

# Combination of Moringa Leaves Puree and Onion Flour as a Healthy Snack for Obesity

*by Rita Ismawati*

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# Combination of Moringa Leaves Puree and Onion Flour as a Healthy Snack for Obesity

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## ABSTRACT

**Background:** The prevalence of obesity in Indonesia shows a figure quite alarming. In adolescents, the food that is consumed is food high in calories but low in fiber. Unfortunately, there are only few variances of healthy snack for obesity in Indonesia so that sticks made by utilizing the functional foods such as moringa leaves puree and onion flour.

**Purpose:** The purpose of this study was to determine the difference in the level of preference and also observe the difference on the fiber content of the product sticks combination of moringa leaves puree and onion flour.

**Materials and Methods:** This research is an experimental research which directed on developing products. In this study, 30 untrained panelists involved.

**Results:** The Kruskal–Wallis test showed that based on the level of preference, there were differences in color (0.001) and aroma (0.016) among the three sticks' products ( $F_1$ , product  $F_2$ , and product  $F_3$ ). Further tests by Mann–Whitney test showed that there is no difference in color between  $F_2$  and  $F_3$  sticks' products (0.592), and there is no difference in aroma between  $F_2$  and  $F_3$  sticks' products (0.414). Analysis of fiber contents showed that the most snack product high in fiber is  $F_3$ .

**Conclusion:** There were differences of color and aroma among the three products' sticks. There was no big difference of the fiber content of each stick.

**Key words:** Fiber content, Level of preference, Moringa, Onion, Sticks

## INTRODUCTION

Teenagers are one of the groups that are vulnerable to the problem of obesity. Obesity in children and adolescents has adverse consequences on premature mortality and physical morbidity in adulthood and is associated with health problems during childhood itself. Having determined obesity in children and persists in adulthood, it is difficult to restore it.<sup>1</sup>

The World Health Organization estimates that 300 million adults worldwide are obese and more than 1 billion are overweight.<sup>2</sup> Obesity is a major determinant of disease burden that can be prevented. The results from the excess consumption of calories/energy can have an impact on health.<sup>3</sup>

The prevalence of obesity in Indonesia shows a figure quite alarming. The prevalence of obesity in the population aged >15 years was 10.3% including 13.9% males and females

23.8% females.<sup>4</sup> The prevalence of obesity at the age of 13-15 years and 16-18 years in a row was 2.5% and 1.4% nationally.<sup>5</sup> The prevalence of overweight, both in the group of children and adults, increased by almost 1% every year. The prevalence of overweight in children and adults was 14.4% and 21.7%, respectively.<sup>4,5</sup>

Research in Saudi Arabia found that obesity is caused by the habit of eating fatty foods, fast food, and a lack of consumption of fibrous foods such as fruits and vegetables.<sup>6</sup> In adolescents, the food that is consumed is food high in calories but low in fiber.<sup>7</sup> Less fiber intake is one of the originators of the more nutrition. Fiber intake is significantly associated with the occurrence of nutrition.<sup>8</sup> Fiber intake is proven to extend the period of transit of food in the digestive organs so as to prolong satiety.<sup>9</sup> Fiber is not digested by digestive enzymes, so it does not produce energy and it makes fiber-preventing occurrence of nutrition.<sup>10</sup>

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Fiber is also very important for the body. However, the fiber consumption of Indonesian society is still less than the adequate intake of fiber. The National prevalence of fiber consumption at the age of 10-14 years is still <5 servings/day for 7 days a week.<sup>4</sup> The average consumption of fiber in general Indonesian population is 10.5 g/day.<sup>5</sup> This value is only reached half of the adequacy of the recommended fiber. This value is only reached half of the adequacy of the recommended fiber. The recommended fiber needs based fiber adequacy rate for adolescent males aged 13-15 years were 35 g and aged 16-18 were 37 g; for women aged 13-18 years was 30 g. Obesity cannot be separated from daily food consumption. Obesity cannot be separated from daily food consumption.

Processed food in the form of stick this time has undergone many developments, by utilizing the material basis of additional materials that come from the local area. Stick is a snack or a type of pastry. Many stick products are already in the market with consumers who come from various types of age, besides that many consumers are interested in products stick because kerenyahannya and selection was great. During most of the stick products on the market that cheese sticks and there is also a stick with a variety of flavors.

Wheat flour is the main ingredient in the manufacture of stick, but the wheat flour does not contain fiber. Fiber is very important for the body because the fibers have the ability to lose weight by inducing satiety<sup>11</sup> and also can reduce energy intake.<sup>12</sup> To enrich the fiber content on a stick, it takes another material having sufficiently high-fiber content and is easy to obtain and utilization is still not optimal. Moringa is one of the vegetables that are rich in various nutrients. 100 g of moringa contains 0.9 g of fibers.<sup>13</sup> In addition to moringa, onions are also used to increase the fiber content of the stick.

Onion (*Allium cepa* Ascolonicum L.) is classified as a vegetable that is one of the kitchen spices for most Southeast Asian cuisines.<sup>14</sup> Dietary fiber in onions dissolves in water, called oligofruktoza. 100 g of onion contains 0.7 g of fiber.<sup>15</sup>

The researchers are interested in creating a healthy snack for teenagers in the form of stick by substituting puree of moringa leaves and red onion powder which has fiber content high enough, so that it can be used as a healthy snack for teenagers. This study aimed to note whether there are differences in the level of preference and fiber content in each product stick in combination of puree of moringa leaves (*Moringa oleifera*) and flour onion (*A. cepa* Ascolonicum L.).

## MATERIALS AND METHODS

This study is an experimental research conducted on the product development of the combination of moringa leaves puree and onion flour using a completely randomized design. This research was conducted in May-July 2016, held at the Faculty of Public Health Nutrition Laboratory of the Airlangga University and on panelist residence. The dependent variable in this study is the organoleptic quality (color, aroma, texture, and taste) and also the fiber content and flavonoids. The independent variable in this study was the proportion of wheat flour, moringa leaves puree, and onion flour while the control variables in this study are the additional ingredients in the manufacture of sticks, such as sugar, margarine, egg yolks, pepper, salt, sugar, baking powder, and the temperature of the oven is used.

This study was divided into two stages. These stages included stage of determining product and phase of organoleptic testing and measured the nutritional value. Making product is an early stage to determine the proportion of main and additive components in the manufacture of sticks that are shown in Table 1. The last stage is the stage of organoleptic quality test, which includes colors, aromas, textures, taste, and the fiber content of the each product stick. The test of flavonoids is only done on the best products.

Organoleptic quality data were collected using a questionnaire and the test given to 30 untrained panelists. The fiber content and flavonoids were collected through laboratory analysis. Organoleptic data were processed by the Kruskal-Wallis test. If there are differences in the level of preference, they will be tested further using the Mann-Whitney test. Data from the analysis of fiber and flavonoids are presented descriptively.

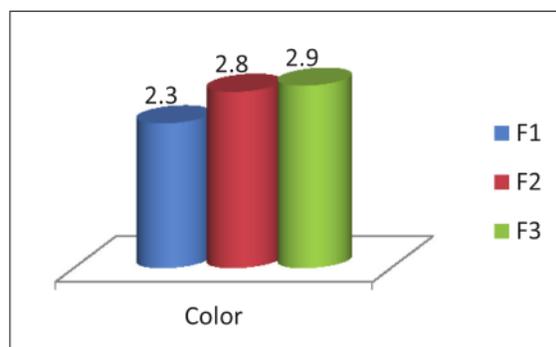
## RESULTS

### Fondness Level to Color

Based on these data product color sticks, it can be seen that the product  $F_1$  has a value of 2.3 which is in the range of dislike, product  $F_2$  has a value of 2.8 which is in the range dislike to approach the like, and product  $F_3$  has a value of 2.9 which is in the range dislikes to approach the like, so it is known that the most preferred product is  $F_3$  and the least preferred is  $F_1$ .

**Table 1:** Products sticks

Ingredients	Products		
	g (%)		
	$F_1$	$F_2$	$F_3$
Wheat flour	60 (46.2)	65 (50)	70 (53.8)
Moringa leaves puree	15 (11.5)	20 (15.4)	25 (19.2)
Onion flour	25 (19.2)	15 (11.5)	5 (3.8)
Margarine	10 (7.7)	10 (7.7)	10 (7.7)
Egg yolk	15 (11.5)	15 (11.5)	15 (11.5)
Pepper	0.5 (0.4)	0.5 (0.4)	0.5 (0.4)
Salt	2 (1.5)	2 (1.5)	2 (1.5)
Sugar	2 (1.5)	2 (1.5)	2 (1.5)
Baking powder	0.5 (0.4)	0.5 (0.4)	0.5 (0.4)
Total	130 (100)	130 (100)	130 (100)



**Figure 1:** Average value of preference level of color 1-4

### Fondness Level to Aroma

Based on these data product aroma sticks, it can be seen that the product  $F_1$  has a value of 2.4 which is in the range of dislike, product  $F_2$  has a value of 2.8 which is in the range of dislike to approach the like, and product  $F_3$  has a value of 3 which is in the range of like, so it is known that the most preferred product is  $F_3$  and the least preferred is  $F_1$ .

### Fondness Level to Texture

Based on these data product texture sticks, it can be seen that the product  $F_1$  has a value of 2.9 which is in the range of dislike to approach the like, product  $F_2$  has a value of 2.8 which is in the range of dislike to approach the like, and product  $F_3$  has a value of 2.8 which is in the range of dislike to approach the like, so it is known that the most preferred product is  $F_2$  and the least preferred is  $F_3$ .

### Fondness Level to Taste

Based on these data product taste sticks, it can be seen that the product  $F_1$  has a value of 2.4 which is in the range of dislike, product  $F_2$  has a value of 2.8 which is in the range of dislike to approach the like, and the product  $F_3$  has a value of 2.9 which is in the range of dislike to approach the like, so it is known that the most preferred product is  $F_3$  and the least preferred is  $F_1$ . Different test results through the Kruskal–Wallis test showed that there are no differences in the level of preference for the texture of the three products' sticks ( $P = 0.055$ ).

### Assessment of all the Organoleptic Characteristic

Figure 5 shows that the extent of the level of preference of color, aroma, and taste is highest in  $F_3$ , while the area of the highest level of preference texture is  $F_2$ .

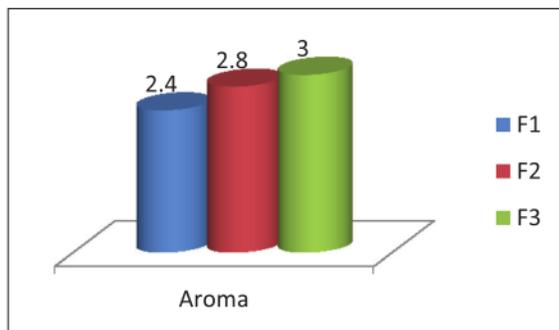


Figure 2: Average value of preference level of aroma 1-4

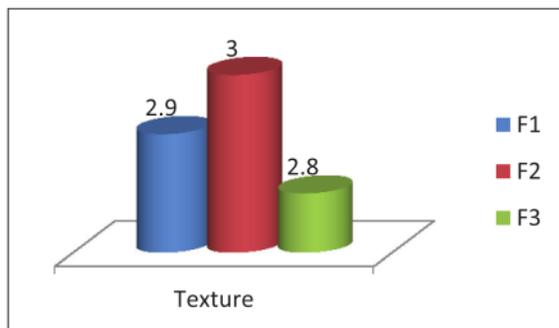


Figure 3: Average value of preference level of texture 1-4

### Statistical Test

To find out whether there are differences in the level of preference on the product, the Kruskal–Wallis test was used. If there is a difference in testing, it is necessary to further test using the Mann–Whitney test to determine the product anywhere that has a difference. Statistical test results are shown in Table 2.

Different test results through Kruskal–Wallis test the showed that there are differences in the level of preference for the color and aroma of the three products' sticks  $P < \alpha$  (0.001 and 0.016).

### Test of Color

Mann–Whitney test was conducted to determine differences in color on every product stick. Statistical test results are shown in Table 3.

After further tested with the Mann–Whitney test, it is known that the color of the  $F_2$  and  $F_3$  sticks product do not have differences  $P > \alpha$  (0.592).

### Test of Aroma

Mann–Whitney test was conducted to determine differences in aroma on every product stick. Statistical test results are shown in Table 4.

After further tested with the Mann–Whitney test, it is known that the aroma of the  $F_2$  and  $F_3$  sticks product do not have differences  $P > \alpha$  (0.414).

### Fiber Content

Table 5 shows that  $F_3$  sticks' product has the highest fiber content than other sticks' products. However, the fiber content

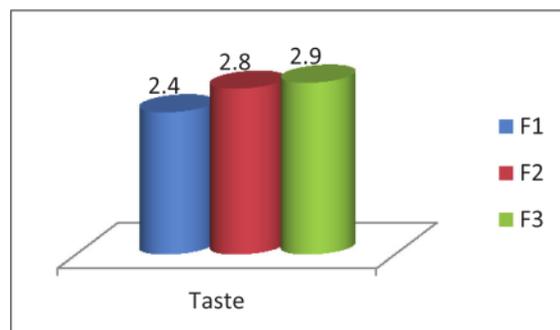


Figure 4: Average value of preference level of taste 1-4

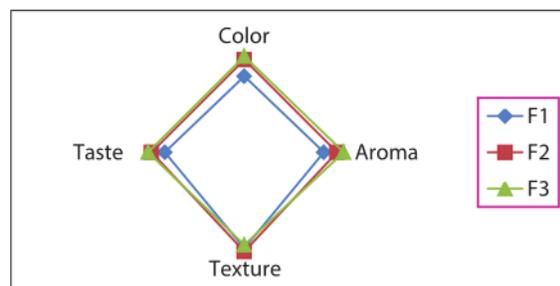


Figure 5: Assessment of untrained panelists toward all of the organoleptic characteristics

**Table 2:** Test of Kruskal–Wallis fondness level of stick

Fondness level	Products	Asymptotic significant	Informations
Color	F <sub>1</sub> -F <sub>3</sub>	0.001	There is a difference
Aroma	F <sub>1</sub> -F <sub>3</sub>	0.016	There is a difference
Texture	F <sub>1</sub> -F <sub>3</sub>	0.662	No difference
Taste	F <sub>1</sub> -F <sub>3</sub>	0.055	No difference

**Table 3:** Test of Mann–Whitney fondness level to color sticks

Products	Asymptotic significant	Information
F <sub>1</sub> -F <sub>2</sub>	0.007	There is a difference
F <sub>1</sub> -F <sub>3</sub>	0.000	There is a difference
F <sub>2</sub> -F <sub>3</sub>	0.592	No difference

**Table 4:** Test of Mann–Whitney fondness level to aroma sticks

Products	Asymptotic significant	Information
F <sub>1</sub> -F <sub>2</sub>	0.049	There is a difference
F <sub>1</sub> -F <sub>3</sub>	0.005	There is a difference
F <sub>2</sub> -F <sub>3</sub>	0.414	No difference

**Table 5:** Fiber content sticks

Products	Fiber (g)
F <sub>1</sub>	5.655
F <sub>2</sub>	5.7
F <sub>3</sub>	5.865

in two other sticks is also quite high so that it can be used as a healthy snack to prevent or control the diet in obesity.

## DISCUSSION

### Fondness Level to Color

The color is one of the first seen factors by the panelists in providing an assessment of a food product because the color is a factor that is very prominent when viewed. Products that have the right color match will attract and increase the desire to buy the consumer. A product will not look attractive if the color is not appealing to the eye, even though the product has good aroma, texture, taste, and nutritional values.<sup>16</sup>

The characteristic of stick color combinations of moringa leaves puree and onion flour generally is greenish. The greenish color is obtained from the leaves of moringa proportion; moringa it-self has a rather dark green color. If seen from the results of the assessment, the panelists preferred the F<sub>3</sub> product when compared to other products. This is because the proportion moringa leaves puree of product F<sub>3</sub> is lowers while the proportion of onion powder is higher, so that the color produced on F3 products are not so dense greenery. The panelists preferred the color as it is not too greenish dense; it is because the product stick conventional on the market has the golden yellow, so when compared degan product stick combination moringa leaves puree that stick that has a color not so green is the product F<sub>3</sub>.

### Fondness Level to Aroma

Aroma is something that can be observed through sense of smell (Sofia, 2011). Aroma is the scent of the food distributed by

food that has a very strong appeal and can stimulate the sense of smell so as to excite the taste buds.<sup>18</sup> Aroma is one of the sensory properties of the most difficult to categorize because it has a range so broad.<sup>19</sup>

Although the leaves of moringa in blanching first before made into puree, moringa leaves still have a strong unpleasant scent. Unpleasant aroma is not favored by most people. If seen from the results of the rating favorite scent, the panelists preferred the scent of the stick F<sub>3</sub>. This is because the proportion of onion flour is highest on F<sub>3</sub> products. With a high proportion of onion flour, the unpleasant aroma of moringa can be neutralized, because the onion before it is processed into flour fried first so that the flour onion has a very distinctive aroma that is very unpleasant when smell. While the dislike aroma is a product with a high proportion of moringa leaves puree that is product F<sub>3</sub>, it is because they smell not pleasant aroma of moringa. The aroma is unpleasant scent when smell, causing the stick not preferred by the panelists.

### Fondness Level to Texture

Texture of a material is one of the important physical properties of foodstuffs because the texture has a relationship with a sense of the time of chewing these foods. Texture of a food also is a component that determines the taste of food because the sense of taste is influenced by the consistency of the food.<sup>20</sup>

Stick combination of moringa leaves puree and onion flour is favored by panelists in terms of textures. This was because a combination sticks has a crunchy texture. Crunchy texture is derived from onion flour, which before used powdered onion fried first and the resulting flour is not too smooth so that when processed stick produced more crunchy when bitten by the panelists. Stick products most preferred by the panelists is F<sub>3</sub> product, it is because F<sub>5</sub> is a product that has the proportions of onion flour highest, thus providing a good texture for the sense of touch panelists.

### Fondness Level to Taste

Taste is the second factor that determines the taste of food after the appearance of the food. If the display of the food served to stimulate the nerves through the sense of sight and being able to appetizing to taste, the next stage will determine the flavor of the food through the senses of smell and taste. The taste is the most important factor in determining the level of preference of the panelists in tasting a food product, because if discomfort or disliked, it is clear that food products cannot be accepted by the panelists.<sup>20</sup>

The taste of the most preferred stick by the panelists is F<sub>3</sub> product; it is because of the high proportion of red onion. With the onion, then stick the unpleasant taste because smell of Moringa leaves puree can be neutralized. Most people are very packed, the taste of onions, especially if the fried shallots, because by frying onions provide a savory taste.

### Fiber Content

Fiber works to launch the process of expenditure from the body. If deficiencies fiber intake, it can cause constipation.<sup>21</sup> Adequacy of fiber in men aged 13-15 years is 35 g/day, aged 16-18 is 37 g/day, aged 16-18 is 37 g/day, women aged 13-18 years is 30 g/day. Snack contribute fiber of 3 to 3,7 g/day.

Based on laboratory test results, stick combination of product moringa leaves puree and onion flour that has the highest fiber content is the product F<sub>3</sub>. This is because the proportion of

the highest onion flour, which is the highest contributor to the fiber when compared with moringa leaves puree. A plate of stick product has been able to fulfill their teens' fiber a day.

Dietary fiber plays an important role for health. Fiber is very important in the process of digestion in the body. Lack of fiber can cause constipation, diabetes mellitus, coronary heart disease, and kidney stones. In addition, the lack of fiber can also lead to obesity.<sup>10</sup>

A product can be claimed as a source of food or fiber if it contains  $\geq 3$  g dietary fiber per 100 g of the product (in solid form) or 100 ml (in liquid form).<sup>22</sup> Based on this, the product stick combination of moringa leaves puree and onion flour can be claimed as a source of dietary fiber and as a product of the high fiber content of its food. With high fiber content, it is suitable to be consumed by the obese, because the fiber is very important in the process of food digestion in the body. Stick conventional on the market today tends to contain high calories and no fiber.

### Flavonoid Compound of F<sub>3</sub> Sticks Product

Flavonoids are substances pigment in plants that dissolves in water. There are thousands of flavonoids that have been identified. Often, it is also called bioflavonoids. Although it is not an essential nutrient, it has potential as flavonoids have antioxidant.<sup>23</sup> Adequacy of flavonoids based on recommended dietary allowance recommends to benefit terapiutik flavonoid consumption of at least 50-500 mg/day. Adequacy of flavonoids consumed by human beings ranged from 20 to 80 mg/day.<sup>24</sup>

In this study, laboratory research on flavonoids only performed on selected products (F<sub>3</sub>). Results flavonoid production through laboratory test stick elected (F<sub>3</sub>) is equal to 106.5 mg/100 g of material. Flavonoid is derived from flour onion. Product F<sub>3</sub> used 25 g onion flour; this composition is the highest composition of flour onion of each product. Hence, if the calculated amount of 25 g of flavonoid, stick F<sub>3</sub> products amounted to 26.625 mg.

## CONCLUSION

Based on these results, we can conclude that there are significant differences in the acceptance of untrained panelists to color and aroma of each sticks' products. Further tests showed that there is no difference in color and aroma between F<sub>2</sub> and F<sub>3</sub> products. The more the proportion of onion flour and the lower the usage wheat flour and the addition of moringa leaves puree, the higher the acceptance of panelist for color, aroma, and taste. The highest fiber content is also owned by F<sub>3</sub> sticks product. The existence of the flavonoid high enough on sticks combination of moringa leaves puree and onion flour makes it able to serve as a healthy snack for obesity.

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