

Natural Color Additive as a Substitute for Rhodamine B Synthetic Color Additive Used in Ice Cream Sold In Lampeunurut Village, Aceh Besar District, Indonesia

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ABSTRACT

Ice cream is a processed milk product that is made by freezing and mixing raw materials together. The making of ice cream usually uses additives including leavening agents, stabilizers and color additives. This study aims to determine the substitute for Rhodamine B as a food additive in ice cream sold in Lampeunurut Village, Darul Imarah Sub-District, Aceh Besar District. This was an experimental study which used a completely randomized design (CRD) which was conducted in 3 treatments and 3 repetitions. The study object was ice cream which was sold by 3 ice cream vendors, each trader was taken as the study sample. The study method used thin layer chromatography test followed by the development of study, namely organoleptic and variance tests. The results of the study showed that there was an effect of natural color additive using dragon fruit on the acceptability of ice cream. Meanwhile, natural color additive using durian fruit for ice cream showed no difference ($p = 0.102$) in the acceptability of ice cream in the formulations of 5%, 10%, and 15%. The most appropriate formulation for the acceptability of ice cream flavor was the formulation with 10% addition of dragon fruit to the aroma, taste and texture. It is expected that consumers will be able to recognize food and beverages sold which contain Rhodamine B and ice cream manufacturers is promoted to use color additive sourced from fruits in making ice cream.

Keywords: Natural color additive, Rhodamine B, Ice cream

INTRODUCTION

Health development is an integral part of the national development. The goal of health development is to increase the awareness of healthy living for everyone to realize an optimal degree of public health. One of the factors influencing the increase in health status is the provision of food and beverages that meet health requirements¹.

Food safety is an important requirement that must exist in the food to be consumed by every human being. Quality and safe food consumed can come from household kitchens or from the food industry. Therefore, the food industry is one of the determinants of the development of food that meets the quality and safety standards set by the government. Nowadays, there is a very remarkable change in food processing since it is supported by the development of science and technology. The amount of ingredients added to food and drink, for example rhodamine B which is widely used for coloring drinks and this is done for various purposes.

Food that is good and meeting health requirements is one element to achieve optimal levels of public health since it does not contain ingredients that are detrimental to health. Food is a basic human need that is needed for sustainable growth and life. Therefore, food consumed by humans must be nutritious, hygienic and safe.²

One type of food that is widely consumed and circulates in the community is ice cream. Ice cream is a very popular frozen snack throughout the world among both children and adults. Ice cream sold in public places is standard type of ice cream or also called economy ice cream.³

Ice cream is a processed milk product that is made by freezing and mixing raw materials together. Ingredients used are a combination of milk with additives such as sugar and honey or without flavoring and color ingredients, and stabilizers. A mixture ingredient of ice cream is called ice cream mix (ICM). The proper ingredients mixing and the correct processing will produce good quality ice cream.⁴

The nutritional value of ice cream is very dependent on the nutritional value of the raw materials used. To make ice cream with high quality, the producer must certainly know the raw materials, and milk should be used as the main ingredient in making ice cream. Then, the ice cream will have the largest contribution due to its nutritional value. Behind the softness and sweet taste, ice cream is proven to have some unexpected nutritional facts. The superiority of ice cream is supported by its main ingredients namely nonfat milk and milk fat, and ice cream is almost perfect with complete nutritional content.⁵

The making of ice cream usually use additional ingredients, namely the leavening agent and stabilizer. For the leavening agent, baking powder (sodium bicarbonate) can be used to increase the volume and lighten the texture of food such as ice cream. Other function of the leavening agent when added to the ice cream mixture is that sodium bicarbonate reacts with acids and is also used as a drug to neutralize excessive stomach acid¹.

Food Additives are compounds (or mixtures of various compounds) that are intentionally added to food and beverages in the processing, packaging and storage processes and are not the main ingredients. These food additives can be preservatives, colorings, sweeteners, flavorings,

antioxidants, anti-emulsifiers, and emulsifiers.⁶

Food color additive is the most interesting group of food additives because often the color of a food or beverage product determines consumer interest. There are natural color additives such as carotene and some are synthetic. Synthetic additives are widely used in food ingredients in accordance with EU directive No.94/36/WE which allows the use of dyes.⁷

The use of artificial or natural color additive can cause health problems. Prohibited dyes can poison the kidneys and can cause liver dysfunction and cancer because they are textile dyes. If the use of synthetic dyes exceeds a predetermined limit it may cause health problems such as tumors, hyperactivity in children, cause effects on the nervous system, allergies and also inflammation of the mucous membranes in the nose, back pain, vomiting and digestive disorders.⁸

The Ministry of Health has promoted the use of Food Additives which are permitted in the process of producing food and beverages, as stipulated in the Minister of Health Regulation No.033/2012 concerning Food Additives which emphasizes safety aspects. In addition to regulating the safety and nutritional quality aspects, this regulation also encourages the creation of honest and responsible trade and the realization of an affordable level of food sufficiency according to the needs of the community.⁴

A test was carried out by the Semarang Consumer Development and Protection Institute (LP2K) on the snacks of children sold in the city of Semarang, to reveal the chemical composition, especially to find out the color additive. The results of analysis of these snacks have found prohibited color additive including rhodamine B (43.10%), methanol yellow (12.07%) and green dyes (1.7%)⁹

In addition, the Bandar Lampung Food and Drug Supervisory Agency (BBPOM) also conducted a study on snacks for school children in June 2012. Of the 156

samples studied there were 29 samples containing rhodamine B (BPOM, 2012). Therefore it is necessary to carry out continuous monitoring on the existence of synthetic color additive in various food products consumed by the public. Analysis of synthetic color additive can be done both qualitatively and quantitatively using paper chromatography method and UV-Visible spectrophotometry.²

Based on a preliminary study conducted in January 2019 among 5 ice cream traders around Lampeunurut Village, Darul Imarah Sub-District, Aceh Besar District, it was found that ice cream which is generally white was given a varied appearance and were made in various colors. Ice cream sold by traders around Lampeunurut Village was ice cream with economical quality because the price was relatively cheap compared to standard, premium or super premium quality ice cream. This ice cream was put in a barrel-shaped container and sold around on a motorcycle. This kind of ice cream was served to consumers in cone-shaped containers made of processed flour with a crispy taste. Based on the results of the interviews with a number of traders, the ice cream sold was processed by the home industry. Based on the assumptions of the researchers on home industry, the regulation of the color additive used was still unclear. So, it is feared that the products might contain color additives that can endanger the health of the people who consume them both regarding the types and levels of the color additives used. This can be seen from the striking bright color of ice cream that was sold by some traders.

The procedure of making snacks performed by sellers used food additives such as artificial color additive which levels were not certainly determined and the main purpose was to produce attractive looks of snacks even though there was no nutritional content. This practice was due to the price of artificial color additive was more affordable and their knowledge of the dangers of hazardous food additives was

still low. The negative effects caused by snacks containing artificial color additive among school students who liked to buy snacks on the streets including stomachache after consuming snacks that might contain artificial color additive. This can be very crucial so that it needs concern of many parties including the government, schools and parents. Lack of attention and supervision can lead to serious health problems.

Based on the above phenomenon, the authors are interested in conducting a study entitled "Natural Color Additive as a Substitute for Rhodamine B Synthetic Color Additive used in Ice Cream sold in Lampeunurut Village, Darul Imarah Sub-district, Aceh Besar District".

METHODS

This was an experimental study which used a completely randomized design (CRD) which was conducted in 3 treatments and 3 repetitions which aims to make a systematic, factual, and accurate figure of the Rhodamine B artificial dye used in icecream through thin layer chromatography method to identify the content of Rhodamine B artificial dye and to develop natural color additive as a substitute for Rhodamine B used in ice cream through Organoleptic Test by measuring people's acceptance.

1. Stage I

This study included several stages, nam. The first stage was the physical test on ice cream. The examination of artificial color additive contained in ice cream samples as a snack food in the Lampeunurut Village, Darul Imarah Sub-District, Aceh Besar District used a layer paper chromatography method which aims to observer Rhodamine B dyes contained in the ice cream samples.

a. Study tools

The equipment used in this study were:

- Erlenmeyers of 250 ml, 500 ml, dan 1000 ml
- Beaker Glasses of 100 ml dan 1000 ml

- Glass funnel
- Pipette
- Stirring bar
- Measuring cup
- Analytic Scale
- Hot plate
- Fat-free wool yarn
- Filter paper
- Chromatographic paper

b. Study materials

Materials used in the study were:

- Ice cream
- Acetic acid
- Ammonia
- 70% Ethanol
- Food color additive (Rhodamine B) standard solution
- Distilled water
- Elution solution (n butanol: ethyl acetate: ammonia = 10: 4: 5)

c. Chromatography Test

- a. Sample was weighed as much as 10 grams and put into a 100 ml beaker, then soaked in 20 ml of 2% ammonia solution (which was dissolved using 70% ethanol),
- b. Then the filtrate is filtered out of the solution using filter paper
- c. The solution was transferred to the beaker glass and then heated on a hot plate
- d. The residue from evaporation was dissolved in 10 ml of acidic water (an acidic solution was prepared by mixing 10 ml of distilled water and 5 ml of 10% acetic acid.
- e. Wool yarn with a length of 15 cm was put into an acid solution and boiled for up to 10 minutes, the color additive will dye the wool yarn, then the wool yarn was removed and washed with water until clean.
- f. Then the wool yarn was put into a basic solution of 10 ml of 10% ammonia (dissolved in 70% ethanol) and boiled.
- g. Wool yarn will release the color, the dye will enter the base solution.

h. The obtained base solution will then be used as a sample in chromatographic analysis.

i. Spot the concentrate on chromatographic paper (2 cm from the bottom edge of the paper).

j. The paper was put into a vessel that had been given an elution solution.

k. The calculation/determination of the dye was performed by measuring each spotted concentrate, by dividing the distance of the solute by the distance of the solvent. If there is a gap in the spotted concentrate, it means that the dye was Rhodamine B.

2. Stage II

Next study included the testing phase of ice cream making by adding natural color additive into ice cream. The basic tools in used this study were: Scales, hand mixers, pans, pirex, stainless bowls, ingredients containers, plastic cups/cone, filters, spatulas, ice cream scoops, wooden spoons.

a. Experimental design

Experiment with 3 levels of treatment and 3 repetitions. The treatment was a comparison of ice cream study with the addition of durian, dragon fruit and Strawberry fruit with different concentrations. The study consisted of 9 levels of treatment namely 5%, 10%, and 15%. The details of the treatment were as follows:

- a. 500 grams of Starch + 3 Kg of Sugar + 3 cans of Carnation Milk, 10 pieces of Vanilla + 2 Eggs + 1 Bread Hungkwe + 10 Kg of Salt + block of Ice Cube + 10 Coconuts + 500 grams of Durian/Dragon Fruit/Strawberry.
- b. 500 grams of Starch + 3 Kg of Sugar + 3 cans of Carnation Milk, 10 pieces of Vanilla + 2 Eggs + 1 Bread Hungkwe + 10 Kg of Salt + block of Ice Cube + 10 Coconuts + 1000 grams of Durian/Dragon Fruit/Strawberry.
- c. 500 grams of Starch + 3 Kg of Sugar + 3 cans of Carnation Milk, 10 pieces of Vanilla + 2 Eggs + 1 Bread Hungkwe + 10 Kg of Salt + block of Ice Cube + 10

Coconuts + 1500 grams of Durian/Dragon Fruit/Strawberry.

b. Study procedure

The study was conducted in accordance with the procedures of material preparation, material processing to the analysis stage of the study variables as shown in Figure 1.

- Preparation Stage
 1. Durian/dragon fruit/strawberry was peeled and washed thoroughly
 2. Durian/dragon fruit/strawberry was blended and weighed
- Ice Cream Making Stage
 1. The ingredients were all mixed into the Boat Barrel (assembly machine from the seller) which had been prepared and were stirred with a wooden stirrer. There was a space to put ice cubes up to 80 percent between the mixture and the output of the boat barrel, then more salt was put on ice cubes until reached 15% more
 2. The mixture was rotated with a boat barrel until ice crystals were formed and the texture of ice cream was soft and shiny
 3. More salt was added when reduced, because salt acts as an ice emulsifier to form ice cream, keep stirring and avoid lumps forming
 4. Blended dragon fruit/durian, strawberry was added/dissolves and put into the ice cream mixture until the ice cream mixture was evenly distributed and ready to sell.

This was a study with an organoleptic trait which included: Taste, aroma, texture, color. The panelists worked in quality testing were rather trained panelists who provided an assessment on the parameters of taste, aroma, texture and color. Test on the quality of ice cream was performed with the addition of dragon fruit using 30 rather trained panelists. Each panelist filled out a quality test form. The panelists provided an assessment based on criteria determined in the quality test. Quality test was performed for taste, aroma,

texture, and color. The terms of the panelists were healthy body condition and those who were not smoking.

RESULTS

Lampeunurut Village was used as a study site and has been established since the Dutch era. The Lampeune Village government is led by the geuchik since the Village has been established as a figure in the history of the village government. According to the story of the village elders, there is no certainty when this village has actually been established.

The governance system of Lampeunurut Village is based on existing patterns/cultures and formal regulations that have been common since ancient times. Village government is led by a geuchik and assisted by two geuchik representatives because at that time there was no government structure in the village with the same function as the hamlet head at this time, Imum Mukim has a fairly strong role in the governance of the village, namely as a good adviser in setting a policy at the level of the village government and in deciding a custom decision.

Tuha Peut becomes a part of the village advisory institution. Tuha Peut also has a very important role and authority in giving consideration to the decisions of the Village, monitoring the performance and policies taken by the geuchik. Imum meunasah has a role in organizing religious activities.

Lampeunurut village is located in Darul Imarah Sub-District, Aceh Besar District with an area of ± 110 ha. Administratively and geographically, the borders of Lampeunurut Village are as follows:

- The north side is bordered by Lamcot Village
- The south side is bordered by the Lamblang Trieng Village
- The west side is bordered by Lampeunurut UB Village
- The East side is bordered by Lamreung Village

Based on village government administration data, the population of Lampeunurut Village was 1025 inhabitants. The number of male population was 450 people, while the number female population was 575 people.

1. Test Results Using Thin Layer Chromatography Method

The assessment of ice cream samples that were studied at the Center for Drug and Food Supervision in Banda Aceh using the thin layer chromatography method obtained the following data:

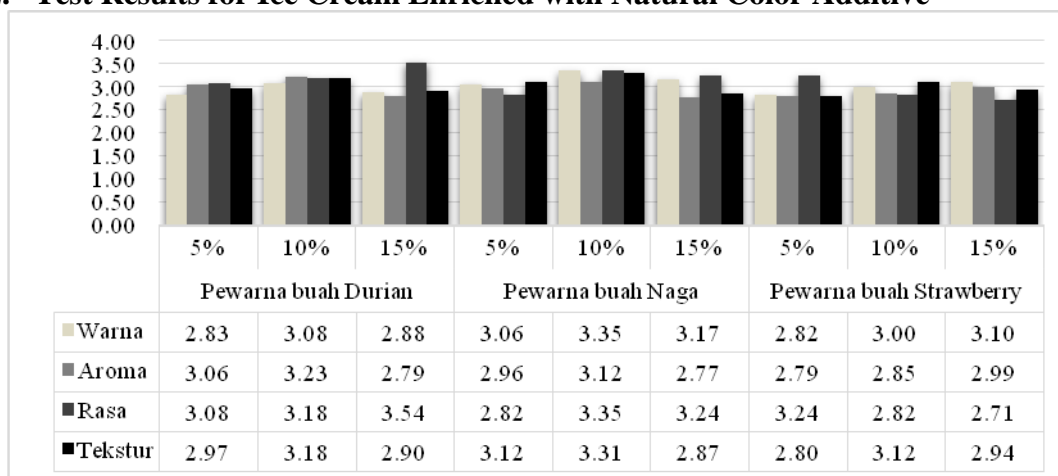
Table 1: Examination of Rhodamine B content in Ice Cream sold in Lampeunurut Village, Aceh Besar District

Sample	Test Parameter			Observation result
	Physics	Result	Chemistry	
Red Ice Cream	Shape Color Taste Smell	Semi-liquid Red Normal Normal	Rhodamine B identification	(+) Positive
Purple Ice Cream	Shape Color Taste Smell	Semi-liquid Purple Normal Normal	Rhodamine B identification	(-) Negative
Pink Ice Cream	Shape Color Taste Smell	Semi-liquid Pink Normal Normal	Rhodamine B identification	(-) Negative

Source: Study results in 2019

Based on the results of Rhodamine B examination in ice cream samples with 3 color samples and three flavors, it was shown that the positive content of Rhodamine B was identified in red ice cream sold in Lampeunurut Village, Darul Imarah Sub-District, Aceh Besar District.

2. Test Results for Ice Cream Enriched with Natural Color Additive



Graph 1: Distribution of Test Results for Ice Cream Flavor Tests Enriched by Natural Color Additive According to Treatment Concentrations

Table 2. Test results for Ice Cream Enriched with Natural Color Additive (Durian, Dragon Fruit and Strawberry)

Color Additive in Ice Cream	Concentration	Color			Aroma			Taste			Texture		
		Mean	SD	p	Mean	SD	p	Mean	SD	p	Mean	SD	p
The color of Durian	5%	2.83	0.61	0.0330	3.06	0.56	0.006	3.08	0.48	0.003	2.97	0.63	0.295
	10%	3.08	0.81	.	3.23	0.58		3.18	0.67		3.18	0.62	
	15%	2.88	0.61		2.79	0.40		3.54	0.40		2.90	0.65	
The color of dragon fruit	5%	3.06	0.57	0.102	2.96	0.51	0.021	2.82	0.48	0.000	3.12	0.49	0.008
	10%	3.35	0.46		3.12	0.42		3.35	0.51		3.31	0.46	
	15%	3.17	0.54		2.77	0.50		3.24	0.56		2.87	0.64	
The color of Strawberry	5%	2.82	0.43	0.102	2.79	0.33	0.240	3.24	0.56	0.000	2.80	0.69	0.126
	10%	3.00	0.54		2.85	0.52		2.82	0.48		3.12	0.49	
	15%	3.10	0.58		2.99	0.49		2.71	0.42		2.94	0.64	

Information:

SD = Standard Deviation value

p = Anova Test Results, to assess the differences in the concentration of each fruit as a natural color additive used in Ice Cream

Anova analysis results (table 1) showed the treatment of making Ice Cream with the addition of 5%, 10% and 15% durian on the Color, Aroma, Taste and Texture as presented in the table above. With CI: 95%, it turned out that only Aroma ($p = 0.006$) and Taste ($p = 0.003$) that had a significant difference ($p < 0.05$) regarding the acceptability of ice cream with by adding 5%, 10% and 15% of durian. Meanwhile, the color ($p = 0.330$) and texture ($p = 0.200$) had no acceptability difference in ice cream making by adding of 5%, 10% and 15% of durian. The most obvious acceptability of the 5%, 10% and 15% formulation treatments were on the aroma and taste of durian ice cream, then Bonferoni and Duncan tests were performed.

Then the results of favorite test on Ice Cream by adding 5%, 10% and 15% dragon fruit to the color, aroma, taste and texture of the ice cream are presented in Table 1. Based on these results, it turned out that the treatment of adding Dragon Fruit by 5%, 10% and 15% in making ice cream had a significant difference in terms of aroma ($p = 0.021$), taste ($p = 0.000$), and texture of ice cream ($p = 0.008$). Meanwhile, the color did not show differences between the three treatments ($p = 0.102$). Thus, further test should be carried out to measure which

treatments were very significant for differences between groups (the addition of Dragon Fruit by 5%, 10% and 15%) on the aroma, taste and texture. Further test used was the Duncan test on CI: 95%.

The Anova test results on the Ice Cream flavor test with the addition of Strawberry with the treatments of 5%, 10% and 15% are presented in table 1. The results indicated that the addition of Strawberry by 5%, 10% and 15% in the Ice Cream flavor test only showed a difference in the Taste of Ice Cream with a p value = 0.000. Meanwhile, in terms of Ice Cream Color, Aroma and Texture there was no significant difference ($p > 0.05$). To find out the best treatment among the three treatments (5%, 10% or 15%) on the acceptability of the Strawberry Ice Cream Flavor, then further test were performed namely Bonferoni and Duncan Tests. The results are presented below.

The following table 2 presents a further test (Post Hoc test) in determining the treatment which had the best acceptability value in making ice cream using natural color additive. The treatment was the addition of natural color additive concentrations by 5%, 10% and 15%. Natural color additives used here were durian, dragon fruit and strawberry.

Table 3. Post Hoc Multiple Comparisons Test Results in Natural Ice Cream Color Additive Concentrations of 5%, 10% and 15%

Ice Cream Color Additive	Treatment (i) – (j)	Color		Aroma		Taste		Texture	
		Mean Difference (i – j)	p	Mean Difference (i – j)	p	Mean Difference (i – j)	p	Mean Difference (i – j)	p
The color of Durian	5% - 10%	-0.25	0.482	-0.18	0.575	-0.09	1.000	-0.22	0.566
	5% - 15%	-0.05	1.000	0.26	0.159	-0.46	0.003	0.07	1.000
	10% - 15%	0.20	0.782	0.44	0.005	-0.37	0.024	0.57	0.260
The color of dragon fruit	5% - 10%	-0.29	0.104	-0.16	0.564	-0.52	0.000	-0.18	0.565
	5% - 15%	-0.11	1.000	0.19	0.399	-0.41	0.008	0.26	0.200
	10% - 15%	0.10	0.560	0.56	0.017	0.11	1.000	0.44	0.006
The color of Strawberry	5% - 10%	-0.18	0.525	-0.05	1.000	0.41	0.005	-0.32	0.129
	5% - 15%	-0.29	0.106	-0.19	0.309	0.52	0.000	-0.14	1.000
	10% - 15%	-0.10	1.000	-0.14	0.707	0.11	1.000	0.18	0.742

Information:

(i) (j) = Treatment group at a concentrations of 5%; 10%; and 15%

p = Post Hoc Multiple Comparisons Test Results, to assess the treatment with the best acceptability for each addition of fruit as a natural color additive used in Ice Cream

Based on the results of the study as presented in table 2, it was shown that the addition of natural color additives namely

Durian, Dragon Fruit and Strawberry with 5%, 10% and 15% treatments did not show the mean difference in color preference ($p >$

0.05), and regarding the texture of the three treatments (5%, 10% and 15%), only the addition of 10% concentration of Dragon Fruit showed a significant difference ($p < 0.05$).

Public acceptance of the aroma of ice cream with the addition of natural color additive also showed a significant difference to the addition of Durian and Dragon Fruit between the concentration of 10% and 15% ($p < 0.05$), where the addition of a concentration of 10% had better acceptability for the aroma of ice cream with natural color additive sourced from Durian and Dragon Fruit.

Meanwhile, in terms of the taste of ice cream added by natural color additive, the results of the study (table 2) showed that all natural color additive (Durian, Dragon Fruit, and Strawberry) were well accepted regarding the taste of ice cream, and there were very significant differences ($p < 0.05$) between treatment concentrations of 5% and 15% and also between treatment concentrations of 10% and 15%. The addition of 15% concentration of natural color additive (Durian, Dragon Fruit and Strawberry) had a very good acceptability regarding the taste of ice cream.

DISCUSSION

Ice creams sold on a motorcycle by ice cream vendors usually have attractive colors so that many consumers, especially children, are interested in enjoying it. However, in its development it turns out that many ice creams use synthetic dyes which are prohibited as a coloring additive in foods and drinks such as rhodamine B¹⁰.

This study was conducted considering the number of producers who use synthetic dyes which are prohibited as a coloring additive in foods and drinks such as rhodamine B. It is carried out to reduce production costs, without regard to the consequences caused by the use of such rhodamine B.

The results of an investigation conducted by the Indonesian Center for Drug and Food Inspection in Banda Aceh

found that all samples used colors that were permitted for use and only one was positive (+) and the others were negative (-) of rhodamine B. This becomes a public concern to consume ice cream sold around in Lampeunurut Village, Darul Imarah Sub-District, Aceh Besar District.

The results of this study are in line with the study conducted by Rini Astuti R (2013) on the analysis of the content of rhodamine B in cold drinks sold in a cart in Pattunuang Village, Wajo Sub-District, Makassar City using the UV-Vis spectrophotometer method which showed that cold drinks which was sold in a cart in Pattunuang Village, Wajo Sub-District, Makassar City was positive (+) containing rhodamine B¹¹.

Overall the three ice cream samples examined used artificial color additive. The use of artificial (synthetic) color additive is preferred by manufacturers because it has a variety of colors and brighter and its use is more practical and durable, besides the price is cheaper. Meanwhile when compared to natural color additive, sometimes the fruits which are used as natural colorant have to wait for the season like durian, and there is only a little color variations. Furthermore, the lack of uniformity and color stability (easy to change color) causes the producers to prefer artificial color additive. However, after knowing the long-term harmful effect of using rhodamine B in food and drinks, the ice cream seller are no longer use synthetic color additive and prefer natural color additive from fruits¹².

The chronic use of synthetic color additive will result in cancer and liver function disorders. If rhodamine B enters the body organs through food it will cause irritation to the digestive tract and cause symptoms of poisoning with the sign of red or pink urine. In addition through food and drink, rhodamine B can also cause health problems. If it is inhaled, there will be irritation of the respiratory tract. Eyes affected with rhodamine B will also experience irritation which is marked by reddish eyes and fluid deposits or dempa

damata. If the lips are exposed, it can cause chapped, dry, itchy lips, even peeling lips¹³.

The use of food additives such as synthetic color additive is usually dominated by small industrial producers and has been carried out for a long time to date and is a violation practice that most endangers the health of consumers. Violations of the use of food additives that are not suitable for use are coupled with their availability in various places that can be purchased freely. In addition, small industry knowledge is limited so that it cannot find alternatives other than those it already knows. Therefore, we need strict action on violations for the empowerment of consumers¹⁴.

CONCLUSION AND RECOMMENDATION

Based on the results of the study conducted in the Lampenerut village, Darul Imarah sub-district, it can be concluded that:

1. The most appropriate formulation of making ice cream was using the addition of 5% strawberries while 10% of Durian fruit and dragon fruit was very influential on the increase in acceptability in terms of color, taste, texture and aroma
2. The use of natural color additive sourced from fruits in the making process of ice cream with such formulation is very safe for consumption and it can be more effective and efficient (economical) if the fruit plant is made a community cultivated plant.

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