Effect of local taro starch (*Colocasia esculenta*) towards the nutritional value of yogurt with commercial probiotic starter

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Abstract. This research was aimed to determine the effect of adding local taro starch (*Colocasia esculenta*) toward the nutritional value of yogurt with commercial probiotic combination of lactic acid bacteria (BAL) *S. thermophillus*, *L. bulgaricus*, and *L. acidophilus*. The materials were used in the manufacturing yogurt including raw cow milk, local taro starch, skim milk powder 4%, starter BAL 3%. The method used a laboratory experiment using a completely randomized design (CRD) with 6 treatments and 4 replications. The treatment used level of local taro starch: 0%; 0.5%; 1%; 1.5%; 2%; and 2.5%. The milk pasteurization temperature at 85°C for 30 minutes and the time of incubation at 24 hours. The variables observed were fat, protein and carbohydrate of yogurt. Data were analyzed by one-way ANOVA, and followed by Duncan's multiple range test (DMRT). The results showed the addition of local taro starch had a very significant effect (P <0.01) on the fat, protein and carbohydrate content of yogurt. Fat have decreased, while protein and carbohydrate of yogurt have increased with the addition of taro starch levels. It could be concluded that the addition of local taro starch to produce optimal nutritional value of yogurt with commercial probiotic starter.

1. Introduction

Milk is an important food for humans because it contains the components of nutrients needed by the body, namely the dominant components: water, fat, protein and carbohydrates; while minor components are minerals, enzymes, vitamins, and dissolved gases. Components of nutrients contained in milk become a good medium for the growth of microorganisms, so milk is easily perishable. One of the efforts to overcome this is by diversifying milk processing with fermentation technology into yogurt [1].

Yogurt is a dairy product and a coagulation pH of about 4.6 of milk casein [2]. In general, lactic acid bacteria used in the process of making yogurt are *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. Improved function and nutritional value can be added to several species of BAL which are good probiotics [3] such as *L. acidophilus* because they can survive the low gastric pH and attach or colonize the intestine. The advantages of yogurt can help the process of digestion of milk for lactose intolerance sufferers [4], weight control, probiotics, and immunological effects [5]. The weakness of yogurt is that in the manufacturing process there is a decrease in the water holding capacity (whey off), so it requires a binding agent.

Starch from taro plants (*Colocasia esculenta*) is one of the local potentials that can be developed to become an alternative source of binding agents [6]. The quality of yogurt can be determined by fat, protein and carbohydrate parameters [7]. This research aims to examine the effect of adding local taro starch to the nutritional value of yogurt by using a commercial starter probiotic culture.
2. Materials and method

2.1. Taro starch
A necessary ingredient in the form of taro are of good quality. Taro peeled and washed and cut and soaked in NaCl solution 7.5% for 1 hour with the aim to eliminate the oxalate compound. Taro chunks of crushed and extracted with a ratio of 4: 1 (water: taro). Dregs taro plus water at a ratio of 4: 1 (water: pulp taro) and then extracted back. Milk starch deposited for 7 hours – 9 hours. Starch that has been formed is dried at a temperature of ± 60 ° C for ± 6 hours, then ground and sifted with a 100 mesh sieve.

2.2. Yogurt
Stages of making yogurt includes pasteurized cow's milk with a temperature of 85 ° C for 30 minutes with the addition of skim milk 4% and local taro starch. Decrease the temperature quickly done to a temperature of 42 ° C with a glass beaker containing milk immersion into cold water. The next stage of the addition of inoculation of bacteria starter 3% (S. thermophilus, L. bulgaricus, and L. Acidophilus). After the inoculation process is completed followed by yogurt fermentation anaerobic incubation for 24 hours at room temperature. After completion of the incubation period. Then analyzed the quality of yoghurt.

2.3. Quality yogurt
Measuring the quality of yogurt made with analysis of chemical.[8]

2.4. The method of research
The method of research was laboratory experiment arranged in completely randomized design. The level of taro starch with 6 treatments (0%, 0.5%, 1%, 1.5%, 2% and 2.5%). Each treatment was repeated 4 times. The variables measured and analyzed: 1) Protein, 2) Fat, 3) Carbohydrate.

2.5. Data analysis
The data were analyzed by Anova. If significant the Duncan’s Multiple Range Test was applied.

3. Results and discussion
Based on the result of variance analysis showed that the use of starch from taro starch gives very real effect to protein, fat and carbohydrate content of yogurt (P <0.01) as shown in Table 1.

| Treatment | Protein (%) | Fat (%) | Carbohydrate(%) |
|-----------|-------------|---------|-----------------|
| P0        | 2.99±0.06a  | 3.46±0.07d | 3.78±0.06a |
| P1        | 3.10±0.04ab | 3.42±0.07d | 4.15±0.06a |
| P2        | 3.16±0.05b  | 3.37±0.07cd | 5.31±0.08b |
| P3        | 3.29±0.03c  | 3.25±0.06bc | 5.68±0.05b |
| P4        | 3.13±0.08b  | 3.17±0.10b  | 6.75±0.04c |
| P5        | 3.07±0.06ab | 3.00±0.09a  | 8.40±0.01d |

**Sign**: highly significant different

Yogurt with the addition of taro starch provides a higher nutritional value of protein than without the addition of taro starch. Taro starch level 1.5% produced the highest protein content compared to other treatments, while the lowest yogurt protein content was the addition of taro starch 0% (control). The results of the study Ibarhim and Khalifa [9], the addition of stabilizers (gelatin, gum, and starch modification) had a significant effect (P <0.05) on the protein content of yogurt compared to controls. Different reported by Alakali, Onokwwo, and Iordye [10] that the addition of corn starch, CMC and gelatin gave a decrease in the protein content of yogurt compared to controls.
Yogurt with the addition of taro starch provides a lower nutritional value of fat content than without the addition of taro starch. Yogurt without the addition of taro starch (0%) provides the highest fat content compared to yogurt with the addition of taro starch. The addition of taro starch levels 0.5% and 1% does not give a difference with no taro starch. This lactic acid bacterium will produce lipase enzyme which will break down fat into fatty acids, then this fatty acid will be broken down into compounds that have a distinctive aroma of yogurt. Different reported by Ibarhim and Khalifa [9] that the addition of stabizer does not give the fat content of yogurt compared to controls.

Yogurt with the addition of taro starch statistically provides a higher carbohydrate content than without the addition of taro starch (0%). Yogurt addition of taro starch (2.5%) provides the highest carbohydrate content compared to other treatments. The results of this research synergize with reported by Olorunnisomo, Ososanya, and Adedeji [11].

4. Conclusion
It could be concluded that the addition of 1.5% local taro starch to produce optimal nutritional value of yogurt with commercial probiotic starter. This study shows that the use of local taro starch and a combination of BAL (S. thermophilus, L. bulgaricus, and L. acidophilus) as starter can improve the quality of yogurt based on protein, fat and carbohydrate content.

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