

# The analysis of phosphor content and sensory quality of dragon fruit and moringa oleifera soft candy

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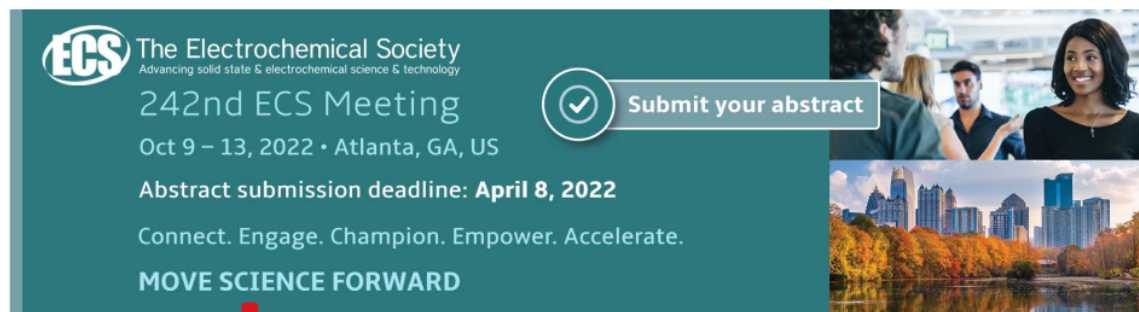
## The analysis of phosphor content and sensory quality of dragon fruit and moringa oleifera soft candy

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## The analysis of phosphor content and sensory quality of dragon fruit and moringa oleifera soft candy

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**Abstract.** This study aims to determine the effect of adding dragon fruit and moringa oleifera to the phosphor content and acceptability of soft candy. This study is an experimental study using a completely randomized design (CRD) with the concentration of adding dragon fruit 10%, 12%, 14%, and 16% Moringa Oleifera 1%, 1%, 2%, and 3% and fresh milk 50 ml. Observation parameters: Phosphor, with the panelists' preference test for colour, texture, taste, and smell. The results showed that the best treatment for adding 12% dragon fruit and 1% moringa leaves was preferred by panelists' in terms of colour, taste, texture, and smell based on analysis using the Mann Whitney test showed a p-value of 0,010 with a mean difference of 53.75, phosphor content 0,288% and meets the quality standard requirement (SNI 2803: 2010). In 100 grams soft candy contains 576 mg of phosphor. Thus, it is considered as an alternative to meet the phosphor daily intake of children under five in Indonesia.

### 1. Introduction

Phosphor is one of the minerals that affect the incidence of stunting. This is exactly associated with the process of bone growth in the child's body. The skeleton, which contains over 90 percent of the phosphor, provides a reserve for regulation and the maintenance of these elements. Both have important functions in cells and body fluids [1].

The results showed that phosphor intake in stunted children aged 24-59 months was significantly lower than in non-stunted children. The group of children who had a low phosphor intake had a 2.29 times greater risk of experiencing stunting than the group of children who had sufficient phosphorus intake. The lowest known calcium and phosphorus intake is phosphorus intake, which is 68.75% [2], [3].

A study in Thailand reported that there were differences in the average intake of energy, protein, and nutrition in school children related to the incidence of stunting. Significantly more boys are stunted than girls. Stunting men had a low average intake of energy, protein, calcium, phosphor, and zinc. Also has a lower average arm muscle area compared to non-stunted children. Stunting at school age can have an impact on decreasing adult size, thereby reducing work capacity and adverse reproductive systems. Stunting is associated with anorexia and hypogeusia caused by insufficient intake of zinc and phosphorus [4], [5].

The impact of stunting is quite complex, including difficulties in learning to read, impaired intellectual development during childhood, the potential for imperfect growth and development and even failure to thrive, low motor skills and productivity, and a higher risk for suffering from non-communicable diseases. Meanwhile, the impact of stunting on women is the potential to contribute to



perinatal mortality and give birth to stunted children, all of which will lead to low work productivity in adulthood [6]. Therefore, it is necessary to conduct a study related to functional foods to support mineral intake in stunting toddlers.

There have been many studies related to functional foods that have mineral content, such as the research we have done, producing biscuits made from dragon fruit and Moringa leaves that contain iron. Thus, it is possible to be an alternative to prevent nutritional problems in children, adolescents, and adults [7]. Similar research was also carried out to identify the physical and chemical quality of functional food cheese sticks from red bean flour and beetroot flour, the chemical quality test being tested was the zinc content [8]. The study of functional food in the form of biscuits has also tested the carbohydrate content of jackfruit seeds that have been fortified with iron, the carbohydrate content of the waste biscuits of jackfruit seed fortified with Fe (% bb) was 73.9139% and carbohydrate content (% wt) was 75.8999% bk [9].

Although many functional foods have been created to prevent and treat stunting, functional foods in the form of sweets are still rarely studied. In addition, the results of research aimed at identifying phosphorus in functional foods have never been carried out. Thus, it is necessary to innovate functional food products in the form of candy and identify phosphorus content, to support mineral intake in stunting toddlers.

## **2. Material and Methods**

This study used an experimental method with a factorial Completely Randomized Design (CRD) through two repetitions.

### *2.1. Material*

The raw materials of this research; sugar, gelatin, pure cow's milk, dragon fruit pulp 10%, 12%, 14%, 16%, and Moringa Oleifera leaf flour 1%, 1%, 2%, and 3%. Sample 1 includes : 10% dragon fruit pulp; 1% Moringa Oleifera leaf powder; 50 ml of factory fresh milk); sample 2 (12% dragon fruit pulp; 1% moringa leaf powder; 50 ml pure cow's milk), sample 3 (14% dragon fruit pulp; 2% moringa leaf powder; 50 ml pure cows milk), sample (16% dragon fruit pulp; 3% Moringa leaf flour; 50 ml pure cow's milk).

### *2.2. Methods*

The research stages started from candy formulation. Followed by the hedonic test which was analyzed by the Kruskal Wallis and Mann-Whitney test with an alpha of 5%. Hedonic test data were analyzed using excel and SPSS 19 programs. The phosphor content was tested using Atomic Absorption Spectrophotometry (AAS). The quality of the phosphor content test was assessed using the SNI standard number 2803:2010. The hedonic test was carried out on 30 semi-trained panelists who were carried out in limited off-line. The instrument used was a hedonic test form including color, taste, aroma, and texture with a rating range of 1-7. The criteria for assessing the quality of candy products were 1. Very bad, 2. Bad, 3. Slightly bad, 4. Moderate/enough, 5. Fairly good, 6. Good, 7. Very good. This criterion was a modification of the hedonic scale presented by Peryam & Girardot, 1952, which consisted of 9 hedonic scales; like extremely, like very much, like moderately, like slightly, neither like nor dislike, dislike slightly, dislike moderately, dislike very much, dislike extremely [10]. The research was carried out at the Politeknik Negeri Jember, and the phosphor content test was carried out at the Bioscience Laboratory Politeknik Negeri Jember.

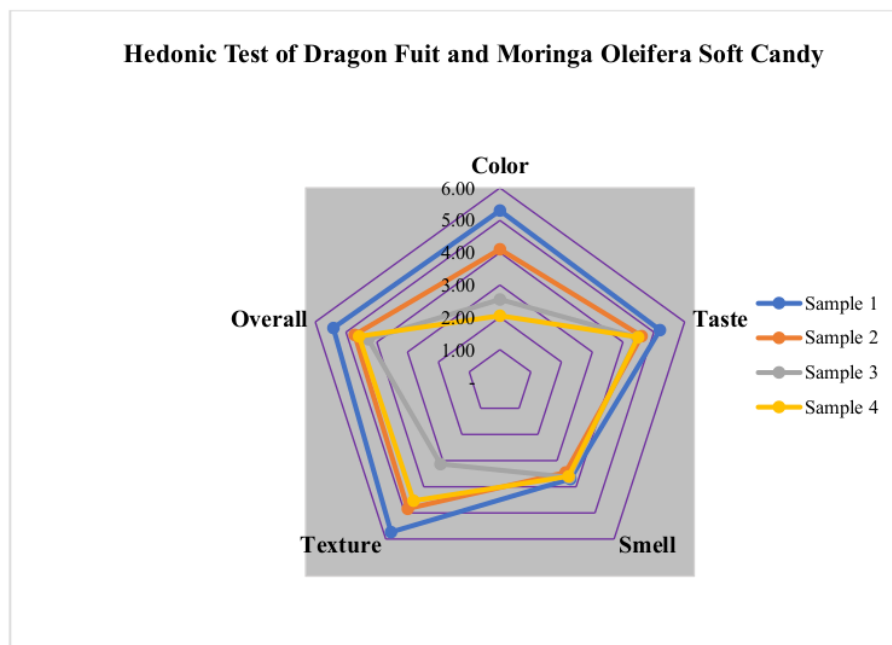
## **3. Result and Discussion**

This research was conducted for 6 months with the results including hedonic tests and phosphor content. The results were presented in univariate and multivariate.

### 3.1. Univariate Analysis

#### 3.1.1. Quality of Hedonic Test (Overall)

The description of the quality of hedonic test can be seen in Figure 1. The picture is a description of the mean (average) value of the hedonic test including color, taste, aroma, texture, and overall soft candy quality. Descriptively, sample 1 has the highest average value of hedonic quality test results on all test items (color, taste, aroma, texture, overall), followed by sample 2. sample 4 has the lowest color hedonic quality compared to other samples.



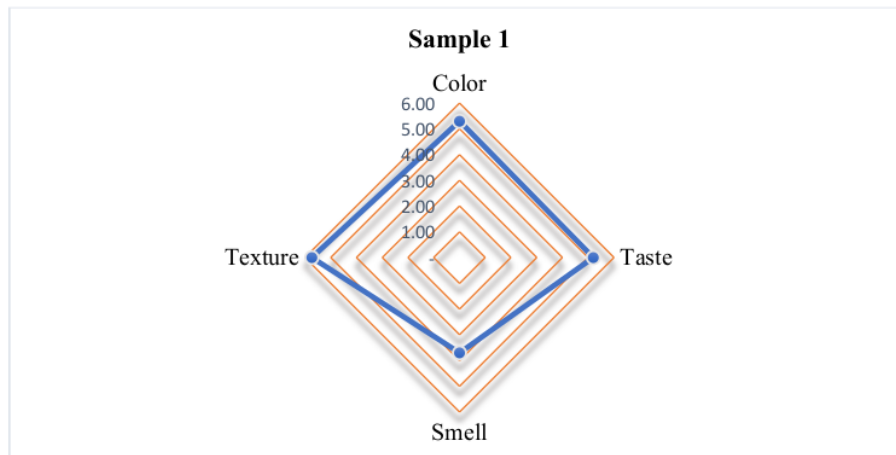
Source: Hedonic test, 2021

**Figure 1.** Hedonic Test of Dragon Fruit, Moringa Oleifera Sof Candy

Overall, the lowest hedonic quality test is the smell. This smell is influenced by Moringa Oleifera leaf flour which does have a distinctive and unpleasant smell. Even so, Moringa leaves have a complete nutritional content including minerals, vitamins, and high protein [11]. In addition, Moringa contains calories (cal), protein (g), fat (g), carbohydrates (g), fiber (g), calcium (mg), magnesium (mg), phosphorus (mg), potassium (mg), copper (mg), iron (mg), sulfur (mg), vitamin B1 (mg), B2 (mg), B3 (mg), C (mg), E [12].

### 3.1.2. Descriptive explanation of Hedonic Test

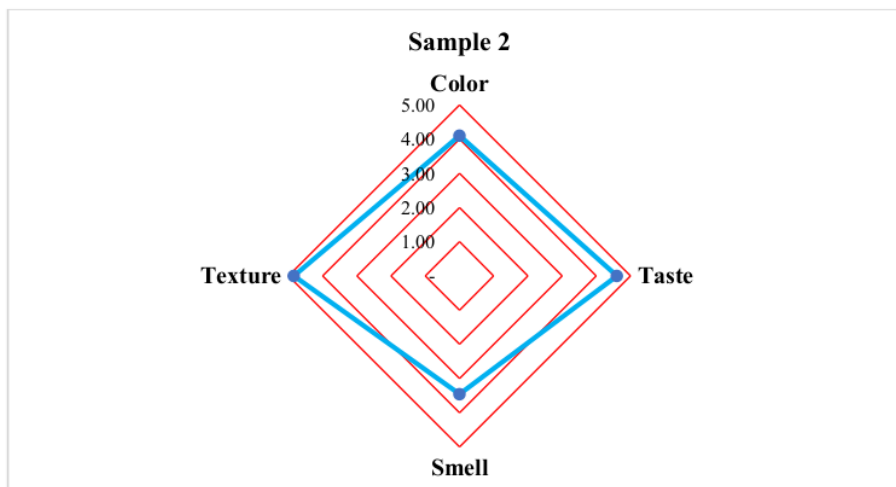
Descriptive explanation based on hedonic quality test items can be seen in Figures 2,3,4 and 5



Source: Hedonic test, 2021

**Figure 2.** The results of the analysis of hedonic differences (color quality, taste, smell, texture) of dragon fruit and Moringa Oleifera soft candy (sample 1)

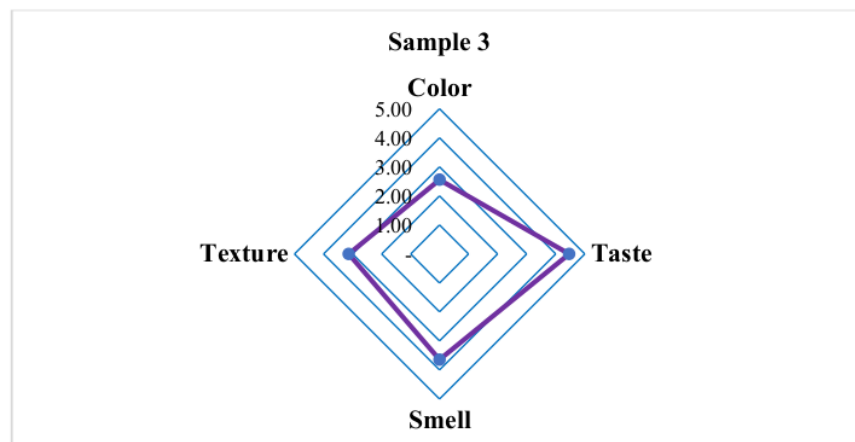
Sample 1 has a lower hedonic quality of smell compared to the quality of color, taste and texture. Moringa leaves have a distinctive unpleasant odor. There are several processing techniques that can minimize the unpleasant smell, one of which is through blanching. Moringa leaf flour does not go through the blanching process to avoid the loss of minerals and vitamins through the heating process. Generally, blanching produces a decrease in the nutritional value of foods. Nutrients leach out from the product especially during water blanching [13].



Source: Hedonic test, 2021

**Figure 3.** The results of the analysis of hedonic differences (color quality, taste, smell, texture) of dragon fruit and Moringa Oleifera soft candy (Sample 2)

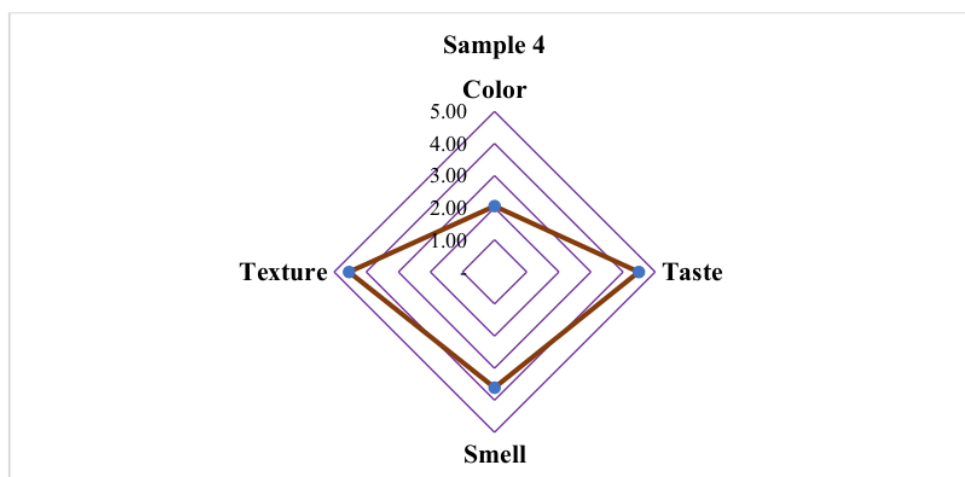
Sample 2 has the lowest hedonic quality of smell compared to the quality of color, taste, and texture. Nonetheless, the color was medium. The smell of soft candy is on slightly bad category, color and taste were Moderate/enough, and texture was Fairly good.



Source: Hedonic test, 2021

Figure 4. The results of the analysis of hedonic differences (color quality, taste, smell, texture) of dragon fruit and Moringa Oleifera soft candy (Sample 3)

Sample 3 has moderate/ enough taste hedonic quality, close sufficient smell but less or Slightly bad texture and color.



Source: Hedonic test, 2021

Figure 5. The results of the analysis of hedonic differences (color quality, taste, smell, texture) of dragon fruit and Moringa Oleifera soft candy (Sample 4)

Sample 4 has a fairly good hedonic quality of texture and taste, sufficient smell and poor (bad) color. Based on the results of the study, the color hedonic quality test is included in the less preferred category. This is due to the content of raw materials for making candy. The results shows that there is gelling

effect on the color characteristics, but do not affect the aroma, texture, and taste [14]. The color of the soft candy is largely determined by the natural color of the fruit juice and the result of browning during the process [15].

### 3.2. Multivariate Analysis

A multivariate test was used to look for differences in treatment groups and to determine interactions between groups. The results of the Kruskal Wallis and Mann Whitney test analysis of dragon fruit powder candy, moringa leaf flour, cow's milk covering color, taste, smell, and texture are shown in table 1.

**Table 1.** The hedonic test analysis (quality) of dragon fruit powder and moringa leaf flour soft candy

Variable	Sample	Hedonic average	Significance ( $\alpha$ 0.05)
Colour	1	78.20	0.010
Taste	2	59.28	
Smell	3	53.75	
Texture	4	50.77	

*Source: Hedonic test, 2021*

The hedonic test (quality) of dragon fruit powder, moringa leaf flour, cow's milk candy which include color, taste, smell and texture have differences between samples with a sig value of 0.010. The different samples were analyzed using the Mann-Whitney test (Table 2).

**Table 2.** The hedonic difference test (quality) of dragon fruit, cow's milk and moringa leaves soft candy

Sample	Sample 1	Sample 2	Sample 3	Sample 4
1	-	0.023	0.004	0.007
2	0.023	-	0.299	0.490
3	0.004	0.299	-	0.711
4	0.007	0.490	0.711	-

*Source: Mann whitney test, 2021*

Sample 1 was significantly different with sample 2 ( $p= 0.023$ ), sample 3 ( $p= 0.004$ ) and sample 4 ( $p= 0.007$ ). Sample 2 was not different with sample 3 ( $p= 0.299$ ) and sample 4 ( $p= 0.490$ ), as well as sample 3 was not different with sample 4 ( $p= 0.711$ ). The most preferred soft candy sample was sample 1 (sample composition of 10 % of dragon fruit: 1 % of *Moringa Oleifera* leaf flour: 50 ml of factory cow's milk (mean: 78.20). Nonetheless, sample 1 is a control (comparison) to sample 2 with a composition of 12% dragon fruit powder: 1% *Moringa oleifera* leaf flour: 50 ml of pure cow's milk with an average: 59.28 is the sample with the best quality.

### 3.3. Phosphor Content of Dragon Fruit and Moringa Oleifera's Soft Candy

The resulting soft candy contains several minerals, but in this study, an identification was made on the phosphor content. The reason for choosing phosphor is because there are less studies that discuss phosphor, even though phosphor plays a very important role in increasing appetite. Although in small amounts this type of phosphor should be met in number in the body. The content of the phosphor is described in table 3.



**Table 3.** Phosphor content of dragon fruit powder and moringa *Oleifera* soft candy (SNI 2803:2010)

Parameters	Sample 1	Sample 2	Sample 3	Sample 4
Phosphor (%)	0,217	0,169	0,288	0,100

Source: Atomic Absorption Spectrophotometry test

Phosphor content was measured in 0.5-gram sample based on SNI 2803:2010. Sample 3 with the addition of 14% dragon fruit powder and 2% Moringa oleifera leaf powder has the highest phosphor content, which is 0.288 %. This is equivalent to 2,88 mg/kg. Phosphor needs for children aged 1-3 years are 460 mg/day and for children aged 4-5 years is 500 mg/day [16]. In 100 grams soft candy contains 576 mg of phosphor. This means candy can be considered as an alternative to meet the phosphor daily intake of children under five in Indonesia. Phosphor becomes a major ingredient of not only bones and teeth, but also the brain. Phosphor facilitates the permeability of cell membranes that helps nutrients pass in and out of cells. Phosphor also mediates energy and maintains consistent blood sugar levels [17]. Phosphor is also required for metabolic processes, coagulation of phospholipids, DNA, RNA metabolism of fats, proteins, and carbohydrates [18].

#### 4. Conclusion

The best phosphor content in dragon fruit and *Moringa Oleifera* soft candy was found in sample 3 with the addition of 14% dragon fruit powder and 2% *Moringa Oleifera* leaf flour with a content of 0.288%. In 100 grams soft candy contains 576 mg of phosphor and meets the quality standard requirement (SNI 2803: 2010). The hedonic test showed the best treatment for adding 12% dragon fruit powder and 1% moringa oleifera leaf flour base on ( color, taste, texture, and smell).

#### 5. Acknowledgment

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