

# UTILIZATION OF PURPLE SWEET POTATO FLOUR AND GREEN BEAN FLOUR IN THE MAKING SPORTS SNACK BAR

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## ABSTRACT

The right nutrients is essential for optimizing recovery post-exercise (Moore, 2015). The purpose of this study was to utilize local raw material of purple sweet potato and green beans in the manufacture of snack bar for the sports enthusiast. This research is an experimental study with four formulations snack bar with a comparison between the purple sweet potato flour and mung bean flour are 10:20, 13:17, 15:15, 17:13. The collected data were statistically tested using Anova, followed by Bonferroni test. The results of this study indicate that the formulation F3 as formulation selected (15 g of flour sweet purple: 15 g mung bean flour) have a level of acceptance that is preferred and desired characteristics, antioxidant activity with IC50 value of 8,136 ppm and nutrients to the water content of 8.7 g, levels ash 1.2 g, 8:52 g protein content, fat content 9,354 g, carbohydrate 32 142 g, and 246.8 kcal energy. In the hedonic test and quality test hedonic parameters of color, aroma, flavor, and texture, nutritional value test, antioxidant activity, and TPC are no significant differences between the four formulations (p-value of <0.05). Subsequent research, it is advisable to analyze more specifically the antioxidant content of the snack bar.

**Keywords:** snack bar, athlete, sports, recovery

## PRELIMINARY

Sport is an activity done regularly motion and also planned are carried out repeatedly. One type of sport views of the goals to be achieved, namely health sport has benefits to improve health tubuh<sup>15</sup>. The sport has changed dramatically over time, it is not a pure competition or a way to maintain one's physical health alone. Sports have become part of our lives, because it deals a lot of ties with society, politics, economics, and business. There is no doubt that the sport has always been a part of budaya<sup>5</sup>. Public participation in sports activities is increasing as indicated by the increased community participation in sports development index (SDI) <sup>19</sup>.

The right nutrients is vital to optimize recovery after olahraga<sup>16</sup>. Glycogen depletion will cause fatigue and hence performance can be impaired by the inability of an athlete to replenish glycogen stores. Therefore, the main objective of nutrients is to optimize the recovery of muscle glycogen and hati<sup>3</sup> status.

Numerous studies have reported that the consumption of carbohydrates + protein post-exercise reduces muscle breakdown marker

changes after exercise after exercise, such as creatine kinase (CK), myoglobin, and lactate dehydrogenase. Other studies have reported that the intake of carbohydrates + protein associated with reduced muscle pain and increased post-exercise muscle function than when carbohydrates are dikonsumsi<sup>7</sup>. Ivy et al, found that taking 200 ml of solution with a ratio of 4: 1 CHO-PRO (7.75% CHO / 1.94% PRO) every 20 minutes during the recovery period increase endurance performance cycling by 36% on cyclists trained compared to CHO alone (7.75 % CHO) <sup>21</sup>.

Purple sweet potato is one of the local food that is found in Indonesia in addition to white, yellow, and merah<sup>9</sup>. In the content of nutrients, purple sweet potato is generally dominated by carbohydrates that can reach 25.1% with a water content of 72.6% <sup>14</sup>, while in the form of flour carbs reached 86.37% with a water content of 7.0% <sup>9</sup>. When compared with other sweet potato, purple sweet potatoes contain carbohydrates and high in antioxidants. The carbohydrate content in purple sweet potato serves as the main energy source for the sportsman. Carbohydrate is a nutrient that is most easily digested and plays an

important role in helping to prevent fatigue after olahraga<sup>1</sup>.

Purple sweet potato types of *Ipomoea batatas* var. Ayamurasaki have a sufficiently dense purple color on the meat yam, so a lot of attention. According Pakorny et al, (2001) as well as Timberlake and Bridle (1982) color purple sweet potato caused by a purple pigment anthocyanin that has spread from the skin to the flesh yam, sweet potato anthocyanins in purple have activity as antioksidan<sup>9</sup>.

Antioxidants in purple sweet potato comes from anthocyanins, vitamin C, vitamin E, and beta carotene. The content of anthocyanins in purple sweet potato that is 110-210 mg / 100g. The content of 1208 mg of beta-carotene and vitamin C by 10.5 mg<sup>18</sup>. The content of anthocyanins in purple sweet potato berfungsi as an antioxidant and free radical catchers, which serves to prevent the happening of aging, cancer, degenerative diseases, anti-inflammatory, and prevent stres<sup>11</sup>. It supports the use of purple sweet potato flour as an alternative source of carbohydrates that can be substituted on wheat flour products and value-added derivatives for the health, as well as antioksidannya<sup>9</sup> activity.

Green beans are one of the local food that is easily found. Green bean production in Indonesia reached 271 463 tonnes during 2015 (CBS, 2015). Green beans are a source of vegetable protein, vitamins (A, B1, C, and E), minerals (calcium, iron), as well as fiber. In terms of protein content, green beans food sources of protein including a second after kering<sup>22</sup> skim milk. The protein content in green beans by 22.9% <sup>14</sup>. Meanwhile, in the form of flour, the protein content of 23:25% <sup>6</sup>. However, when compared with other beans, green bean protein content ranks third after soybean and peanut. In terms of agronomy, green beans including drought-resistant plant species and can grow in less fertile soil and resistant to pests and penyakit<sup>22</sup>.

Diversification based food processed green beans (*Phaseolus aureus*) is still very kurang<sup>24</sup>. The green beans are traditionally only used into various preparations such as porridge, bakpia contents, and drink the juice of green beans. Besides the green beans are also utilized as a green bean flour as the starch digestible

carbohydrates. However, there are still many opportunities to take advantage of green beans into a more healthful processed products so as to give a lot of choices to konsumen<sup>24</sup>.

*Snack bara* rod-shaped snacks and generally consumed as food selingan<sup>13</sup>. The snack bar is a convenient ready meals and healthy nutritionally balanced (protein, fat, minerals, vitamins, calories, and carbohydrates) and to delay lapar<sup>10</sup>. Snack bar can be given as a food supplement to help recovery after exercise. Snack bar made of carbohydrate source should provide a practical and concise with the amount of protein and micronutrients varied for use during exercise or in a busy lifestyle. A snack bar weighs between 45 g and 80 g and the possibility of supplying energy of 200-300 kcal, 7-15 g of protein, 3-9 g of fat, and 20-40 g karbohidrat<sup>2</sup>

Food ingredients used in making the snack bar can be derived from local food in Indonesia. Previous research has made the snack bar of black soya beans and white, mocaf flour, rice flour, dodol, bananas, and others - others. Based on the above background, the authors are interested in making the snack bar of the local food, which is purple sweet potato and green beans. Purple sweet potato and green beans advance made in the form of flour. Snack bar is aimed at sports enthusiasts who can help meet energy needs and nutrients the sports enthusiast, especially carbohydrates and protein after a workout in the process of recovery.

The purpose of this study was to utilize local raw material of purple sweet potato and green beans in the manufacture of snack bar for the sports enthusiast.

The problems of this study include how acceptance snack bar for the sports enthusiast with the utilization of local raw material of purple sweet potato and green beans, how the content of macro and micronutrients snack bar for the sports enthusiast with the utilization of local raw material of purple sweet potato and green beans, and how physical analysis in terms of color, aroma, flavor, and texture of the snack bar for the sports enthusiast with the utilization of local raw material of purple sweet potato and green beans.

## RESEARCH METHODS

The research was conducted at the University of Esa Unggul to manufacture and organoleptic tests at the snack bar as well as performed in the laboratory MBRIO Bogor to test the nutritional value held in January and February 2019. This study is an experimental type.

The population of this study is the student / i Faculty of Health Sciences, University of Esa Unggul. Sample or respondents in this study using somewhat trained panelists from the student / i Nutrition Department Esa Unggul University. Number of panelists in this study as many as 30 people.

The type of data used are primary data derived from a form organoleptic and nutritional value in a laboratory test. This study starts from the preliminary research in the form of formulations determination snack bar and advanced research in the form of organoleptic consisting of hedonic test and test and test hedonic quality nutritional value.

The data obtained and analyzed by a computer program. The analysis was performed by ANOVA test followed by a Bonferroni test (p-value of <0.05).

### ***hypothesis***

Ho: There is no difference hedonic profile and hedonic quality profiles among formulations snack bar

Ha: There are differences in hedonic profile and hedonic quality profiles among formulations snack bar

Ho: There is no difference in the nutritional value (energy, protein, fat, carbohydrates, moisture content and ash content) between formulations snack bar

Ha: There is a difference in the nutritional value (energy, protein, fat, carbohydrates, moisture content and ash content) between formulations snack bar

Ho: There is no difference between the formulation of the antioxidant value of the snack bar

Ha: There is a difference between the formulation of the antioxidant value snack bar Analyzing differences between formulations snack bar

Ho: There is no difference between the TPC results formulations snack bar

Ha: There is a difference between the TPC results formulations snack bar

## RESULTS

After a series of preliminary studies it was determined 4 formulations snack bar that is:

F1: purple potato flour 10 g and 20 g mung bean flour

F2: purple potato flour 13 g and 17 g mung bean flour

F3: purple potato flour 15 g and 15 g mung bean flour

F4: purple potato flour 17 g and 13 g mung bean flour

In addition to the main ingredients of the above, there is additional material that is full cream milk powder, skimmed milk powder, candied pineapple, chicken egg yolk, honey, and olive oil.

In the hedonic test panelists expressed a personal response will like or dislike the color, aroma, flavor, and texture of the snack bar. Panelists organoleptic fill out a form that uses the scale VAS (Visual Analogue Scale) after tasting formulation given snack bar. The hedonic test described between extremely dislike and desperately in love.

**Color.**The most preferred formulation is Formula 1 ( $6.74 \pm 1.05$ ), followed by Formula 2 ( $5.85 \pm 2.04$ ), then Formula 3 ( $5.69 \pm 2.21$ ) and the last Formula 4 ( $5.18 \pm 2.53$ ). Based on the Anova test showed the value of F count equal to 3,019 with significant value 0.033 (p-value <0.050) or Ho is rejected, so it can be concluded that there are significant differences in the preferences panel to color between the four formulations snack bar. Then proceed with the Bonferroni test to determine the difference between the average value of the formulation. After Bonferroni test, it is known that Formula 1 has the distinction of Formula 4, with a significance value of 0.023 (p-value <005).

**Aroma.**The most preferred formulation is Formula 1 ( $6.95 \pm 1.64$ ), followed by Formula ( $6.28 \pm 2.14$ ),



then Formula 2 ( $6.25 \pm 2.01$ ), and the last Formula 4 ( $5.37 \pm 2.33$ ). Based on the Anova test showed the value of F count equal to 2,997 with significant value 0.034 (p-value  $<0.050$ ) or  $H_0$  is rejected, so it can be concluded that there are significant differences in preferences between the panelists on the aroma to the four formulations snack bar. Then proceed with the Bonferroni test to determine the difference between the average value of the formulation. After Bonferroni test, it is known that Formula 1 has the distinction of Formula 4, with a significance value of 0.021 (p-value  $<0.05$ ).

**Rasa.**The most preferred formulation is Formula 3 ( $6.89 \pm 1.51$ ), followed by Formula ( $6.28 \pm 2.14$ ), then Formula 2 ( $5.64 \pm 2.17$ ), and the last Formula 4 ( $5.40 \pm 2.56$ ). Anova test showed Berdasarkan calculated F value of 3,028 with significant value 0.032 (p-value  $<0.050$ ) or  $H_0$  is rejected, so it can be concluded that there are significant differences in preferences between the panelists to taste the four formulations snack bar. Then proceed with the Bonferroni test to determine the difference between the average value of the formulation. After Bonferroni test, it is known that the Formula 3 has the distinction of Formula 4, with a 0048 value of significance (p-value  $<0.05$ ).

**Texture.**The most preferred formulation is Formula 1 ( $6.24 \pm 1.85$ ), followed by Formula 3 ( $6.09 \pm 2.16$ ), then Formula 4 ( $5.64 \pm 2.17$ ), and the last Formula 2 ( $5.40 \pm 2.56$ ). Based on the Anova test showed the value of F count equal to 3,573 with significant value 0.016 (p-value  $<0.050$ ) or  $H_0$  is rejected, so it can be concluded that there are significant differences in the texture a panelist preferences between all four formulations snack bar. Then proceed with the Bonferroni test to determine the difference between the average value of the formulation. After Bonferroni test, it is known that Formula 1 has the distinction of Formula 2, with a significance value of 0.022 (p-value  $<0.05$ ).

#### **Quality Test hedonic**

**Color.**Formulations with the largest average value that is Formula 1 ( $7.5 \pm 1.95$ ), followed by Formula 2 ( $7.01 \pm 2.12$ ), Formula 3 ( $5.92 \pm 2.77$ ), and the last Formula 4 ( $5.65 \pm 2.78$ ). Based on ANOVA test values obtained F count equal to 3,902 with significance of 0.011 (p-value of  $<0.05$ ). This

means that  $H_0$  is rejected, or are there differences in the average value of a personal impression panelists specifically against color snack bar. Then proceed with the Bonferroni test to determine which formulations which have significant differences. After Bonferroni test, it is known that there are significant differences between Formula 1 and Formula 4 with a significance value of 0.024 (p-value of  $<0.05$ ).

**Aroma.**Formulations with the largest average value that is Formula 3 ( $6.25 \pm 1.98$ ), followed by Formula 1 ( $4.97 \pm 2.28$ ), Formula 4 ( $4.69 \pm 2.97$ ), and the last Formula 2 ( $4.53 \pm 2.46$ ). Anova once that is done to see if there is a difference between the average value of the formulation, obtained calculated F value of 3.031 with 0.032 significance (p-value of  $<0.05$ ). this means that  $H_0$  is rejected, or are there differences in the average value of a personal impression panelists specifically on flavor snack bar. After that, followed by Bonferroni test to determine which formulations which have significant differences. After Bonferroni test, it is known that there are significant differences between Formula 1 and Formula 4 with a significance value of 0.024 (p-value of  $<0.05$ ).

**Rasa.**Formulations with the largest average value that is Formula 3 ( $67.5 \pm 1.15$ ), followed by Formula 1 ( $7.4 \pm 1.75$ ), Formula 4 ( $7.2 \pm 2.34$ ), and the last Formula 2 ( $6.7 \pm 2.16$ ). Anova once that is done to see if there is a difference between the average value of the formulation, obtained calculated F value of 2.720 at 0048 significance (p-value of  $<0.05$ ). this means that  $H_0$  is rejected, or are there differences in the average value of a personal impression panelists specifically to taste the snack bar. After that, followed by Bonferroni test to determine which formulations which have significant differences. After Bonferroni test, it is known that there are significant differences between Formula 2 and Formula 3 with a significance value of 0.034 (p-value of  $<0.05$ ).

**Texture,** Formulations with the largest average value that is Formula 3 ( $7.06 \pm 1.93$ ), followed by Formula 1 ( $6.83 \pm 1.83$ ), Formula 2 ( $6.24 \pm 2.35$ ), and the last Formula 4 ( $5.51 \pm 2.32$ ). Anova once that is done to see if there is a difference between the average value of the formulation, obtained calculated F value of 3,186 with the significance of 0.026 (p-value of  $<0.05$ ). this means that  $H_0$  is

rejected, or are there differences in the average value of a personal impression panelists specifically on the texture snack bar. After that, followed by Bonferroni test to determine which formulations which have significant differences. After Bonferroni test, it is known that there are significant differences between Formula 3 and Formula 4 with a significance value of 0.033 (p-value of <0.05).

#### **Nutritional value**

**Water contents** snack bar in this study amounted to 14.62 - 16:14%. F count of Anova on the water content of the four formulations which amounted to 1085.7 with a significance value of 0.0001 (p-value <0.05), this means that  $H_0$  is rejected. This shows that there are differences in the average value of significant inter formulations to water content of the snack bar. Then do the Bonferroni test to determine which formulations which have significant differences. After Bonferroni test, it is known that there are significant differences between the formula 1 with formula 3, formula 1 to formula 4, and vice versa with significant value 0.0001 respectively (p-value of <0.05).

**ash content** at the four formulations snack bar ranges from 2:02 to 2:22%. F count of Anova on the ash content of the four formulations which amounted to 959.4 with a significance value of 0.000 (p-value <0.05), this means that  $H_0$  is rejected. This shows that there are differences in the average value of significant inter formulations of the ash content of the snack bar. Then do the Bonferroni test to determine which formulations which have significant differences. After Bonferroni test, it is known that there are significant differences between the formula 1 with formula 2, formula 1 to formula 3, formula 1 to formula 4, and vice versa with significant value 0.0001 respectively (p-value of <0.05). There are also differences between the formula 2 to formula 3, formula 2 to formula 4, formula 3 formula 4, and vice versa with significant value 0.0001 respectively; 0.0001; 0.0001 (p-value of <0.05).

**protein content** at the four formulations snack bar at 13.93 - 15:33%. F count of Anova on the protein content of the four formulations which amounted to 27194.4 with a significance value of 0.0001 (p-value <0.05), this means that  $H_0$  is rejected. This

shows that there are differences in the average value of significant inter formulation of the protein content of the snack bar. Then do the Bonferroni test to determine which formulations which have significant differences. After testing Bonferroni, it is known that there are significant differences between the formula 1 with formula 2, formula 1 to formula 3, formula 1 to formula 4, formula 2 and formula 3, formula 2 to formula 4, formula 3 formula 4, and vice versa with significant value 0.0001 respectively (p-value of <0.05).

**The energy content** highest in formula 3 by 411.39%. F count of Anova on the energy content of the four formulations which amounted to 298377.9 0.0001 with a significance value (p-value <0.05), this means that  $H_0$  is rejected. This shows that there are differences in the average value of significant inter formulation of the energy content of the snack bar. Then do the Bonferroni test to determine which formulations which have significant differences. After testing Bonferroni, it is known that there are significant differences between the formula 1 with formula 2, formula 1 to formula 3, formula 1 to formula 4, formula 2 and formula 3, formula 2 to formula 4, formula 3 formula 4, and vice versa with significant value 0.0001 respectively (p-value of <0.05).

**The fat contents** snack bar in this study amounted to 12.92 - 16:08%. F count of Anova on the fat content of the four formulations which amounted to 126021.5 0.0001 with a significance value (p-value <0.05), this means that  $H_0$  is rejected. Thus, we can conclude that there are differences in the average value of significant inter formulation of the fat content of the snack bar. Then do the Bonferroni test to determine which formulations which have significant differences. After testing Bonferroni, it is known that there are significant differences between the formula 1 with formula 2, formula 1 to formula 3, formula 1 to formula 4, formula 2 and formula 3, formula 2 to formula 4, formula 3 formula 4, and vice versa with significant value 0.0001 respectively (p-value of <0.05).

**The carbohydrate contents** snack bar in this study is 50.89 - 55.68%. F count of Anova on the carbohydrate content of the four formulations which amounted to 159139.2 0.0001 with a significance value (p-value <0.05), this means that  $H_0$  is rejected. This shows that there are

differences in the average value of significant inter formulations of the carbohydrate content of the snack bar. Then do the Bonferroni test to determine which formulations which have significant differences. After testing Bonferroni, it is known that there are significant differences between the formula 1 with formula 2, formula 1 to formula 3, formula 1 to formula 4, formula 2 and formula 3, formula 2 to formula 4, formula 3 formula 4, and vice versa with significant value 0.0001 respectively (p-value of <0.05).

**The antioxidant activity** highest in the formula 4 with 13:14 ppm value. F count of Anova on the antioxidant activity of the four formulations in the amount of 0.0001 1580572.886 with a significance value (p-value <0.05), this means that Ho is rejected. This shows that there are differences in the average value of significant inter formulation of antioxidant activity snack bar. Based on the test Bonferroni, it is known that there are significant differences between the formula 1 with formula 2,

formula 1 to formula 3, formula 1 to formula 4, formula 2 and formula 3, formula 2 to formula 4, formula 3 formula 4, and vice versa the significant value 0.0001 respectively (p-value of <0.05).

**Total Plate Count** highest in formula 1 of 150 cfu / g. Meanwhile, the results of TPC was lowest for the formula 3 of 40 cfu / g. F count of Anova on TPC of four formulations in the amount of 0.0001 1233750.0 with a significance value (p-value <0.05), this means that Ho is rejected. Thus, we can conclude that there are differences in the average value of significant inter formulations against TPC snack bar. Based on the test Bonferroni, it is known that there are significant differences between the formula 1 with formula 2, formula 1 to formula 3, formula 1 to formula 4, formula 2 and formula 3, formula 2 to formula 4, formula 3 formula 4, and vice versa the significant value 0.0001 respectively (p-value of <0.05).

Table 1. Test Results Test Statistics hedonic Snack Bar

Parameter (Cm)	formulation				p-value
	F1	F2	F3	F4	
Color	1:05 ± 6.74 *	5.85 ± 2:04	5.69 ± 2:21	5:18 ± 2:53 *	0033
aroma	6.95 ± 1.64 *	6:25 ± 2:01	6:28 ± 2:14	5:37 ± 2:33 *	0034
flavor	6:34 ± 2:15	5.64 ± 2:17	1:51 ± 6.89 *	5:40 ± 2:56 *	0032
Texture	6:24 ± 1.85 *	4.71 ± 1.68 *	6:09 ± 2:16	5.69 ± 2:23	0016

Table 2. Quality Test Test Results Statistics hedonic Snack Bar

Parameter (Cm)	formulation				p-value
	F1	F2	F3	F4	
Color	7.5 ± 1.95 *	7:01 ± 2:12	5.92 ± 2.77	5.65 ± 2.78 *	0011
aroma	4.97 ± 2:28	4:53 ± 2:46 *	6:25 ± 1.98 *	4.69 ± 2.97	0032
flavor	7.4 ± 1.75	2:16 ± 6.7 *	8:02 ± 1:15 *	7.2 ± 2:34	0048
Texture	6.83 ± 1.83	6.24 ± 2.35	7:06 ± 1.93 *	5:51 ± 2:32 *	0026

Information :

Figures followed superscript letters in the same line indicate values significantly different (p-value <0.05), values are presented in the form of mean ± standard deviation.

Table 3. Nutritional Value Snack Bar

Category (%)	formulation			
	F1	F2	F3	F4
Water content	16:08	16:14	14.62	15:35
Abu Kadar	2:22	2:14	2:02	2:12
Energy	403.1	407.28	411.39	394.7
protein	15:33	14.75	14.2	13.9
Fat	15.2	16:08	15:59	12.9
Carbohydrate	51.1	50.89	53.57	55.6

Table 4. Antioxidant activity (IC50 value)

Parameter (Ppm)	formulation				<i>p-value</i>	Standard (Ppm)
	F1	F2	F3	F4		
Antioxidant activity	24.6	18.7	13:56	13:14	0.0001	0-50

Table 5. Total Plate Count

Parameter (Cfu / g)	formulation				<i>p-value</i>	Standard
	F1	F2	F3	F4		
TPC	150	85	40	100	0.0001	Max 100

## DISCUSSION

Based on the organoleptic, color snack bar preferably contained in the formula 1. In formula 1 has a lighter brown color when compared to other formulations. This is not in line with research conducted by Pricilya et al (2013), in which the most preferred snack bar is colored dark brown.

Aroma snack bar favored by hedonic test is formula 1, while the hedonic quality is the most preferred is the formula 3. The distinctive aroma of caramel derived from the content of sugar in purple sweet potato and honey and candied pineapple use as an ingredient in making the snack bar. Their browning reaction (Maillard) during roasting will produce a distinctive aroma and preferred product (Ayu, 2014).

Flavor snack bar most preferred 3 3. The formula contained in the formula has a sweet taste. The sweet taste derived from the use of honey and candied pineapple. In addition, the purple sweet potato has a sugar content sufficient so that it can give a sweet taste (Ayu, 2014).

The most preferable texture hedonic is formula 1, whereas in the hedonic quality which has a soft

texture is soft texture to the formula 3. The snack bar is affected by the use of fats such as olive oil and honey.

The water content of the snack bar in this study amounted to 14.62 - 16:14% (bb). Snack bar available in the market which has a water content of 8.7-11.4% (b) in accordance with the variant. When compared with the standard snack bars on the market, the water content of the snack bar in this study exceeded standards. This can be caused by the use of fluids in the manufacture of the snack bar in the form of egg yolk and honey. The water content contained in honey by 20% and water content in egg yolks country by 49.4%, in addition to the water content of purple sweet potato flour is also quite high at 9.4%.

The ash content in the four formulations snack bar ranges from 2:02 to 2:22% (bb). With high ash content contained in the formula 1 of 2.22%. While the ash content was lowest for the Formula 3 at 2:02%. The ash content snack bar on the market ranging from 2:20 to 2:50% (bb) (Natalia 2010; Janah, 2017). It can be concluded that the levels of ash in the four formulations in



accordance with standard snack bar on the market.

On the protein content of four formulations snack bar at 13.93 - 15.33%. At the snack bar available in the market that the protein content of 15.5 - 15.8% (Natalia 2010; Janah, 2017). For Formula 1 was able to meet the standards of the snack bar on the market. Meanwhile, formula 2, 3, and 4 have not been able to meet the standards of the snack bar on the market. The low protein content of the snack bar in this study could be due to the composition of mung bean flour in the formula 1 is higher than Formula 2, 3, and 4.

The fat content snack bar in this study amounted to 12.92 - 16.08%. Snack bar available in the market which has a fat content of 12.1 - 16.7% (bk) (Natalia 2010; Janah, 2017). It can be concluded that the snack bar in this study already meet the standards of the snack bar on the market.

Carbohydrate content of the snack bar in this study is higher than the standard snack bar are available in the market in the amount of 50.89 - 55.68%. The content of carbohydrate snack bars are available in the market amounted to 36.4 - 38.5% (Janah, 2017). This can be caused by the use of purple sweet potato flour containing high carbohydrate that is 84.4% (DKPI, 2017). In addition, honey and candied pineapple also contribute to the high carbohydrate content.

The highest energy content contained in the formula 3 by 411.39%. While the energy content was lowest for the formula 4 by 394.72%. These results are higher when compared to the research that has been done before. In the study conducted by Wiranata et al (2017), the energy content in nutrimat bar are made from soy bean flour and red bean flour amounted to 235.47 kcal.

Measurement of antioxidant activity by the method of free radical 1,1-diphenyl-2-picrylhydrazyl (DPPH). Values known antioxidant activity through the IC50 value is the concentration that caused a 50% reduction of the initial DPPH concentration (Sunarni 2005 in Gustandy et al, 2013).

Category antioxidant activity is based on the following criteria: very strong (<50 ppm), strong (50-100 ppm), and weak (150-200 ppm) (Saptarini et al, 2018). IC50 snack bar on the research of

13:14 - 24.60 ppm. It shows that the snack bar in this study are included in the category of a very strong antioxidant activity.

Category antioxidant activity is based on the following criteria: very strong (<50 ppm), strong (50-100 ppm), and weak (150-200 ppm) (Saptarini et al, 2018). IC50 snack bar on the research of 13:14 - 24.60 ppm. It shows that the snack bar in this study are included in the category of a very strong antioxidant activity.

TPC is one of the methods for calculating a colony of microbes contained in a contamination of a product that was grown on an agar medium (SNI 2897: 2008; State et al, 2016).

Based on the test results of proximate, it is known that the highest TPC results contained in the formula 1 of 150 cfu / g. Meanwhile, the results of TPC was lowest for the formula 3 of 40 cfu / g.

The results of four formulations TPC at the snack bar at 40-150 mcu / g. When compared with a maximum limit of microbial contamination based cake vegetables, tubers, and nuts (SNI 7388, 2009), TPC at the snack bar is selected in this study is still in the standard threshold for formula 2, 3, and 4. As for the formula 1 had crossed the threshold of a predetermined standard.

In the process of selecting snack bar is selected, viewed by parameter priority. Parameter priority at this bar snacks that taste and texture. Products selected snack bar should have the highest liking score (Rachmayani et al, 2017). Thus, in the selection of formulations seen the highest average value on the taste and texture parameters of the hedonic test and hedonic quality test. In addition, because the snack bar is aimed at the recovery process, the ratio between carbohydrate and protein (4: 1) become a factor.

Based on this, the snack bar formulation chosen in this study is the Formula 3.

Terms of preparation of the snack bar is on weight between 45 g to 80 g of the possibility of supplying energy of 200-300 kcal, 7-15 g of protein, 3-9 g of fat, and 20-40 g of carbohydrate (Alla et al, 2018). Weight of the fruit snack bar for a meal is 60 g. One fruit snack bars weighing 60 g protein at 8:52 g, at 9,354 g fat, carbohydrates at 32 142 g, and a total energy of 246.8 kcal. When compared to the above standard, the content of energy, protein, and carbohydrates to meet the standard.



Meanwhile, a bit of a fat content exceeding the standard. The cause of the increased levels of fat snack bars in this study are influenced by the additional material used, the olive oil, egg yolks, and full cream milk powder. Olive oil have been selected for unsaturated fat content. In 100 g of olive oil contains as much as 91.3 g fat. With no saturated fat content as much as 77.3 g. And also, the carbohydrate content in the fruit snack bar is selected to meet the needs carbs for endurance exercise for 1-2 hours. In addition, the comparison between carbohydrates and proteins at the snack bar that are the 3.7: 1 (approximately 4: 1) so it can meet the needs for recovery. This is in line with research Ivy et al, found that taking 200 ml of solution with a ratio of 4: 1 CHO-PRO (7.75% CHO / 1.94% PRO) every 20 minutes during the recovery period increase endurance performance cycling by 36% on cyclists trained compared with CHO alone (7.75% CHO) (Pritchett et al, 2011). the carbohydrate content of the fruit snack bar is selected to meet the needs carbs for endurance exercise for 1-2 hours. In addition, the comparison between carbohydrates and proteins at the snack bar that are the 3.7: 1 (approximately 4: 1) so it can meet the needs for recovery. This is in line with research Ivy et al, found that taking 200 ml of solution with a ratio of 4: 1 CHO-PRO (7.75% CHO / 1.94% PRO) every 20 minutes during the recovery period increase endurance performance cycling by 36% on cyclists trained compared with CHO alone (7.75% CHO) (Pritchett et al, 2011). the carbohydrate content of the fruit snack bar is selected to meet the needs carbs for endurance exercise for 1-2 hours. In addition, the comparison between carbohydrates and proteins at the snack bar that are the 3.7: 1 (approximately 4: 1) so it can meet the needs for recovery. This is in line with research Ivy et al, found that taking 200 ml of solution with a ratio of 4: 1 CHO-PRO (7.75% CHO / 1.94% PRO) every 20 minutes during the recovery period increase endurance performance cycling by 36% on cyclists trained compared with CHO alone (7.75% CHO) (Pritchett et al, 2011). 1) so it can meet the needs for recovery. This is in line with research Ivy et al, found that taking 200 ml of solution with a ratio of 4: 1 CHO-PRO (7.75% CHO / 1.94% PRO) every 20 minutes during the recovery period increase endurance

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## CONCLUSION

Based on the research results, it can be concluded that there are significant differences in hedonic test, test hedonic quality, nutritional value, antioxidant activity, and total plate count snack bar in this study. Obtained formulations that are the formula 3 with a ratio between flour purple sweet potato and green bean flour 15:15.

## SUGGESTION

For further research, is expected to analyze the specific content of antioxidants that anthocyanins, vitamin E, vitamin C, vitamin A, and selenium; can analyze the content of nutrients in purple sweet potato flour and mung bean flour; intervensikan can be directly on the sports enthusiast; can test the snack bar product shelf life; can be tested allergen snack bar products.

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