>				0,003*
X <sub>3</sub>				

**Source:** Prepared by author, 2023.

Information:

(\*)= There is a significant difference in p value  $\leq 0.05$

X<sub>0</sub> = No addition of sorghum and edamame

X<sub>1</sub> = There is an addition of 60% sorghum and 40% edamame

X<sub>2</sub> = There is an addition of 50% sorghum and 50% edamame

X<sub>3</sub> = There is an addition of 40% sorghum and 60% edamame

There are 3 treatment groups that differ markedly, namely X<sub>0</sub> X<sub>1</sub>, X<sub>1</sub> X<sub>3</sub>, and X<sub>2</sub>X<sub>3</sub> with p value less than equal to 0.05. The other treatment groups did not differ markedly because the results of the analysis showed a p value of more than 0.05 which included X<sub>0</sub> X<sub>2</sub>, X<sub>1</sub> X<sub>2</sub>, and X<sub>0</sub> X<sub>3</sub>.

### Fiber Adequacy and Food Bar

The adequacy of each person's fiber intake is different according to age category and gender. When the food interlude needs fiber in men aged 10-12 amounted to 2.8 grams, ages 13-15 years amounted to 3.4 grams, ages 16-19 years amounted to 3.7 grams, while women aged 10-12 years amounted to 2.7 grams, ages 13-18 years amounted to 2.9 grams, and aged 19 years amounted to 3.2 grams [36]. Fiber adequacy and food bar consumption recommendations can be seen in the table below:

**Table 6.** Fiber Adequacy and Food Bar Consumption Recommendations

Gender	Fiber Adequacy (%)	Recommendation (bar/dining)
Man		
10-12 years	62,5	2
13-15 years	51,5	2
16-19 years	47,3	2
Woman		
10-12 years	64,8	2
13-18 years	60,3	2
19 years old	54,7	2

**Source:** Prepared by author, 2023.

In the table above can be seen, 1 bar of tofu pulp flour food bar with the addition of 40% sorghum and 60% edamame (X<sub>3</sub>) weighing 10 grams can meet the RDA of 47%-62% fiber in men and 54%-64% in adolescent women aged 10-19 years when consumed as a distraction. Recommendations for food bar consumption for snacks in order to meet fiber needs in accordance with RDA in men and women aged 10-19 years with the addition of sorghum and edamame as much as 2 bars [30].

Tofu pulp flour food bar can be used as an alternative food distraction, especially in adolescents with obesity. Food bar consumption in this study can be consumed by obese adolescents who are on a weight loss

diet or in adolescents with BMI  $\geq 25$  to  $\leq 40$ . This is because the management of obese adolescents with BMI  $\geq 40$  can be through surgical therapy, namely bariatric surgery that considers several previous principles [37]. The principle considerations in question include, unable to lose weight after undergoing  $\geq 6$  months of a planned program and have met anthropometric, medical to psychological requirements, superobese conditions or BMI  $\geq 40$ , have reached bone maturity (in women generally aged  $\geq 13$  years, while men aged  $\geq 15$  years), and experience complications of obesity that are required to lose weight (Indonesian Pediatrician Association, 2014). The study by [38], explained respondents who were given an intervention in the form of 2 food bars from fruits and nuts with high fiber content, along with the diet that was being undertaken did not cause weight gain. It also explains snacks with high fiber content can help maintain weight [39].

## 5. Conclusion

The crude fiber content increased along with the decrease in the percentage of sorghum addition and the increase in the percentage of edamame increase, which was the highest in tofu pulp flour food bars with the addition of 40% sorghum and 60% edamame ( $X_3$ ). Tofu pulp flour food bar with the addition of 40% sorghum and 60% edamame ( $X_3$ ) is the best formula in terms of organoleptic assessment. Tofu pulp flour food bar with the addition of 40% sorghum and 60% edamame ( $X_3$ ) can meet the fiber needs of 10-19 years old by 47%-62% in men and by 54%-64% in women. Recommended consumption of food bars for snacks as much as 2 bars. Further research is needed related to water content, shelf life, and other micronutrient analysis in food bars.

## Conflict of Interest

All authors have no conflict of interest in this article

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