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# Analysis of the Yogurt Nutrient Content and Antioxidant Activity by Adding Podang Urang Mango Juice (*Mangifera Indica L.*)

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**ABSTRACT**

Yogurt is a nutrient-rich drink and is mostly liked by many consumers. However, the thermal process in yogurt manufacturing reduces its final product nutrients. Therefore, Podang Urang mango (*Mangifera indica l.*) juice is added to give the supplementation of the yogurt. This research aims to find out the yogurt nutrient content and antioxidant activity by adding Podang Urang mango juice. There were four different treatments in the process of adding Podang Urang mango juice, there was P0 (0%), P1 (3%), P2 (6%), and P3 (9%). The observed parameter used in this research were the water content, ash, protein, fat, carbohydrate, vitamin C, and antioxidant activity. This result showed that addition Podang Urang mango juice has significantly increased the water content, carbohydrate content, vitamin C, and antioxidant activity. Nonetheless, it has significantly decreased the fat content in yogurt. Whereas, there were no significant differences between the ash content and protein when adding Podang Urang mango juice.



## 1. Introduction

Milk is one of the foodstuffs from the livestock which have high nutrients and good protein and minerals for the human's body. It is also categorized as a functional food. According to [1], functional food is both originally or processed food that contains one or more compound which is considered to have beneficial physiological functions for health. The high nutrient content of the milk leads to large numbers of live microorganisms. Thus, advanced processing is needed to increase the milk shelf life.

One of the popular dairy products and mostly developed by scientists is yogurt. It is a fermented milk product using bacteria of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* or other similar lactic acid bacteria with or without additional food ingredients and the allowed foods [2]. According to [3], yogurt has higher nutrients than fresh milk as the basic ingredients of yogurt manufacturing. It is because of the increase of total solids followed by the increase of other nutritional content. Yogurt also has longer shelf life than fresh milk.


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In recent years, there is significant increase in the popularity of yogurt as a functional beverage [4]. Yogurt, which is fermented by lactic acid contains nutrient-rich, is good for health [5]. Most people like consuming yogurt because it is good for the gut microbiota and immune health [6]. Yogurt is produced by reducing the pH of milk protein into (pH 4.6) isoelectric through lactose fermenting into lactic acid of bacteria starter. The kinds of yogurt can be differentiated by fat content milk used for yogurt production [7].

The thermal process in producing yogurt can cause loss of some nutritional content of milk. The sterilization process affects the loss of some vitamins, folic acid, and denaturation of serum proteins [8]. [9] reported that sterilization damage the composition of vitamin C from 0.77 mg/100 g to 0.14 mg/100 g. Besides, the careless fermentation process causes the reduction of milk ingredients. [8] stated that long shelf and unprotected yogurt can affect the decrease of A and C vitamins. Therefore, the supplementation of probiotic yogurt is truly needed to increase the lost vitamins during the manufacturing process. One of the best choices is adding Podang Urang mango (*Mangifera indica l.*) juice.

Podang Urang mango is one of the local fruits in Kediri which has the highest production in the harvest season from September until December [10]. It has orange color with a soft texture and sweet taste [11]. Scientists believe that mango fruit can be the source of carotenoids named cryptoxanthin as the good cancer prevention ingredients. Besides, mango contains rich in C and E vitamins, and antioxidants [12]. Previous research also proves that the addition of Podang Urang mango extract significantly increase the yogurt beta carotene [13]. Based on those benefits, this research aims to acquire the nutrient content and antioxidant activity on yogurt by adding Podang Urang mango (*Mangifera indica l.*) juice.

## 2. Research Methods

### Materials

The materials of this research involved the fresh milk from KUD Karya Bhakti Kediri. Podang Urang mangoes were collected from Banyakan Kediri. Other materials were a bacterial starter culture of *Lactobacillus delbrueckii subsp bulgaricus of RRAM-01 and Streptococcus salivarus subsp thermophillus of RRAM-01, and others.*

### Methods

Production of Podang Urang mango (Mangifera indica l.) juice

Fruit mango juice is produced by 500-gram mango flesh, crushed with the mortal, and filtered with fabric. Afterwards, its distillation is put into a centrifuge tube and spun at 6000 rpm for 15 minutes. Next, the supernatant was given for about 20% [14].

Starter Rejuvenation

Bacteria used in this process were Lactobacillus delbrueckii subsp bulgaricus RRAM-01 and Streptococcus salivarus subsp thermophillus RRAM-01. The process of bacteria starter rejuvenation was occurred by inoculating yogurt culture into the sterile milk. The next process was incubation and calculation of the total population of lactic acid bacteria [15].

Yogurt Drink Production

The process of yogurt drink production started by pasteurized milk at temperature 80℃ for about 15 minutes and decreased to 43℃. The milk was put into a glass bottle of 500 ml and inoculated with the work starter. After being incubated at 43℃ for 8 hours, Podang Urang mango juice was added in accordance with the treatment (0%, 3%, 6%, 9%) [16].

### Research Variables

The variables tested in this research are analysis of water content [17], analysis of ash content [15], analysis of protein [18], analysis of fat [18], analysis of carbohydrate [18], analysis of vitamin C [19], and analysis of antioxidant activity [20].


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## 3. Results and Discussion

The measurement result by the contents of water, ash, protein, fat, and carbohydrate of yogurt by adding Podang Urang mango juice can be seen in Table 1.

Table 1. The content of water, ash, protein, fat, and carbohydrate of yogurt by adding Podang Urang mango (*Mangifera indica l.*) juice.

| Treatments | Water Content (%) | Ash Content (%) | Protein Content (%) | Fat Content (%) | Carbohydrate Content (%) |
|---|---|---|---|---|---|
| P0 | 85.11 a ± 0.92 | 0.82 a ± 0.01 | 3.66 a ± 0.06 | 3.14 b ± 0.26 | 5.52 a ± 0.65 |
| P1 | 86.51 b ± 0.59 | 0.79 a ± 0.01 | 3.72 a ± 0.01 | 3.00 b ± 0.17 | 5.83 a ± 0.35 |
| P2 | 86.66 b ± 0.40 | 0.77 a ± 0.01 | 3.87 a ± 0.06 | 2.91 a ± 0.07 | 5.94 a ± 0.28 |
| P3 | 86.86 b ± 0.92 | 0.75 a ± 0.01 | 3.84 a ± 0.18 | 2.79 a ± 0.02 | 7.51 b ± 0.53 |

Remarks: Different superscripts in the average value of the same column showed significant differences (P<0,05).

The increase of yogurt content by adding Podang Urang mango juice has caused yogurt water content increase. It is related to the high-water content in the Podang Urang mango juice. The highest water content in the P3 treatment was (86.86 ± 0.92 %) and the lowest was found in the P0 treatment (85.11 ± 0.92 %). These water content values have based on [2] which stated that there was 83%-84% water content found in yogurt. However, this result had a higher result than the research by [21] which stated that commercial yogurt compositions have 75-80% water content. The difference was because the commercial yogurt used lots of additional ingredients and caused the lower water content. The growth of acid lactic bacteria in the foodstuffs is closely related to the product's water content. Nevertheless, *Lactobacillus delbrueckii subsp bulgaricus RRAM-01* and *Streptococcus salivarus subsp thermophillus RRAM-01* are the kinds of homofermentative lactic acid bacteria which has the metabolism result of non-produce water. Research showed that the highest water content found in yogurt caused the high lactic acid bacteria and microbes [22]

Yogurt sample by adding Podang Urang mango juice provided the data that were not significantly different. The result showed that the highest ash content was found in the P0 treatment (0.82 ± 0.01 %) and the lowest was in the P3 treatment (0.75 ± 0.01 %). [2] of ash content is not more than 1,00%. Yogurt ash content commonly decreased with the increase of additional Podang Urang mango juice. The ash content in yogurt depends on some factors, including the milk ingredients, and also the quantity and characteristic of ingredients used. According to [23], the addition of lactic acid or juice significantly changed some compounds at the proximal analysis, especially for the ash content. There was a slight increase in the ash content that was caused by the metabolic dynamism of L. *acidophilus IIA-2B4* and other LAB in yogurt. That dynamism caused the change of chemical and physic characteristics of yogurt by the additional probiotic.

According to the protein calculation, there was an increase in protein content in adding Podang Urang mango juice. The highest protein content was found in the P3 treatment (3.87 ± 0.06 %) and the lowest was in the P0 treatment (3.66 ± 0.06 %). It showed a higher result rather than the Indonesian Standard 01.2981-1992 which stated that the protein content was 3.5%. The increase of yogurt protein content of Podang Urang mango juice might be caused by the protein breakdown of the proteolytic organism in the sample [24]. The high-quality milk protein in yogurt was because of the high biologic value which provides almost all essential amino acids needed to keep a healthy body.

The addition of Podang Urang mango juice in yogurt had affected the significant differences where P0 and P1 treatment showed the significance difference to P2 and P3 treatments. The highest fat content was found in the P0 treatment (3.14 ± 0.26 %) and the lowest was found in the P3 treatment (2.79 ± 0.02 %). The higher additional Podang Urang mango juice caused the decreased fat content. This reduction was caused by the low-fat content of Podang Urang mango juice. In line with this, this result was accordance with the previous research by [25] which stated that during the fermentation process, there would be three main reactions of bacteria through the rotting milk components, such as rotting the lactose to lactic acid (fermentation), hydrolyzing the casein to peptide and free amino acids (proteolysis), and cracking milk fat to free fatty acid (lipolysis).


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Carbohydrate content in yogurt had increased along with the adding of Podang Urang mango juice. The highest carbohydrate was found in the P0 treatment (5.52 ± 0.65 %) and the lowest was in the P3 treatment (7.51 ± 0.53 %). The high carbohydrate content in the P3 treatment is caused by the high carbohydrate content in Podang Urang mango juice. In this situation, carbohydrate is the lactose used by lactic acid bacteria as the source of main carbon in producing lactic acid [26]. Fructose was one of the carbohydrates found in Podang Urang mango in the form of a disaccharide. Besides, fructose is a kind of sugar polymer (sugar fruit). It is the complex sugar that was indirectly digested by the human digestive system but needs to be proceeded first into simple sugar [27].

Table 2. Vitamin C and Antioxidant Activity of Yogurt by adding Podang Urang mango (*Mangifera indica l.*) juice.

| Treatment | Vitamin C (mg/100mL) | Antioxidant Activity (%) |
|---|---|---|
| P0 | 0.18 a ± 0.02 | 14.82 a ± 0.21 |
| P1 | 0.20 b ± 0.02 | 14.79 a ± 0.04 |
| P2 | 0.24 c ± 0.02 | 16.77 b ± 0.13 |
| P3 | 0.25 c ± 0.02 | 16.75 b ± 0.42 |

Remarks: Different superscripts in the average value of the same column showed the significant differences (P<0,05).

The analysis result of Vitamin C in yogurt by adding Podang Urang mango juice (in Table 2) showed that there was an increase along with the adding of Podang Urang mango juice. The highest Vitamin C was found in the P3 treatment (0.25 ± 0.02 mg/100 mL) and the lowest was in the P0 treatment (0.18 ± 0.02 mg/100 mL). Yogurt with the other fermented milk produced by the strain might have different vitamins based on the starter used [28]. Besides, there was a difficult vitamin evaluation due to some causes, such as the thermal process, incubation time, temperature, and storage condition that could change the yogurt vitamin [29].

Analysis of antioxidant activity in yogurt showed that there was an increase of nutrient by adding Podang Urang mango juice. The highest antioxidant activity was found in the P3 treatment (16.75 ± 0.42 %) and the lowest was in the P0 treatment (14.82 ± 0.21 %). Antioxidant activity is the oxidant ability in foods to catch the free radicals. The higher the antioxidant activity, the higher the antioxidant contents. Thus, there would be fewer foodstuffs needed to catch free radicals [30].

## 4. Conclution

The addition of Podang Urang mango juice significantly increased the content of water, carbohydrate, vitamin C, and antioxidant activity. However, it also significantly decreased fat content in yogurt. In contrast, there was no significant result showed by ash and protein content related to the adding of Podang Urang mango juice.

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