

# ORGANOLEPTIC PROPERTIES AND ACCEPTABILITY OF MODISCO WITH MORINGA LEAF FLOUR

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**Abstract.** Modisco (Modified Dried Skimmed Milk and Coconut Oil) is a highly nutritious formula. Modisco has been tested and meets special dietary requirements for toddlers. It can be used to improve nutritional status. This research aims to describing organoleptic properties and acceptability of modisco with moringa leaf flour. It is an experimental research based on completely randomized design. The research results are analyzed through descriptive analysis and also *Kruskall-wallis*. The higher composition of moringa flour which is added can increase the green color, unpleasant aroma, and bitter taste. So that it can be weaken the aroma of milk, sweet taste and savory taste in Modisco. *Kruskall-wallis* significance test results showed that there were different acceptance (preferences) of the three organoleptic attributes color ( $p=0,000$ ), aroma ( $p=0,000$ ) and taste ( $p=0,000$ ). The percentage of the addition of Moringa flour which is most preferred or accepted by panelists based on external and internal attributes in this study is modisco formulation with 2.5% moringa leaf flour.

## 1. Introduction

The prevalence of under nutrition and malnutrition towards toddler nationally in 2013 was 19, 6% and became 17,7 % in 2018 [1]. Sustainable Development Goals (SDGs) in 2015 targeting the prevalence of under nutrition and malnutrition nationally in 2019 is 17% in Indonesia, the prevalence of under nutrition based on body weight per height reach 11% that consisting of thin and very thin, while treshold from WHO is 5% [2]. The prevalence of under nutrition in Jember Regency is 11,7%, while the prevalence of malnutrition is 1,61%, while toddlers who had suffering malnutrition related with body weight per height or very thin is 128 toddlers, and toddlers who had suffering malnutrition with clinical sign were getting treatment is 9 toddlers [3].

Indirectly, the cause of malnutrition is insufficient food supplies in household, inadequate parenting, poor sanitation / enviromental health, and access to health services is limited. The root of the problem is closely related to the low level of education, income level, family poverty. The short term impact of this condition is increased morbidity, while the long term impact is low quality of human resources for the future generations looking from intelligence, creativity, and productivity [4].

Efforts to solve the problem of malnutrition and under nutrition which has been done is by supplementary feeding. Specifications of the type of food provided, among others with the requirement of adequate nutritional composition at least 1/3 of the needs of 1 day, that is energy 350 – 400 calories and 10-15 gram protein.

Modisco (Modified Dried Skimmed Milk and Coconut Oil) is a highly nutritious formula, rich in energy and protein that consist of skim milk or full cream, sugar and oil or margarine. Modisco has been tested and meets special dietary requirements for toddlers so that can be used

to improve nutritional status, PMT, or gaining weight of a toddler quickly [5]. Lahdji research, et al (2016) shown that by providing modisco can improve the nutritional status of toddlers in Purworejo Regency [6]. Case study in Jombang Regency shown that there was a difference between toddlers that giving modisco PMT and BGM toddlers who has not giving modisco [7].

Kelor (Moringa Oleifera) is one of local food that nutrient dense. Fuglie research (2001) mentions that moringa contains vitamin A, vitamin C, vitamin B, Calcium, Potassium, Ferrum, and Protein in very high numbers and easy to digest and also assimilated by the human body [8]. The addition of moringa leaf flour ingredients into the modisco can add vitamins and minerals that toddlers needed. Based on these, this research aims to describing organoleptic properties and acceptability of modisco with moringa leaf flour. And also determine the percentage of moringa leaf flour addition. And also determine the exact percentage of moringa leaf flour addition in order to get the preferred medisco formula.

## 2. Reference Review

Modisco (modified disco), is a modification of 'Disco 150', a high calories beverage (100 kal) whose formula consist of 7, 85 grams of skim milk, 4,73 grams of sugar, and 5,93 grams of cottonseed oil, that used to treat severe nutritional disorders or lack of protein energy for children [5]. Modisco is effective for children because the portion of food or beverage is relatively small, however it contains calories and high protein, it easy to digest because ir consist of vegetable fat and medium fat chain, is an alternatif way for the children who doesn't like milk, and also can increase weight quickly which is 30-100 grams per day. Medisco is very good to give to children who suffering malnutrition, chronic disease, children who are recovering from a serious illness, children who have difficulty eating due to congenital abnormalities and additional food for the children who have health body but still thin.

Kelor (Moringa Oleifera) is thought to have origins in Agra and Oudh, located in northwestern India, the southern himalayan mountain region, but now thrives in tropical regions of the world. All of parts of the moringa tree are edible and has long been consumed by the humans [9]. According to the Fuglie research results (2001) mentions that Moringa contains vitamin A, vitamin B, calcium, mpotassium, and very high amounts of protein and easy to digest and as assimilated by the human body [8]. Moringa is also known that contain more than 40 antioxidants [10]. Yunita research (2017) shown that by giving moringa leaf modification biscuits and cork fish has an effect on improving the nutritional status of toddlers [11].

Sensory testing also known as organoleptic testing, has existed since humans began using their senses to assess the food or beverages quality and safety. Sensory testing involves humans not only as the analysis object, but also as a determinant of the results or data obtained by prioritizing scientific methods to explain sensory phenomena. Sensory analysis is very important in food products, if it doesn't taste good, then the nutritional value can't be utilized because nobody consumes [12].

## 3. Method

It is an experimental research. Study design using a completely randomized design with two repetitions which consist of one factor is the proportion of the addition of Moringa flour to Modisco ingredients. The proportion consists of three levels 2,5%, 5% and 7,5% from the initial weight of the Modisco material. This research was carried out in the Culinary and Diet Laboratory, Clinical Nutrition Study Program, Politeknik Negeri Jember. Organoleptic tests performed on this Modisco product are carried out through descriptive tests and acceptance tests. The descriptive test data collection instruments using a hedonic quality test form, while instrument of acceptance test data collection using hedonic test forms. Descriptive test results were presented by using the average (mean), while the acceptance test result has been analyzed by using statistic test with Kruskall – Wallis test, that following by the Mann Whitney test, if there is a significant difference at  $\alpha = 5\%$ .

#### 4. Result and Achieved Output

The main raw materials used to make Modisco are skim milk flour and Moringa flour. Other ingredients that used as supporting materials include sugar and vegetable oil. Treatment in the manufacture of Modisco products is the addition of Moringa flour that made as many as three types of treatment levels. Third types of level (2,5%, 5 %, and 7,5%) made based on the same composition of skim milk flour, vegetable oil and sugar and the different moringa flour as a treatment obtained through a trial and error process. The ratio is the percentage of Moringa flour to the total ingredients used.

##### a. Organoleptic Test

Organoleptic test or commonly called as sensory test is the way of testing by using the human senses as the main tool for measuring the acceptability of the product consisting of texture, color, shape, aroma, taste of the food product [13][14]. Organoleptic test aims to determine the quality characteristics of the food product according to the panelist perceptions and to find out levels of pleasure and panelist acceptance of the product that being tested [15]. Organoleptic properties assessment methods differentiated based on the purpose of organoleptic quality assessment that is differentiation test (discriminative test), acceptance test (affective test) and description test (descriptive test) [16]. Organoleptic test which has done on Modisco products conducted through descriptive tests and acceptance tests that is hedonic test which includes attributes : color, aroma, taste, and thickness.

##### 1) Color

Table 1. Description test results and color attribute hedonic test

Moringa Flour Addition	Description Test	Hedonic Test	<i>p value</i>
2,5%	2,41	3,67	0,000
5%	1,77	3,52	
7,5%	1,63	2,92	

Description:

Description test :1= very dislike, 2= dislike, 3=normal, 4=like, dan 5= really like.

Hedonic test :1=Yellowish dark green, 2= Yellowishlight green, 3=Brownish light yellow, 4=Brownish light yellow, 5=Brownish dark yellow

The color that contained in a food comes from a number of certain pigments that found in these materials. The strongest pigment will give a dominant color to the food [17]. The food color is determined by several natural pigments, such as chlorophyll in green dyes [18]. The average panelist's assesment of the color attribute is between the color of yellow - yellowish dark green to almost yellowish light green (1,63-2,41). The increasing of green color in modisco is influenced by the increasing concentration of Moringa leaf flour addition, because Moringa leaf contain chlorophyll or green pigment that is usually found in green vegetables [19].

Table 1 explained the average hedonic test score of modisco color attribute on the addition of 2,5%, 5%, and 7,5% Moringa flour respectively is (3.67, 3.52. and 2.92). These results illustrate that the addition of Moringa flour, tends to make panelists give a hedonic test assessment of the modisco color attribute towards dislike. Kruskal Wallis test results showed  $p$ -value (0,000) < (0,05), it means that there is a difference in the hedonic test values on the color attributes of the addition of Moringa flour.

The results of Mann-Whitney test between modisco color attributes with the addition of 2,5% and 5% Moringa flour ( $p$ -value=0,000) and also 5% and 7,5% ( $p$ -value=0,000). The Mann-Whitney test result can be interpreted that panelists assess the color of modisco with addition of 2.5% Moringa flour as the same as the color of modisco with 5% Moringa flour. However, the panelists assess the color of modisco with the addition of 2,5% Moringa flour and 5% is different from the color of modisco with the addition of 7,5% Moringa flour. It shown that the higher composition of addition Moringa flour can increasing the green color in Modisco, so that it tends to make panelist dislike the color.

Color is the first organoleptic attribute that seen by consumers in consuming a product [20]. Color characteristics play an important role in the choice of food to be consumed [21]. Because the color is the most important intrinsic cues in terms of assign people's expectation about food and beverage taste of possibility [22]. So, it can be concluded that if someone is interested in modisco color, then most likely that person has a good expectations of the taste of modisco.

2) Aroma

Table 2. Description test results and aroma attribute hedonic test

Moringa Flour Addition	Description Test		Hedonic Test	<i>p value</i>
	Unpleasant Aroma	Milk Aroma		
2,5%	3,51	2,64	3,89	0,000
5%	3,07	3,14	3,32	
7,5%	2,53	3,20	3,06	

Description:

Description test : 1= very dislike, 2= dislike, 3=normal, 4=like, dan 5= really like.

Hedonic test: 1=very strong, 2=strong, 3=normal, 4=weak, 5=very weak

Aroma is a smell that caused by chemical stimuli that were smelled by olfactory nerves that are in the nasal cavity [23]. Odor is a response when volatile compounds from a food enter the nasal cavity and it felt by the olfactory system. Volatile compounds enter the nose when the humans breathe or inhale, but can also enter from the back of the throat while someone eats [24]. The average panelist's assessment of the milk aroma attribute between weak to almost strongly scented (2.53-3.51). While the average panelist's assessment of the milk aroma attribute between moderate to almost strongly scented (2.64-3.20). The smell of milk is caused by the main raw material used to make modisco is skim milk flour. The weakening aroma of milk is influenced by an increase in the concentration of Moringa leaf flour. It is known that the basic aroma of Moringa leaves is unpleasant [25].

Table 2 explains the average hedonic test scores of the Modisco aroma attribute on the addition of 2.5%, 5% and 7.5% Moringa flour, respectively (3.89, 3.32, and 3.06). These results illustrate that the addition of moringa flour, tends to make panelists give hedonic test assessments on the modisco aroma attribute to dislike. The results of the kruskal wallis test show the  $p$ -value ( $0,000 < (0,05)$ ), it means that there is a difference in the hedonic test values on the aroma attribute on the addition of Moringa flour.

The results of the Mann-Whitney test between the modisco aroma attributes with the addition of Moringa flour 2.5% and 5% ( $p$ -value = 0,000), 2.5% and 7.5% ( $p$ -value = 0,000) and 5% and 7.5% ( $p$ -value = 0.129). Mann-Whitney test results can be interpreted that the panelists assess the aroma of modisco by adding 2.5% Moringa flour different from the aroma of Modisco by the addition of Moringa flour 5% and 7.5%. It can be concluded that panelists tend to prefer aroma in modisco with the addition of 2.5% Moringa flour compared to Modisco with the addition of 2.5% and 7.5% Moringa flour. It shown that the higher composition of Moringa flour which is added will increase the unpleasant aroma and will be weaken the aroma of milk in Modisco, so that it tends to make the panelists dislike the aroma.

The aroma of food forms an important sensory signal and is a fundamental component when a person perceives taste [26]. Food quality is attractive and appetizing, when the aroma is accepted or liked by consumers [27]. Based on the research by Nurlina et.al (2015) showed that food has a distinctive aroma is preferred by consumers [28]. So it can be concluded that the preferred modisco aroma will arouse the taste and it is likely that the person has a good perception of the taste of the modisco, so it will consume it.

3) Taste

Table 3. Description test results and taste attribute hedonic test

PenambahanTepunKelor	Uji deskripsi			Uji hedonik	<i>p value</i>
	Rasa pahit	Rasa manis	Rasa gurih		

2,5%	4,35	2,78	3,09	3,88	0,000
5%	3,79	3,01	3,55	3,34	
7,5%	3,59	3,12	3,68	3,17	

Keterangan :

Description test : 1= very dislike, 2= dislike, 3=normal, 4=like, dan 5= really like.

Hedonic test : 1=very strong, 2=strong, 3=normal, 4=weak, 5=very weak

Taste perception is a sensory response to nerve stimulation, such as bitter or sweet taste sense [29]. The average of panelist ratings on modisco with the addition of Moringa flour 2.5%, 5% and 7.5% have values of 4.35, 3.79 and 3.59. The average panelist's evaluation of the sweet to medium attribute was moderate to strong (2.78-3.12). The average panelist's assessment of the sweet to medium attribute is almost towards strong (3.09-3.68). Moringa leaves have a slightly bitter taste but are not poisonous [30]. So that the higher composition of added Moringa flour will increase the bitter taste in Modisco. Sweet taste is caused by the supporting material used to make modisco is sugar. While the savory taste caused by the main ingredients and supporting materials used to make modisco are milk flour, sugar and vegetable oil.

Table 3 explains the average hedonic test scores of the Modisco taste attribute on the addition of 2.5%, 5% and 7.5% Moringa flour respectively (3.88, 3.34, and 3.17). These results illustrate that the addition of moringa flour, tends to make panelists give hedonic test ratings on the modisco taste attribute to dislike. The results of the kruskal wallis test showed the p-value (0,000) < (0.05), meaning that there is a difference in the hedonic test values on the flavor attributes on the addition of Moringa flour.

The results of the Mann-Whitney test between the modisco taste attributes with the addition of Moringa flour 2.5% and 5% (p-value = 0,000), 2.5% and 7.5% (p-value = 0,000) and 5% and 7.5% (p-value = 0.295). Mann-Whitney test results can be interpreted that panelists assess the taste of Modisco with the addition of Moringa flour 2.5% different from the taste of Modisco with the addition of Moringa flour 5% and 7.5%. It can be concluded that panelists tend to prefer the taste of Modisco with the addition of Moringa flour 2.5% compared to Modisco with the addition of Moringa flour 2.5% and 7.5%. The higher composition of Moringa flour which is added will increase the bitter taste, and weaken the sweet and savory taste in Modisco. So that the addition of the modisco flour concentration tends to make the panelists dislike the taste of the modisco.

One factor that determines the quality of food is the content of flavor compounds. Taste compounds are compounds that cause taste sensations [31]. Foods that already have good taste, will have a good impact on the acceptability of the food. Besides the taste of food plays an important role in determining whether or not the food served [32]. This is supported by Sitoayu and Trisia's 2016 research which shows that taste is a dominant factor in influencing food acceptability compared to favorite foods and appetites [33]. So it can be concluded that Modisco's taste has an important influence in determining the acceptability of the Modisco in society. So that modisco which has good taste tends to be liked and will be consumed by the community.

#### 4) Viscosity

Tabel 4. Hasil uji deskripsi dan uji hedonikatributkekentalan

PenambahanTepunKelor	Uji deskripsi	Uji hedonik	p value
2,5%	3,55	3,28	0,116
5%	3,31	3,46	
7,5%	3,20	3,18	

Keterangan :

Uji deskripsi : 1= very dislike, 2= dislike, 3=normal, 4=like, dan 5= really like.

Uji hedonik : 1= very thick, 2=thick, 3=normal, 4=aqueous, 5=very aqueous

Viscosity is closely related to the water content of a food product. If the water content is low then the texture will be thicker [34]. The average panelist's rating on Modisco with the addition of

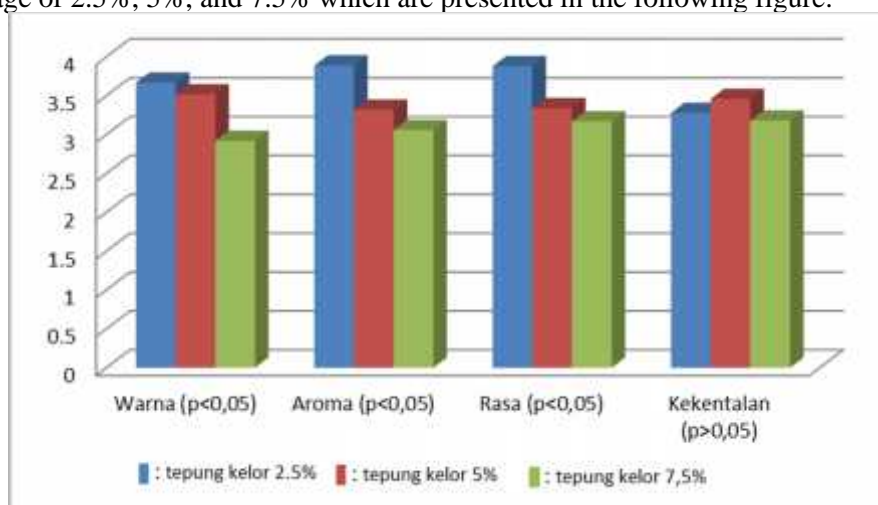


2.5% Moringa flour has a value of 3.55 which means that it has a viscosity level that is almost headed for water. While the average panelist rating on Modisco with the addition of Moringa flour 5% and 7.5% has a value that is not much different that is 3.31 and 3.20 means it has thickness on a medium scale. The results of the kruskal wallis test show the p-value ( $0.116 < (0.05)$ ), meaning that there is no difference in the hedonic test values on the viscosity attribute on the addition of Moringa flour. The test results shown that the panelists assess the thickness of Modisco with the addition of 2.5% Moringa flour with the thickness of Modisco with the addition of Moringa flour 5% and 7.5%. So it can be concluded that the panelist preference assessment of the modisco thickness with the addition of 2.5%, 5% and 7.5% Moringa flour is the same.

The perception of the viscosity attribute of food is determined by the viscosity of the food itself, the grains felt, the sweetness and moistness in the mouth which is felt in three phases namely the bribery phase, the mastication phase and the residual phase [24]. Jaworska et.al (2005) states that the thickness or texture influences consumers' interest in a food product [35]. This is supported by the results of research by Werthman et.al (2014) which shows that there is a significant influence between food texture and food acceptability [36]. So it can be concluded that the modisco thickness has an important role in influencing one's acceptance. The more someone likes the texture or thickness of the modisco phoemulation, then the person will be more interested in consuming the modisco again.

b. Determine the percentage

Determine the percentage of addition on Moringa leaf flour is done by comparing the average hedonic test results and the results of the significance test on the addition of Moringa flour with a percentage of 2.5%, 5%, and 7.5% which are presented in the following figure.



Picture 1. The average of hedonic test result and significant test result

The significance test results on the addition of Moringa flour showed that there were different acceptance (preferences) of the three organoleptic attributes namely color, aroma and taste. Where in the three attributes the percentage level of Moringa flour addition of 2.5% is preferred compared to the level of percentage of addition of Moringa flour 5% and 7.5%. Overall external and internal attributes can affect consumer preferences. External appearance attributes such as shape, color and smell give an impression to consumers which can attract them to try or buy a food product *sutu*. While internal attributes such as taste can influence consumers to consume or buy these products again [37]. It can be concluded that external and internal attributes can influence consumers to consume Modisco formula with the addition of Moringa flour. While the level of addition of Moringa flour which is most preferred or accepted by panelists based on external and internal attributes in this study is the modisco formulation with the addition of 2.5% Moringa flour.

## 5. Conclusion

The higher composition of Moringa flour which is added can increase green color, unpleasant aroma and bitter taste so that it can be weaken the aroma of milk, sweet taste and savory taste in Modisco. So that, the higher composition of Moringa flour is added tend to make panelists doesn't like these attributes. The percentage of the addition of Moringa flour which is most preferred or accepted by panelists based on external and internal attributes in this study is Modisco formulation with` 2,5% Moringa flour.

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