IOP Conf. Series: Materials Science and Engineering **732** (2020) 012001 doi:10.1088/1757-899X/732/1/012001

Making mix fruit and vegetable drink instant powder that is rich in iron as prevention of dismenore with composition variations and drying temperatures

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Abstract. Making a drink mix fruit and vegetable from the red spinach, red bean, guava and beet fruit can be a way to enhance iron content of their products, and will raise the value of favorite of the society towards it. This study aims to determine the right formula of the variation of composition fruit and vegetable and temperature levels drying against iron and find out acceptance to the society in powder fruit and vegetable drink mix. Methods used to making a drink mix fruit that is a Foam Mat Drying method. Based on an analysis of the iron, the best conditions exist to variation composition 40% of guava at temperature drying 60°C. The temperature drying affecting the iron and vitamin C in mixed fruit and vegetable. Based on the hedonic organoleptic test, mix fruit and vegetable can be well accpted by the society for its color from variations composition 40% of red bean (60°C), the aroma of 40% of guava (60°C), and the taste of 40% beet fruit (50°C). So it can be concluded that variations composition fruit that is produced with composition of the 40% of guava.

1. Introduction

Dismenore is stomachache which occurs on woman before menstruation or during menstruation. In Indonesia around 55% womans at fertile age have dismenore. There is some factors that could affect dismenore, one of them is iron intake. Some iron intake which related to dismenore is iron and calcium. This research intends to reduce the dismenore potential with iron and calcium intake [1]. Iron is an important component in the formation of hemoglobin, a protein found in red blood cells that is needed for oxygen transport. Anemia develops due to a lack of iron intake [2].

The raw materials used in this study, using 4 kinds of fruits and vegetables that have iron, namely Red Spinach or Blitum Rubrum, various nutrients contained in spinach, including the content of vitamin A (beta-carotene), vitamin C, amino acids, antioxidants. The mineral content found in spinach is calcium, zinc, magnesium phosphorus, potassium and iron (3 mg/100 g). Iron is very important to overcome anemia or lack of blood [3]. Red Beans (Vigna Angularis) is a source of vegetable protein, complex carbohydrates, phosphorus, vitamin B1, Vitamin C (1,1 mg/100g), calcium, phosphorus, and iron (2,6 mg/100 g) (Food and Drug Administration, 2018). Beet fruit (Beta Vulgaris) significantly contains vitamins A, C (4,9 mg/100g), calcium, iron(mg/100g), phosphorus, potassium, protein, carbohydrates, high folate, dietary fiber, antioxidants, and high [4]. Guava (Psidium Guajava L.) is a

local fruit that is rich in antioxidants, especially vitamin C (50-300 mg / 100 g), fiber, iron (0,26 mg/100 g), and polyphenolic compounds [5].

Foaming Agent is food additive which serves to maintain foam stability in the gas dispersion phase in liquid or solid food forms [6]. Tween 80 is a surfactant that is often used as an emulsifier. Tween 80 does not cause allergies, and does not smell. Tween 80 in certain concentrations can serve as a driver of foam formation, in the form of foam surface particles increase and can accelerate drying [7]. Previous studies stated that foam stability is strongly increased in the presence of polysaccharides as foam stabilizers in this study we uuse sucrose.

Instant powder drinks are food preparations in the form of powder, easily soluble in water, practical in serving and have a long shelf life due to their low water content. Instant powder drinks are food preparations in the form of powder, easily soluble in water, practical in serving and have a long shelf life due to their low water content.

The method used for making mix fruit and vegetable drinks is the Foam Mat Drying method. Where red spinach, red beans, beets, and guava are mixed into one with added foam agent solution in order to speed up the drying time mixed with foam which is then dried using a cabinet dryer [8].

This study aim to reduce the dependence of preservative and flavored powder drinks, it is necessary to make substitution efforts with powder drinks that are high in iron, without preservatives and without any additional ingramsedients. In order to get the right formula in terms of taste to be liked by all people from small children to adults. And considering the making of fruit and vegetable mixes is very potential as a high intake of iron which is very useful for people with dysmenorrhea so research needs to be done.

2. Materials and methods

2.1. Materials and eqquipment

Red spinach, red bean, guava, beet fruit, and foaming stabilizer(sucrose) was obtained from Traditional Market of Oro-oro Dowo, Klojen, Malang City. Tween 80 was purchased from CV. Makmur Sejati. Packaging material of alumuium foils was purchased from Simona Plastic and Package Store.

The tools used in this study include: analytic weigher, blenders, hand mixers, cabinet dryers, stainless steel baking trays, stainless steel knives, and sieve.

2.2. Methods

2.2.1. Technological methods. All materials were processed and divided by preparation of raw materials, mixing(whipping), drying, grinding, and packaging.

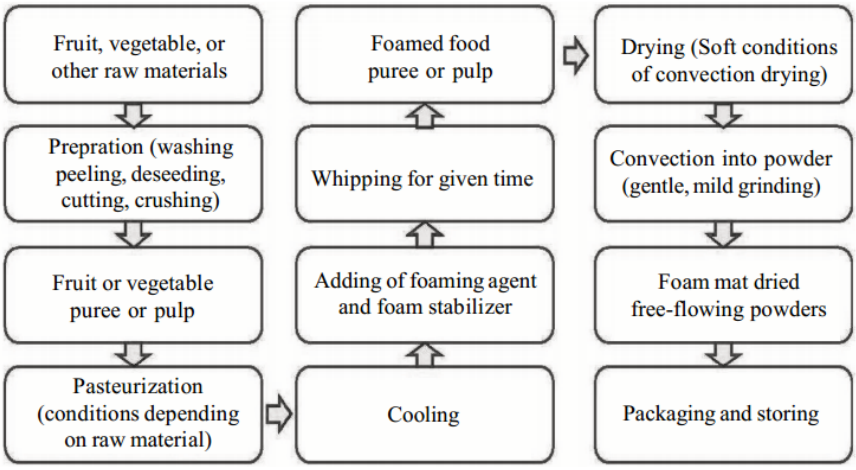

Figure 1. Simple schematic of FMD process.

2.2.1.1. Dependent variables

- Fruits-Vegetables mixture weight: 500 grams
- Tween 80 concentration: 0.5% (b / b)
- Sucrose concentration: 20% (b / b)
- Time: 6 hours

2.2.1.2. Independent variables

- Drying Temperatures: 50, 55, 60, 65 dan 70 ^{o}C

2.2.1.3. Composition of mixing fruits and vegetables

- 40% Red Spinach, 20% Red Beans, 20% Beet Fruit and 20% Guava(I)
- 20% Red Spinach, 40% Red Beans, 20% Beet Fruit and 20% Guava(II)
- 20% Red Spinach, 20% Red Beans, 40% Beet Fruit and 20% Guava(III)
- 20% Red Spinach, 20% Red Beans, 20% Beet Fruit and 40% Guava (IV)
- 25% Red Spinach, 25% Red Beans, 25% Beet Fruit and 25% Guava(V)

2.2.2. Analytical methods

2.2.2.1. Analysis of iron content with the Atomic Absorbtion Spectrophotometer (AAS) method. Weigh 5 grams of sample which has been blended until homogeneous, inserted into erlenmeyer. Add 25 mL of 65% nitric acid / v, leave it in room temperature for 24 hours then heat it on the hotplate at a temperature of about 100 ° C for two hours or more until a clear yellow solution is formed and the steam is lost. Add 5 mL of 1N HNO_3, put in a 25 mL volumetric flask, and diluted with aquabidest until the marking line is then filtered using Whatman filter number 42 twice by removing 2 mL of the first filtrate. This solution is made for qualitative and quantitative analysis with an atomic absorption spectrophotometer.The sample solution resulting from the decoding is measured by its absorbance using atomic absorption spectrophotometry with air-acetylene at a wavelength of 248.3 nm [9,10].

2.2.2.2. *Hedonic organoleptic test.* Prepare 25 panelists. Serving mix fruit and vegetable drinks from mixed fruit and vegetable powder drinks. Give an assessment of mix fruit and vegetable powder drink products with a numerical scale 1-7 where 1 = very like, 2 = like, 3 = dislike the parameters tested, namely aroma, texture, color and taste. Record the results of measuring the results of the mixfruit and vegetable powder beverage products.

3. Results and discussion

3.1. Analysis of iron content

To analyze iron content in the Mix Fruits and Vegetables we used AAS methode, to get the corelation between materials composition and drying temperature in Mix Fruits and Vegetables.

Table 1. Iron content of Mix Fruits and Vegetables (mg/kg).

Temperatures	Iron Content (mg/kg)				
(^{o}C)	I	II	III	IV	V
50	2,37	2,20	1,92	4,03	4,79
55	3,10	3,88	4,15	4,20	4,45
60	4,10	2,21	4,34	6,05	5,51
65	4,76	2,47	5,24	4,36	3,86
70	4,12	2,37	3,98	3,62	4,37

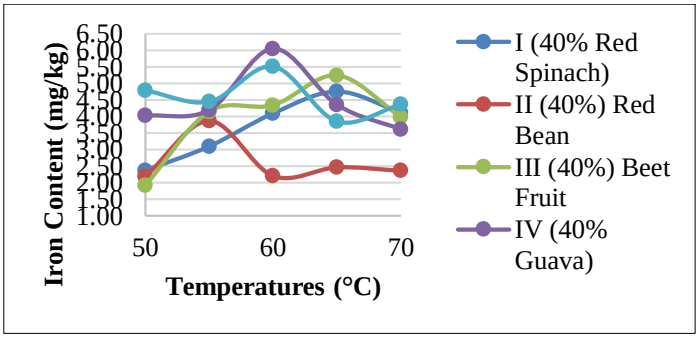

Figure 2. Effect of materials composition and drying temperatures to Iron content in Mix Fruits and Vegetables.

Based on the results of the analysis at each temperature, it can determine the composition variation that has a high concentration of iron in 40% red guava at 60 ºC because the ability of vitamin C to help dissolve iron increases iron content has the highest vitamin C content.

Based on the results of the analysis at each temperature, it can be concluded that the highest yield at a temperature of 60 ºC with a composition of 40% red guava but the higher the temperature of cultivation, the lower the iron content. In this study, according to the journal Qamariah and Rini 2018 states that this is long time or too high temperature in the process can increase or reduce iron levels. In accordance with the journal Eric 2013 claiming that causes iron oxidative damage, which is released and reduced iron [11,12].

Based on the journal Musthalina 2015 about consumption patterns (inhibiting factors and enhancing iron) on the anemia status of consenting girls who can increase iron or additives from sources of vitamin C such as guava, oranges, papaya and animal protein sources such as beef, meat chicken and fish. Vitamin C is an enhancer because vitamin C can help overcome diseases that become easily absorbed [13].

3.2. Analysis of vitamin C content

To analyze vitamin C content in the Mix Fruits and Vegetables we used Iodometri methode, to get the corelation between materials composition and drying temperature in the best composition of Mix Fruits and Vegetables (40% Red Guava).

Table 2. Vitamin C content of mix fruits and vegetables (%/100 g).

Temperatures (ºC)	Vitamin C Content (%/100 g) Composition IV
50	2,814
55	3,341
60	3,516
65	2,989
70	2,989

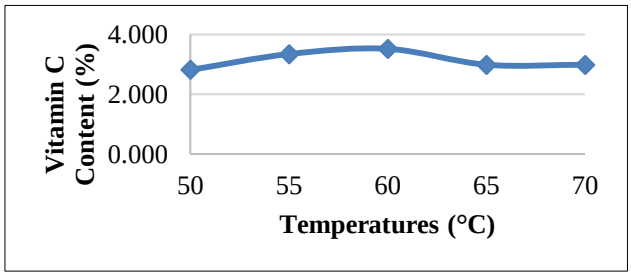

Figure 3. Effect of materials composition and drying temperatures to Vitamin C content in Mix Fruits and Vegetables.

Based on the results of the analysis at each temperature, it can determine the composition variation that has a high concentration of iron in 40% red guava at 60 °C because the ability of vitamin C to maintain its content has the limit in 60 °C.

Based on the results of analysis at each temperature, it can be concluded that the higher the drying temperature, the lower the level of vitamin C, because from a temperature of 50 °C to 70 °C the level of vitamin C can reach the optimal temperature at 60 °C. In this study, according to journal Susanti et al. 2014 stated that the heating process can affect the stability of vitamin C so that vitamin C levels decrease. Because of damage to components in food, including vitamin C can be caused by high temperatures. The process of damage to these vitamins can also be accelerated by heat, light, alkali, enzymes, and oxidizers and vitamin C is easily damaged during storage [7]. According to Budiyati journal 2004 stated that by processing fruit with low temperatures of less than 60 °C, vitamin C did not experience much damage [14]. In a study conducted by Nilna 2018 under the title *study of the use of vacuum (evaporator) in maintaining vitamin and antioxidant content in powdered drinks* explained The trend of changes in vitamin C levels of tomato instant powder drink products with increasing temperature and drying time, especially in the application of a temperature of 60 ° C. Vitamin C resistance will decrease with increasing treatment temperature. Thus, processing tomatoes at low temperatures (<60 ^{0}C) is expected to minimize damage to vitamin C in the product. The best levels of vitamin C are obtained in products produced with a drying temperature of 50 ^{0}C for 7 hours [15]. in addition to temperature, which also has an important role in maintaining the quality of food or beverage in the form of powder is a packaging. In maintaining antioxidant and vitamin content by graph analysis, it was found that PP plastic packaging was better than other packaging in maintaining the stability of nutritional quality of instant tomato powder beverage products. Whereas in maintaining the quality of brightness and color of the product, the packaging of aluminum foil plastic coating shows the best results compared to other packaging. Research on the role of packaging in maintaining product quality was carried out by Nilna in her research entitled *Study of Packaging Variations on the Quality of Instant Tomato Powder Drinks* [16].

3.3. Hedonic organoleptic test

The hedonic organoleptic test was conducted to find out the product acceptance power to the society, represented by 25 panelists. Taken 3 parameters, in color, namely 1(Not Interesting), 2 (Less Interesting), and 3 (Interesting). The aroma is 1 (Odorless), 2 (A little odor), and 3 (Smell Mix fruits and Vegetables). At taste that is 1 (Very dislike), 2 (Dislike), and 3 (Likes).

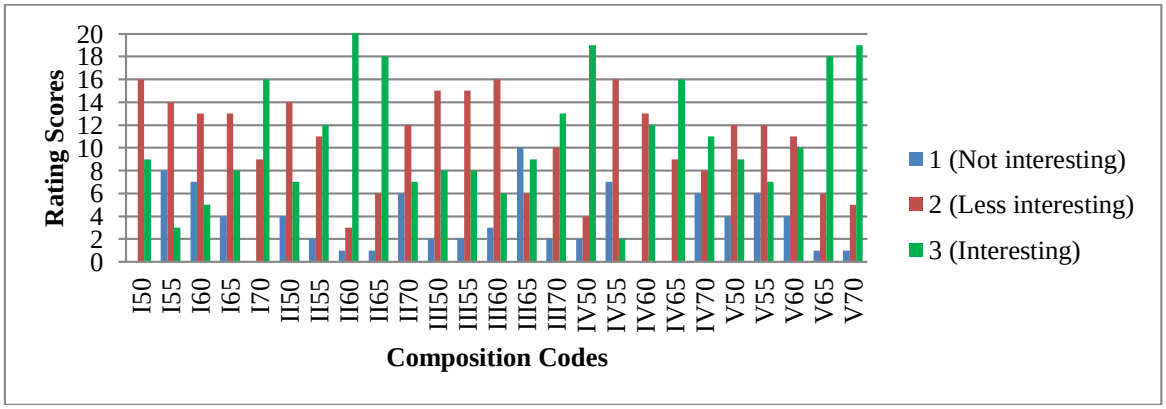

Figure 4. Organoleptic test based on color parameters in 25 samples.

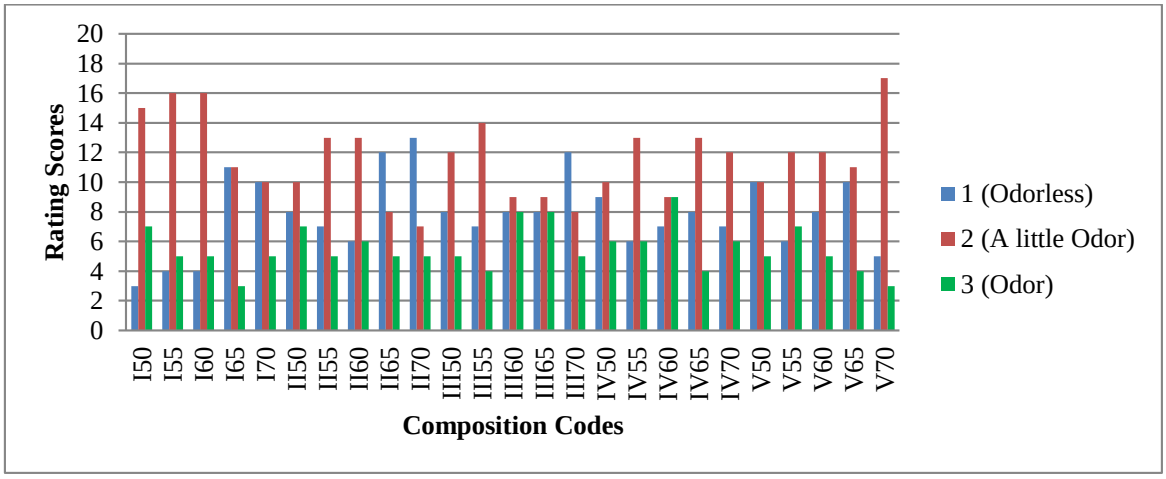

Figure 5. Organoleptic test based on aroma parameters in 25 samples.

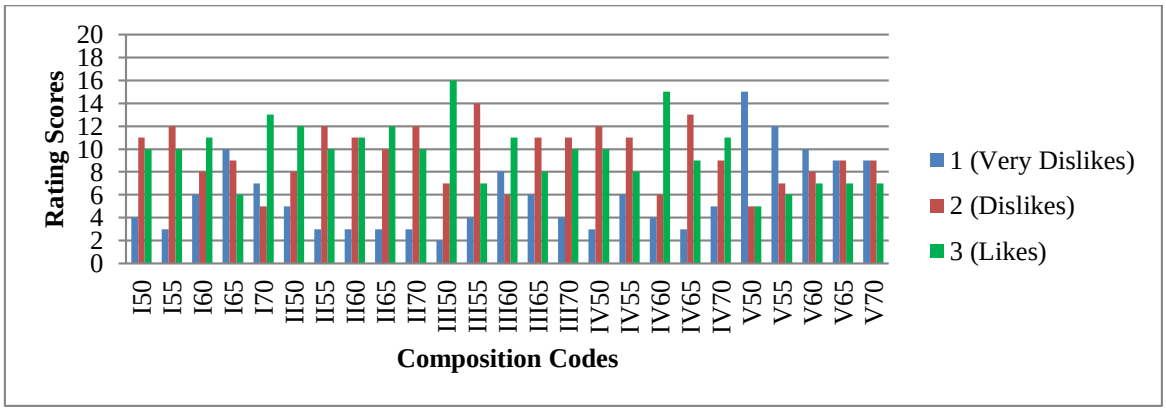

Figure 6. Organoleptic test based on taste parameters in 25 samples.

Table 3. Sample codes description.

Codes	Description	Codes	Description	Codes	Description	Codes	Description
I50	40% red spinach, temperatures 50°C	II65	40% red beans, temperatures 65°C	IV55	40% guava temperatures 55°C	V70	25% all materials temperatures 70°C
I55	40% red spinach, temperatures 55°C	II70	40% red beans, temperatures 70°C	IV60	40% guava temperatures 60°C		
I60	40% red spinach, temperatures 60°C	III50	40% beet fruits temperatures 50°C	IV65	40% guava temperatures 65°C		
I65	40% red spinach, temperatures 65°C	III55	40% beet fruits temperatures 55°C	IV70	40% guava temperatures 70°C		
I70	40% red spinach, temperatures 70°C	III60	40% beet fruits temperatures 60°C	V50	25% all materials temperatures 50°C		

Table 3. Cont.

II50	40% red beans, temperatures 50°C	III65	40% beet fruits temperatures 65°C	V55	25% all materials temperatures 55°C
II55	40% red beans, temperatures 55°C	III70	40% beet fruits temperatures 70°C	V60	25% all materials temperatures 60°C
II60	40% red beans, temperatures 60°C	IV50	40% guava temperatures 50°C	V65	25% all materials temperatures 65°C

In the hedonic organoleptic test carried out on Mix fruits and Vegetables drinks at temperatures of 50°C, 55°C, 60°C, 65°C and 70°C it can be concluded that:

- The color that people like with the favorite score of 3 (Interesting) is Mix fruits and Vegetables code II60 with a composition variation of 40% red beans at a temperature of 60 °C.
- Aroma, which is favored by the people with a favorite score of 3 (smelling mix fruit) is a Mix fruits and Vegetables code III60 drink with a composition variation of 40% beet fruits at temperature of 60 °C.
- The taste that people like with a favorite score of 3 (likes) is Mix fruits and Vegetables code IV60 with variations in the composition of 40% red guava fruit at a temperature of 60 °C.

4. Conclusion

From this study, it can be concluded that the best manufacture of Mix fruits and Vegetables drinks from high levels of iron content is found in the variation of the composition of 40% red guava at 60 °C. And based on society acceptance, the preferred composition variation is 40% red guava at 60 °C, which meets the target because the average society likes variations in composition containing high iron levels. So that the composition variations that will be produced are 40% red guava at a temperature of 60 °C based on society acceptance level.

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