PROBIOTIC DRINK FROM FERMENTED PITAYA (HYLOCEREUS UNDATUS) PEEL RICH IN ANTIOXIDANT AS A POTENTIAL ANTIATHEROGENIC

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Abstract: Probiotics are living microorganisms that, if administered in sufficient quantities, can provide health benefits to the host by regulating an unbalanced gastroenteric microbiota. The probiotic strain of L. paracasei also can modulate biomarkers of immune function and responses, improve microbial activity, and limit gut injuries. Dragon fruit (Hylocereus undatus) or pitaya is a popular fruit high in micronutrients with a lot of significant health benefits, starting from cancer prevention to controlling blood cholesterol and glucose level and lowering blood pressure. This research aims to process and determine the healthy drink formula from fermented pitaya peel with the highest vitamin C content and antioxidant activity. There was 3 samples formulation with a difference on pitaya peel and water concentration (S1 = 900:100; S2 = 850:150; and S3 = 800:200). All samples were inoculated with Lactobacillus paracasei 5% b/v for 14 days under anaerobic conditions. Sample variation was carried out to determine the significance of the average vitamin C content in it. The next step was determining the amount of vitamin C (mg/100g) analysis from 3 samples of probiotic drinks using the Titration Iodometric Method, while the antioxidant activity was determined with 2.2-diphenyl-1-picyrylhydrazyl (DPPH), each with a triplicate. The results of vitamin C and antioxidant activity in each sample of probiotic drinks were as follow: S1 contains 100.34mg/100g with 25.12% antioxidant activity, S2 contains 98.45mg/100g with 20.26% antioxidant activity, and S3 contains 127.75 mg/100g with 29.93% antioxidant activity. A significant difference (P<0.05) was found in vitamin C content between samples. The higher the antioxidant activity, the higher the antioxidant levels, and the less food or drink needed to reduce free radicals (Lisdawati, 2006). This shows that the formulation of probiotic drinks from fermented pitaya peel with Lactobacillus paracasei contains high vitamin C and antioxidant activity. The average vitamin C level in the three probiotic drink samples was 108.84±mg/100g. S3 showed the best antioxidant activity against 2.2-diphenyl-1-picyrylhydrazyl (DPPH) of 29.93%.

Keywords: Probiotic, Dragon Fruit (Pitaya), Vitamin C, Antioxidant

Introduction

Probiotics are living microorganisms that, if administered in sufficient quantities, can provide health benefits to the host by regulating an unbalanced gastroenteric microbiota (Margiotta et al., 2021). Lactobacillus group is some of the most researched and applied probiotics.
Lactobacillus paracasei (L. casei) has health-beneficial effects ranging from atopic dermatitis, cancer, potentially allergic disease, obesity, to diarrhea (Hill et al., 2018). The probiotic strain of L. paracasei also can modulate biomarkers of immune function and responses (Guillemand et al., 2010; Merenstein et al., 2010), improve microbial activity (Cazorla et al., 2018), and limit gut injuries (Zakostelska et al., 2011).

Dragon fruit (Hylocereus undatus) or pitaya is a popular fruit high in micronutrients with a lot of significant health benefits, starting from cancer prevention (Luo et al., 2014; Paśko, Galanty, Zagrodzki, Ku, et al., 2021; Paśko, Galanty, Zagrodzki, Luksirikul, et al., 2021), antioxidant (Som et al., 2019), antimiobic (Nurmahani et al., 2012), anti-inflammatory, antiangiogenic (Rodriguez et al., 2016), antidiabetic (Poolsup et al., 2017), hepatoprotective (Ramli et al., 2014), wound-healing property (Juliaostuti et al., 2020), controlling blood cholesterol and glucose level in diabetes, to lowering blood pressure (Jayasinghe et al., 2015; Susanti et al., 2012). Anti-inflammatory and prebiotic effects were also observed in pitaya (Choo et al., 2016). Pitaya peel and pulp contain flavonoids, phenolic acids, tannins, and a high content of amino acids, alkaloids, and lipids (Lin et al., 2021); along with a high water content, fibres, vitamins, and minerals (Perween et al., 2018). Pitaya may contain vitamin C up to 6mg/100g fresh weight (Arivalagan et al., 2021). Moreover, pitaya peels contained higher antioxidant activity than its pulps (Nurliyana et al., 2010).

Based on pitaya potential, a functional probiotic drink with a high vitamin C content and antioxidant activity could be formulated. This research aims to process and determine the healthy drink formula from fermented pitaya peel with the highest vitamin C content and antioxidant activity.

Methods

There was 3 samples formulation with a difference on pitaya peel and water concentration (S1 = 900:100; S2 = 850:150; and S3 = 800:200). All samples were inoculated with Lactobacillus paracasei 5% b/v for 14 days under anaerobic conditions. Sample variation was carried out to determine the significance of the average vitamin C content in it. The next step was determining the amount of vitamin C (mg/100g) analysis from 3 samples of probiotic drinks using the Titration Iodometric Method, while the antioxidant activity was determined with 2,2-diphenyl-1- picrylhydrazyl (DPPH), each with a triplicate.

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\text{Vitamin C (mg/100g)} = \frac{VI2 \times 0.88 \times Fp \times 100}{Ws \text{ gram}}
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Results and Discussion

The results of vitamin C and antioxidant activity in each sample of probiotic drinks were as follow; S1 contains 100.34mg/100g with 25.12% antioxidant activity, S2 contains 98.45mg/100g with 20.26% antioxidant activity, and S3 contains 127.75 mg/100g with 29.93% antioxidant activity. A significant difference (P<0.05) was found in vitamin C content between samples. The higher the antioxidant activity, the higher the antioxidant levels, and the less food or drink needed to reduce free radicals (Lisdawati, 2006). This shows that the formulation of probiotic drinks from pitaya peel fermented with Lactobacillus paracasei contains high vitamin C and antioxidant activity. The average vitamin C level in the three probiotic drink samples was 108.84mg/100g. S3 showed the best antioxidant activity against 2,2-diphenyl-1-picrylhydrazyl (DPPH) of 29.93%. Phenolic compounds and vitamin C content contribute to the high antioxidant activity (Pehlivan, 2017; San Miguel-Chávez, 2017).
The fermented pitaya peel has the potential to be developed into healthy probiotic drinks. Vitamin C content and antioxidant activity may help to lower the risk for degenerative diseases, while antioxidant activity may restore the oxidant balance (Barchitta et al., 2019; Mohammed et al., 2016) and increase immunity (Biesalski et al., 2010). Betain in pitaya peel also modulates lipid metabolism, reduces oxidative stress, inflammatory response, and lipid peroxidation (Song et al., 2016; Yeh et al., 2020). Vitamin C also protects against atherosclerosis by inhibiting LDL oxidation and vascular endothelial dysfunction (Carr et al., 2000); while phenolic acids and flavonoids may exert cardioprotective effects by improving glucose tolerance (Abdel-Moneim et al., 2017), increasing vasodilatation (Perez et al., 2014), lowering LDL levels (Magyar et al., 2012), and exerting anti-platelet properties (Rolnik et al., 2020); showcasing its role as a potential antiatherogenic ingredient.

Acknowledgment

We thank all contributors for their outstanding help in formatting the paper. All authors contributed to the writing and revisions contained in the abstract and have read and approved the final manuscript. Personal funding comes from the author.

Reference


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Sample | Vitamin Content (mg/100g) | Anti-Oxidant Activity towards DPPH (%) |
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<tbody>
<tr>
<td>S1</td>
<td>100.34</td>
<td>25.12</td>
</tr>
<tr>
<td>S2</td>
<td>98.45</td>
<td>20.27</td>
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<tr>
<td>S3</td>
<td>127.75</td>
<td>29.93</td>
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<tr>
<td>Mean</td>
<td>108.84 ± 16.39</td>
<td>25.10 ± 4.83</td>
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