

Bio-Gurt: Purple Sweet Potato and Mung Bean Yogurt High in Vitamin B6 and Antioxidant for Minimizing the Severity of COVID-19 Complications

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ABSTRACT

The research is to process local-based product formulation into yogurt containing high Vitamin B6 and antioxidant by adding Purple Sweet Potato and Mung Bean Powder through a fermentation process and to find the suitable formulation of "Bio-Gurt". Procedures were firstly done by formulating 3 treatments and 1 control. P0 (Treatment 0) as controlled variable, P1 as addition of 2% Sweet Purple Potato Powder and 4% Mung Bean Powder, P2 3% : 3%, and P3 4% : 2%. The results were determined by an organoleptic test and pH measurement. By all treatments, P3 suits the characteristic of yogurt texture. The limitations were due to the lack of effectiveness of the process. Bio-Gurt helps reduce the cytokine storm that occurs in the early stages of SARS-CoV2 infection. It also can reduce oxidative stress for the severity of COVID-19. Bio-Gurt becomes a healthy local snack containing vitamin B6 and antioxidants.

KEYWORDS: Vitamin B6, Antioxidant, Yogurt, Sweet Purple Potato, Mung bean, COVID-19

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INTRODUCTION

Vitamin B6 and antioxidants; specifically isoovitexin, vitexin, anthocyanin, and lactoferrin are essential micronutrients needed to boost the immune system during COVID-19. The fulfillment can be maintained by consumption of foods containing Vitamin B6 that exerts a protective effect against chronic diseases such as cardiovascular diseases (CVD), diabetes, and its deficiency has been associated with lower immune function and higher susceptibility to viral infection, in this case, is Coronavirus Disease (COVID-19). According to Richardson & Lovegrove (2021), deficiencies and suboptimal nutritional status of these micronutrients can potentially decrease resistance to infections and reinfections. According to (Muhammad et al., 2021), COVID-19 infections with other comorbidities, such as malaria, hypertension, and diabetes, are at higher risk of developing oxidative stress. Through processing local food, purple sweet potato with the addition of mung bean that contains specified antioxidants is in the process of making to be the alternative product. The purpose of this research is processing local-based product formulation into yogurt which contains high in Vitamin B6

and antioxidant with the addition of Purple Sweet Potatoes and Mung Bean Powder through the fermentation process and milk and to find the suitable formulation for making Sweet Purple Potato and Mung Bean "Bio-Gurt".

MATERIALS AND METHODS

The material of this study was Bio-Gurt. Choosing yogurts the processed product was due to the effectiveness of fluid texture products, which provides probiotics, vitamins, and minerals that help boost immune health when consumed regularly (Elliot, 2017). Yogurt consumption was able to enhance the response system that happens as a potential immune stimulatory effect of the therapy that is due to the presence of (Lactic Acid Bacteria) LAB in yogurt and its consumption its pathway suppressing hyper inflammation (Ahmad, 2020).

Cow's milk for making yogurt was using "Ultramilk" low fat. Purple sweet potatoes (*Ipomea batatas L. var. ayamurasaki*) and the mung beans (*Vigna radiata*) powder were obtained by the local store of organic food. Starter culture was using from Biokull plain starter which contained *Thermophilus*, *L. Bulgaricus*, *L. Acidophilus*, and *Bifidobacterium* (Rasbawati et al., 2019). The tools used in the process of making yogurt are

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a refrigerator, a thermometer, stopwatch, glass jar, spoon, knife, oven, 80 mesh sieve, stirring rod, pH meter, test tube, micropipette, volume pipette, volumetric flask, fabric, steamer, plastic bag, and incubator.

Study Procedures

Powder and materials measured into 4 formulations, using digital scales



Mixture of purple sweet potato and mung bean powder then mixed them all with the milk in the pan



Pasteurized for 15 minutes at 85°C and kept stirred



20 ml of yogurt starter added into the pan, wait until the temperature of milk showed 40°C. After mixed well, poured the formulation into the glass jar.



Incubation process:

Cover up the glass jar and add 2 layers of coverage which were a plastic bag and napkin to make sure there will be no air contamination during the fermentation process. Put the jar into the incubator and wait for 20-24 hours for the result

Making The Starter of Bio-Gurt

The starter begins with the preparation of plain yogurt 'Biokul' which contains *S. thermophilus*, *L. Bulgaricus*, *L. Acidophilus*, *Bifidobacterium*. The purpose of using multiple strains of bacteria was to get the best quality of the yogurt itself.

Bio-Gurt making method

The mixture of boiled purple sweet potato and mung bean powder and low-fat milk was pasteurized at 85°C for 15 minutes and keep it stirred while the pasteurization process. Then wait until the temperature turns into 40°C to add the starter of the yogurt and incubated through incubator at 36°C for 24 hours.

Overall ratio of ingredients was made to obtain the correct formulation for the preferred taste and texture of yogurt. The comparison of purple sweet potato and mung bean powder were obtained from the percentage ratio which can be seen in the following table 1:

Table 1. Formulation of Bio-Gurt

Treatments	Sweet Purple Potato Powder (%)	Mung Bean Powder (%)
P0	0	0
P1	2	4
P2	3	3
P3	4	2

RESULTS

The results of all treatments could be seen in Figure 1.



Figure1. The result of Bio-Gurt Treatment 0; Treatment 1; Treatment 2; Treatment 3

Organoleptic Result

An organoleptic test was done to determine the treatment that produces the desired texture and taste. The results of the test were in the table 2 below:

Table 2. Organoleptic Result of Bio-Gurt Formulations

No.	Colour	Aroma	Texture	Taste
P0	White	Sour	Viscous liquid	Sour
P1	Moderate purple	Sour (slight aroma of mung bean flour)	Very thick	Sour
P2	Moderate purple	Sour (slight aroma of mung bean flour)	Viscous liquid	Sour
P3	Moderate purple	Sour (slight aroma of mung bean flour)	Thick	Sour

DISCUSSION

From the organoleptic tests, the formulation chosen based on texture and taste quality is the P3 (3rd treatment). This is due to the amount of purple sweet potato flour contained in yogurt. According to (Mahawan, 2019) states that the carbohydrate elements in purple sweet potatoes have the function of improving texture, adding flavor, increasing and stabilizing the water-holding capacity so that effect on viscosity and soft texture. Meanwhile, mung beans powder as the source of protein can affect the viscosity of yogurt. The higher the protein content, the higher the viscosity of the yogurt. Bio-Gurt as a snack that fulfils recommended dietary allowance (RDA) snack intake up to 10%.

Both purple sweet potatoes and mung beans contained vitamin B6. Mung beans have vitamin B6 as much as 0.10 ± 0.002 mg/100 g (Rao, 1996). Mung beans were known to be an a perfect source of protein, dietary fiber, minerals, vitamins, and many of bioactive compounds (Hou et al., 2019). In several phytochemical studies, sweet purple potatoes have detected numerous potential compounds like vitamins such as pantothenic acid (vitamin B5), pyridoxine (vitamin B6), and

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thiamin (vitamin B1), as well as niacin, riboflavin, β -carotene, iron, calcium, and zinc (Kurnianingsih et al., 2020).

Vitamin B6 was shown its ability to reduce IL-1 β production with suppressing NLRP3 inflammasome responded to various NLRP3 inflammasome stimuli. Also, vitamin B6 markedly reduced reactive oxygen species (ROS) production in macrophages, where it plays a central role in NLRP3 inflammasome activation. It is suggested at an early stage in the infection. SARS-CoV2 potentially escapes innate immune, thereby increasing the viral replication. Then, those infected cells undergo cell death, causing acute virus spread and severe cytokine storm. We can assume that vitamin B6 is possible to suppress hyper inflammation, through NLRP3 inflammasome inhibition, limiting virus spread and cytokine storm (Zhang et al., 2016).

The vitexin and isovitexin are the major antioxidant components in mung beans (more than 96% of them existing in the bean seed coat). However, little information is known whether vitexin and isovitexin could be biologically absorbed. In purple sweet potato, antioxidant can be found anthocyanin. In addition, the process of antioxidant is on suppressing the oxidative stress which are the key factors of COVID-19 severity especially in the presence of chronic diseases associated with the antioxidant system fragility (Cao et al., 2011).

CONCLUSION

Besides having higher digestibility value than milk, Bio-Gurt also provides additional selling value for these dairy products. Bio-Gurt Formulation Treatment 3 has better result over other treatments, based on texture, color, and taste. The continuation of this research is finding more specific nutritional values based on the nutritional needs of the age groups.

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AUTHOR CONTRIBUTIONS

ANI, SFR, RAG designed, conducted, and performed result analysis; and RA drafted the manuscript, all authors approved the final manuscript.

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