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# Chemical Properties Of Dragon Fruit Probiotic Drink Produced By Biocapsules *Lactobacillus paracasei* ssp. *paracasei* Ml.3 Isolated From "Dadih" traditional fermented food West Sumatera

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**Abstract.** In this research, Biocapsules Lactobacillus paracasei ssp. paracasei Ml.3 isolated from "dadih" was used to ferment a probiotic drink made from dragon fruit juice. Lb. paracasei ssp. paracasei Ml.3 biocapsules are produced by extruding carrageenan-skim (2:1). Making dragon fruit juice probiotic drink using *Lactobacillus paracasei* ssp. paracasei Ml.3 at concentrations of 3%, 5%, and 7% for 18 hours. The following factors were analyzed: nutritional adequacy rates, moisture content, ash content, protein, fat, crude fiber content, carbohydrate, sugar, and total dissolved solids. The results showed that the use of culture concentrations of 3%, 5%, and 7% had no significant effect on the chemical characteristics of dragon fruit juice probiotic drinks. All fermented products (3%, 5%, and 7%) had an average water content of 81.93–82.56%, an ash content of 0.17–0.19%, a protein content of 0.53–1.45%, a fat content of 0.33–0.42%, a crude fiber content of 0.24–0.39%, a carbohydrate content of 15.10–16%, a sugar content of 12–13%, and a total soluble solids content of 16.5–17.2%. The highest antioxidant capacity against ascorbic acid was obtained in the 3% treatment, namely 94.28 ppm. The product's nutritional adequacy rate meets the criteria set forth for functional foods, where the nutritional adequacy rate number indicates that protein makes up 0.267 kcal (0.133%) of total energy, fat makes up 0.196 kcal (0.049%) of it, and carbohydrates make up 35.474 kcal (2.534%).

Key words: chemical characteristics, dadih, nutritional adequacy rate, dragon fruit, probiotic drink

## 1. Introduction

Currently, probiotic drinks are one type of functional food that is highly developed. The probiotic drink does not only use fresh milk, but has been developed in various variants using fruit juice. The development of these products, cannot be separated from the role of microorganisms, especially lactic acid bacteria. Lactic acid bacteria used can improve human health status. This is because the lactic acid bacteria are able to grow and develop in the human digestive tract, so they are able to provide beneficial effects on human health. The health effects of probiotics would be obtained if you consume probiotics with a total of $10^6$-$10^7$ colonies/G [1]. Additionally, the findings of clinical investigations support the positive benefits of probiotics on allergic diseases as well as gastrointestinal diseases (such as IBS, gastrointestinal disorders, the removal of Helicobacter, inflammatory bowel disease, and diarrheas) (e.g., atopic dermatitis). In numerous clinical investigations, probiotics have been shown to be useful in treating conditions like obesity, insulin resistance syndrome, type 2 diabetes, and non-alcoholic fatty liver disease [2].

Dadih is one of the traditional fermented foods from the province of West Sumatra. Dadih has great potential to be reused as a starter in making other fermented products, especially those made from milk. This is because the curd contains potential probiotic lactic acid bacteria. The isolates from curd were able to live at low pH, tolerance to bile salts, and high viability $10^7$-$10^{10}$ colonies/mL, and coaggregation value of 36% - 74%. The pathogenic bacteria E. coli, Listeria monocytogenes, S. aureus, and B. cereus could not develop when these isolates produced organic acids in the form of 1.04% to 1.2% lactic acid [3].

It should nonetheless be highlighted that the capacity of lactic acid bacteria in the human digestive tract, particularly probiotic bacteria, needs to be continually maintained. One way that can be used is the encapsulation method. where encapsulation can maintain the viability of probiotic bacteria because it can protect bacteria from unfavorable environmental factors. The materials used for encapsulation differ based on the type of microbe that needs to be enclosed. Lower oral doses of probiotics and microbiota can be used while still maintaining effective intestinal transport and release due to the capacity of cellulose sulfate microencapsulation to protect bacteria and yeasts against viability losses caused by stomach acid [4]. The use of 3% carrageenan as an encapsulation in the encapsulation of Lactobacillus paracasei ssp paracasei Ml3 was able to maintain viability up to 10.11 log CFU/gr [5]. Additionally, a 2:1 ratio of skim to carrageenan was effective in preserving viability up to 1.97 x 109 cfu/g [6]. In this research, probiotic drinks made with dragon fruit juice were made using encapsulated Lactobacillus paracasei ssp. paracasei Ml3, and their chemical and nutritional qualities were then examined.

## 2. Materials and Methods

Dragon fruit juice and pasteurized cow's milk are utilized as the raw materials, while probiotic bacteria *Lb paracasei* ssp. *paracasei* Ml3 encapsulated is employed as the fermentation starter. This study was carried out in four stages, which are as follows:

### 2.1 Production of Probiotic Biomass

*Lb paracasei* ssp. *paracasei* Ml3 was subcultured and incubated at 37oC, then harvested cell biomass using a centrifuge at 4500 rpm for 15 minutes [7]. The biomass substrate was then taken out of the liquid, twice rinsed with sterile water, then centrifuged one more for 10 minutes at 3000 rpm [5].

### 2.2 Production of Bio-capsule

The production of biocapsules consists of three important steps, namely (1) biomass of Lb paracasei ssp. paracasei Ml3 was made in the form of a suspension with a concentration of 10%, (2) preparation of the encapsulation, namely carrageenan and skim milk in a ratio of 2:1, where the skim milk was pasteurized first and the carrageenan was dissolved in sterile water. (3) mix the suspension of biomass with encapsulated material, which is then put into a syringe and dripped into a sterile 3% KCL solution. The formed biocapsules were stored in the refrigerator (temperature 10$^{o}$C) for 2 hours. then rinsed using physiological saline, then drained[8] [9] [10].

### 2.3 Dragon Fruit Probiotic Drink Production

The starter used was in the form of biocapsules that had been subcultured again on MRSB media for 24 hours. then 4% (v/v) was re-grown on 10% skimmed media and 5% sucrose (w/v), and incubated for 17 hours at 280C.

Dragon fruit is mashed with a blender then added water (2:1), 10% (w/v) skim milk and 8% (w/v) glucose. then the dragon fruit juice was transferred to a bathing pan to be pasteurized for 15 minutes, then cooled to 37$^{o}$C. Next, dragon fruit juice was put into three glass bottles, then 3%, 5% and7% (v/v) starter were inoculated. The product was incubated at 25$^{o}$C – 30$^{o}$C for 18 hours. Probiotic fermented dragon fruit juice is homogenized into a probiotic drink by adding a solution of sugar and water in a ratio of 1; 2; 2 [11].

### 2.4 Analysis of chemical properties of the product

Chemical characteristics include moisture content, ash content, protein and fat content, total carbohydrates [12], total soluble solids with a hand refractometer, and determination of the nutritional adequacy rate by estimating the carbohydrate content, protein, fat, and energy present in each package based on a 2000 kcal diet.

## 3. Result and Discussion

The results showed that the use of culture concentrations of 3%, 5%, and 7% gave no significant effect on the chemical characteristics of dragon fruit juice probiotic drinks (Figure 1 and Figure 2).

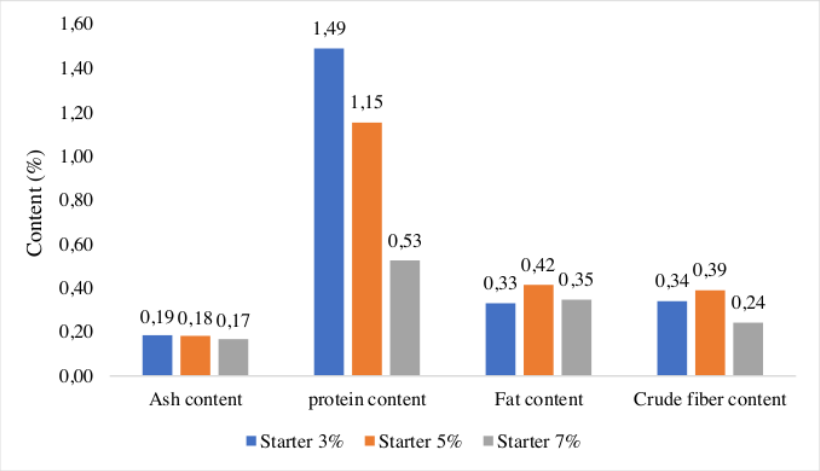


Figure 1. Chemical characteristics of dragon fruit juice probiotic drinks

All fermented products (3%, 5%, and 7%) had an average water content of 81.93 to 82.56%, ash content of 0.17 to 0.19 %, protein content of 0.53 to 1.45 %, fat content of 0.33 to 0.42%, crude fiber content of 0.24 to 0.39 %, carbohydrate content of 15.10 to 16.6 %, sugar content of 12 to 13%, and total soluble solids of 16.5 to 17.2 %

The increase in the number of starters used in the manufacture of dragon fruit probiotic drinks caused the activity of *Lactobacillus paracasei* ssp. *paracasei* to increase. The starter bacteria's activity did increase, but not across the board in terms of the product's chemical characteristics. Compared to the starter concentrations of 3% and 5%, the starter concentration of 5% had a more significant effect. This is because the increase in the number of microbes must be supported by the availability of nutrients in the growth medium. It can be indicated that the availability of nutrients in the raw material for making probiotic drinks is insufficient for starters with a concentration of 7%.

This dragon fruit juice probiotic drink is one of the dragon fruit juice diversification products that can be used as an energy source for consumers.However, this product cannot be used as a staple food or the only food consumed because its nutritional content cannot meet all the nutritional needs of humans as a whole. Therefore, this product is suitable for use as a by-product only.

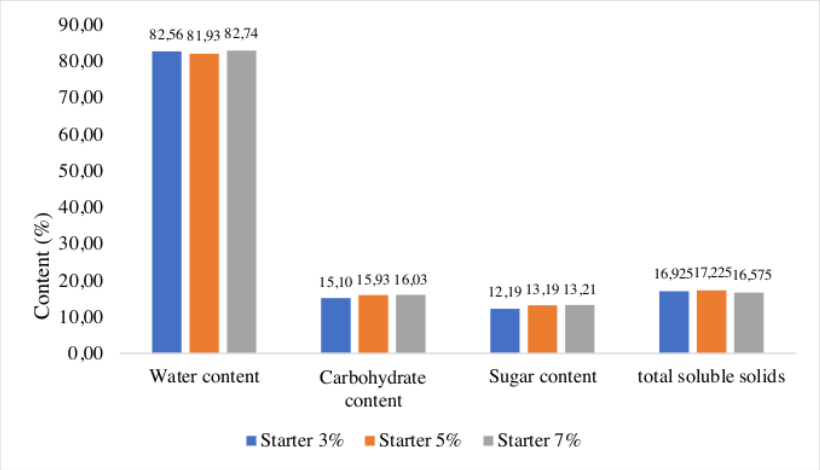


Figure 2. Chemical characteristics of dragon fruit juice probiotic drinks (water content, carbohydrate content, sugar content and total soluble solids)

Based on the calculation of the nutritional adequacy rate for one pack of dragon fruit juice probiotic drink (100 ml/serving) obtained 35.936 kcal of energy, which comes from protein 0.267 kcal (0.133%), fat 0.196 kcal (0.049%), carbohydrates 35.474 kcal (2.534%). Carbohydrates are the highest source of calories, which is 2.534% of the total human calorie need of 1,200 kcal per day. According to a study by [13, 14], this probiotic drink produced from dragon fruit juice is regarded as a low-calorie beverage because it only contains about 100 calories. Additionally, this product is excellent for ingestion by obese persons and those who consistently maintain a healthy weight.

Antioxidant activity is the ability of a product to inhibit the formation of free radicals. The results of this study indicate that dragon fruit probiotic drinks made in several treatments have different antioxidant activities (Figure 3). Where the highest antioxidant capacity was obtained in the 3% starter treatment, namely 94.28 ppm, the 5% starter treatment was 76.81ppm, and the lowest was in the 7% starter treatment, namely 69.47 ppm. This shows that the higher the number of starters used, the lower the antioxidant capacity.

The difference in antioxidant activity was caused by differences in starter activity in utilizing nutrients in the growing medium. As previously stated, the availability of nutrients has an effect on how many seeds are utilized, which is why it does not correspond to an increase in activity. Dragon fruit juice's antioxidant concentration has an impact on antioxidant activity, but fermented chemicals, particularly lactic acid, also have an impact.

An increase in antioxidant activity is also associated with an increase in total lactic acid bacteria, which have high antioxidant activity [15;16;17]. During the fermentation process, lactic acid levels also continue to increase. The increase in antioxidant activity is caused by the presence of secondary metabolites of bacterial metabolism. Probiotic bacteria produce antioxidant compounds in the form of vitamin C and vitamin E.

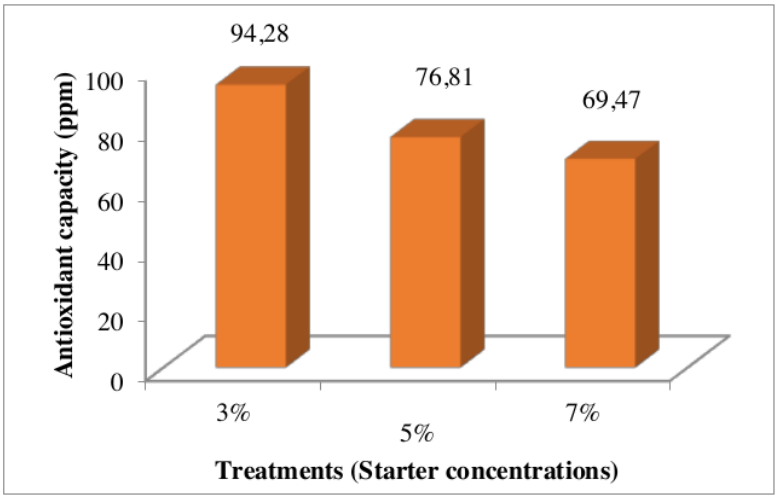


Figure 3. Antioxidant capacity of dragon fruit juice probiotic drinks

Every food item, especially fermented foods, has a unique level of antioxidant activity. The raw materials utilized and the starter used have a significant impact on this. One fruit variety with significant antioxidant content in both the pulp and peel is dragon fruit. Beta cyanins and anthocyanins are found in the dragon fruit peel extract, which also has strong enough activity against free radicals [18]. Due to the presence of betalains, which are beneficial for human health, the utilization of dragon fruit peels is not only advantageous as a waste disposal method but may also be used in the production of functional drinks [19, 20].

## 4. Conclusions

All fermented products (3%, 5%, and 7%) had an average water content of 81.93-82.56%, an ash content of 0.17-0.19%, a protein content of 0.53-1.45%, a fat content of 0.33-0.42%, crude fiber content of 0.24-0.39%, a carbohydrate content of 15.10-16%, a sugar content of 12- 13%, and a total soluble solids content of 16.5-17.2%. The highest antioxidant capacity against ascorbic acidwas obtained in the 3% treatment, namely 94,28 ppm. Dragon fruit juice probiotic drink potentially to classified as a lowcalorie diet because this product only has calories of 35,936 kcal per 100 ml.

## 5. Acknowledgments

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