

# Probiotic Drink Banana with Addition of Sea Grapes Flour (*Caulerpa racemosa*) Rich in Polyphenols and Dietary Fiber as Functional Food Potential Anti-NCDs

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## ABSTRACT

Banana contains phenolics, carotenoids, flavonoids, monoamines, and phytosterols, which have many healthy effects on humans and the prevention of chronic degenerative diseases. *Caulerpa racemosa* has abundant nutrient, such as poly-unsaturated fatty acids (PUFA), essential amino acids, vitamins, minerals, dietary fibers, and other natural bioactive compounds. Based on banana and sea grapes potential, a probiotic drink with a high polyphenol and dietary fiber content could be formulated. This research aims to process and determine the probiotic drink formula from fermented banana and sea grapes flour with the highest polyphenol and dietary content. There was 3 samples formulation with a difference on banana pulp, sea grapes flour, and water concentration (S1, 900:100:0; S2, 850:150:150; and S3, 800:200:200). Samples were inoculated with *Lactobacillus paracasei* 106 CFU for 60 hours and incubated in anaerobic (30-32°C). Analysis of polyphenol percentage was done using the High-Performance Liquid Chromatography (HPLC) at a wavelength of 415 nm with each sample triplicated. Dietary fiber, ash, and water content were determined using the AOAC method. The One-Way ANOVA test was used to determine the difference between samples. Total polyphenol content in each sample was identified; S1 was 78,99%, S2 was 91,58%, and S3 was 97,82%. Total dietary fiber in each sample was identified; S1 was 25,98%, S2 was 28,07%, and S3 was 31,47%. The formulation containing the highest polyphenols and dietary fiber was S3. A significant difference ( $P < 0.05$ ) was found in total polyphenols content between samples..

## Keywords:

Probiotic; banana; sea grapes; polyphenols; dietary fiber

## 1.Introduction

Banana is one of the popular fruit that grows mostly in tropical and sub-tropical areas, originating mainly from South-East Asia. Banana contains phenolics, carotenoids, flavonoids, monoamines, and phytosterols, which have many healthy effects on humans and the prevention of chronic degenerative diseases. The bioactive compounds of bananas also contribute antioxidant effect against oxidative and free-radical agents (B. Singh et al., 2016).

Banana contains an estimate of 75% water and 25% carbohydrate, along with a small amount of protein, fat, micronutrient such as high levels of potassium (K), magnesium (Mg), phosphorus (P), iron (Fe), calcium (Ca), and also known as a source of vitamins (with provitamins A, B, and C) (Laksmi Suryaatmadja Jenie *et al.*, 2013; Mohapatra *et al.*, 2010). The high iron and potassium content is beneficial for anemic patients and controlling blood pressure. Daily intake of bananas may improve insulin sensitivity in diabetic subjects and shows hypocholesterolemic activities, therefore bananas have the potential to be developed into other food products. (Cressey *et al.*, 2014). Bananas are rich in resistant starch, fructan, and fructooligosaccharides, which constitute the probiotic effect of bananas (Mitsou *et al.*, 2011). Bananas contain about 59-79% carbohydrates as indigestible carbohydrates such as resistant starch, cellulose, hemicellulose, and lignin, also contain prebiotic properties (Cordoba et al., 2018; Sarawong et al., 2014).

*Caulerpa racemosa*, also known as 'sea grape', is a green seaweed eaten raw as salad or vegetable and cultivated in many parts of the world, particularly in the Indo-Pacific region such as Indonesia, Philippines, and Malaysia (de Gaillande *et al.*, 2017; Nagappan & Vairappan, 2014). *C. racemosa* has abundant nutritional value, including polyunsaturated fatty acids (PUFA), essential amino acids, vitamins, minerals, dietary fibers, and other natural bioactive compounds (Kumar, Kumari, *et al.*, 2011; Nagappan & Vairappan, 2014). Many studies have concluded the antioxidant, anticoagulant, antimutagenic, antibacterial, and anticancer properties of *C. racemosa* (Chia *et al.*, 2015; Kumar, Gupta, *et al.*, 2011; Nagappan & Vairappan, 2014; Natrah *et al.*, 2015; Tanna *et al.*, 2018; Yap *et al.*, 2019).

Based on banana and sea grapes potential, a probiotic drink with a high polyphenol and dietary fiber content could be formulated. This research aims to process and determine the probiotic drink formula from fermented banana and sea grapes flour with the highest polyphenol and dietary content.

## 2. Methods

There was 3 samples formulation with a difference on banana pulp, sea grapes flour, and water concentration (S1, 900:100:0; S2, 850:150:150; and S3, 800:200:200). Samples were inoculated in 60 hours with *Lactobacillus paracasei* 10<sup>6</sup> CFU and incubated in anaerobic settings with a temperature of 30-32°C. Analysis of polyphenol percentage was done using the High-Performance Liquid Chromatography (HPLC) at a wavelength of 415 nm with each sample triplicated. Dietary fiber, ash, and water content were determined using the AOAC method. The One-Way ANOVA test was used to determine the difference between samples.

## 3. Results and Discussions

Sample	Total Polyphenols (%)	Dietary Fiber (%)	Ash Content (%)	Water Content (%)
S1	78.99	25.98	1.87	31.97
S2	91.58	28.07	1.75	31.85
S3	97.82	31.47	1.57	31.79
Mean	89.46 ± 9.59	28.50 ± 2.77	1.73 ± 0.15	31.87 ± 0.09

Total polyphenol content in each sample was identified; S1 contains 78,99% polyphenol, S2 contains 91,58%, and S3 contains the highest polyphenol content (97,82%). A significant difference (P<0.05) was found in total polyphenols content between samples. Phenolic compounds' main role as a primary antioxidant is based on their ability to donate hydrogen atoms to free radicals. Many studies have stated that the antioxidant capacity of bananas is correlated with high contents of total phenolic compounds and flavonols. Phenolics present in fruit and vegetables as the main phytochemicals that contribute to human health (Singh *et al.*, 2015; Taslim *et al.*, 2020; Amelia and Taslim., 2019; Makmun *et al.*, 2020)

Total dietary fiber in each sample was identified; S1 contains 25,98% dietary fiber, S2 contains 28,07%, and S3 contains the highest dietary fiber content (31,47%). Dietary fiber also has

prebiotic properties by modulating intestinal microbiota, which has an essential role in the maintenance of health (Hijová *et al.*, 2019).

The average (ash content) of all samples was 1.73% and water content was 31.87%. Average ash content hasn't fulfilled quality criteria from SNI 2981:2009, which stated that ash content may not exceed 1%.

The fermented banana added with sea grape flour has the potential to be developed into healthy probiotic drinks. The polyphenols and dietary fiber content may help to lower the risk for degenerative diseases, since polyphenols have a role as an antioxidant, and dietary fiber may help to modulate intestinal microbiota balance. The formulation containing the highest polyphenols and dietary fiber was S3.

### Acknowledgment

We would like to thank all contributors for their excellent assistance in formatting the Papers including reviewers. The responsibilities of the author are as follows all of authors contribute to the write and revision of the manuscript and have read and approved the fixed manuscript until the publication of this paper.

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