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Quality analysis of dragon fruit yoghurt for dyslipidemic patients

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ABSTRAK

Latar Belakang: *Penyakit kardiovaskular merupakan penyebab kematian nomor satu di dunia dengan faktor risikonya yaitu profil lipid dalam batas yang tidak normal.*
Tujuan: *Tujuan penelitian ini untuk mengetahui pengaruh pemberian probiotik yoghurt sari buah naga terhadap kadar profil lipid penderita dislipidemia pada pegawai Poltekkes Kemenkes Padang Kampus I dan II.*
Metode: *Desain penelitian adalah quasi eksperimen with pre-post test design, dengan membandingkan kadar lipid profile sebelum dengan setelah diberikan perlakuan. Total sampel berjumlah 30 orang, dipilih dengan menggunakan purposive sampling. Pengumpulan data dilakukan selama 21 hari, dengan pemberian yoghurt sebanyak 1 botol per hari, disiang hari, melakukan recall, pengisian kuesioner dari pemeriksaan laboratorium profil lipid (Cholesterol, HDL, LDH and triglyceride). Uji statistik yang digunakan adalah T-Test dependent dan independent.*
Hasil: *Dari hasil penelitian terdapat perbedaan yang bermakna pada kadar kolesterol total responden awal dan akhir sampel perlakuan ($p<0,05$), dan terdapat perbedaan yang bermakna pada kadar trigliserida responden awal dan akhir sampel perlakuan ($p<0,05$). Tidak ada perbedaan yang bermakna kadar lipid profile awal dengan akhir sampel kontrol ($p>0,05$). Tidak ada perbedaan yang bermakna kadar lipid profile akhir sampel perlakuan dengan sampel kontrol ($p>0,05$). Didapatkan kandungan zat gizi vitamin B2, B3, B6, B7, C dan serat dalam 100 mg yoghurt sari buah naga, yang beberapa diantaranya memiliki hubungan dengan perubahan kadar lipid profile.*
Kesimpulan: *Disarankan kepada peneliti selanjutnya untuk melanjutkan penelitian dengan jumlah sampel yang lebih banyak dan uji kandungan zat aktif produk sehingga dapat dijadikan salah satu minuman alternatif untuk penderita dislipidemia.*

KATA KUNCI*: dislipidemia; yoghurt; jus buah naga*

ABSTRACT

Background: *Cardiovascular disease is the number one cause of death in the world with a risk factor, namely a lipid profile within abnormal limits).*

Objectives: *The purpose of this study was to determine the effect of giving dragon fruit yoghurt probiotics on the profile of dyslipidemia sufferers in the Health Polytechnic of the Ministry of Health, Padang Campus I and II.*

Methods: *The research design was a quasi-experimental with pre-post test design, by comparing the levels of lipid profile before and after being given treatment. The total sample size is 30 people, selected using purposive sampling. Data collection was carried out for 21 days, by giving 1 bottle of yoghurt per day, during day by recalling and filling out questionnaires from laboratory tests (lipid profile). The statistical test used is T-Test dependent and independent.*

Results: *From the results of the study, there was a significant difference in the total cholesterol levels of the initial and final respondents of the treatment sample ($p < 0.05$), and there was a significant difference in the triglyceride levels of the initial and final respondents of the treatment sample ($p < 0.05$). There was no significant difference between the initial and final profile of the control sample ($p > 0.05$). There was no significant difference in the final profile of the treatment sample with the control sample ($p > 0.05$). It was found that the nutritional content of vitamins B2, B3, B6, B7, and C and fiber in 100 mg of dragon fruit juice yoghurt, some of which have a relationship with changes in lipid profile levels.*

Conclusions: *It is recommended that further researchers continue research with a larger number of samples and test the product's active substance content so that it can be used as an alternative drink for people with dyslipidemia.*

KEYWORD*:* *dyslipidemia, yoghurt, dragon fruit juice*

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INTRODUCTION

Cardiovascular disease is the number one cause of death in the world. In 2008, as many as 17.8 million (30%) people died from cardiovascular disease of these deaths, 7.3 million were caused by coronary heart disease (CHD) and 6.2 million were caused by stroke (1). The number of deaths from cardiovascular disease, particularly heart disease and stroke, is expected to reach 23.3 million by 2030 (2). Based on the 2012 World Health Statistics, the death rate due to heart and blood vessel disease in Indonesia for 100,000 people aged 30–70 years is 308 cases (3). The prevalence of coronary heart disease according to diagnosis or symptoms in Indonesia is 1.5%, while in West Sumatra Province it is 1.2% (4).

Hypercholesterolemia is a fat metabolism disorder characterized by an increase in total cholesterol levels of up to 200 mg/dl and as one of the risk factors for cardiovascular disease. High blood cholesterol levels are a significant and independent risk factor for the formation of atherosclerotic plaques, which cause cardiovascular disease (2) (5). At the age of 30–40 years, the total cholesterol level in the blood reaches 260 mg/dl, so the incidence of atherosclerosis will increase 3-5 times (6). Based on the results of Riskesdas 2013, people aged >15 years who had total cholesterol levels above the normal value were 35.9 (1). There were 15.9% with high LDL levels, 11.9% with high TG levels, and 22.9% with low HDL levels (40 mg/dl)(7).

Based on gender and place of residence, it was found that the proportion of the population with cholesterol levels above normal in women (39.6%) was higher than in men (30.0%), and in urban areas (39.5%) was higher compared to rural areas (32.1%). Controlling lipid levels by reducing total cholesterol, LDL, and triglycerides and increasing HDL to the recommended limit is an ideal strategy and one of the main targets in cardiovascular disease therapy. Management of

hypercholesterolemia can be done through non-pharmacological efforts by changing healthy lifestyles and dietary settings by limiting the consumption of cholesterol and saturated fat intake and increasing the intake of vegetables and fruits rich in fiber and antioxidants. One source of nutrients from these types of fruits is dragon fruit (8).

Red Dragon Fruit is a functional food that is good for your health. Mahattanawee research in 2006 showed that red dragon fruit has high antioxidant activity. The red pigment in red dragon fruit is known as betacyanin, which is a derivative of betalain. Betalains have been studied for their benefits as anti-radicals and antioxidant compounds. In West Sumatra, dragon fruit plants have been cultivated intensively since 2008(9). The districts that are the centers of cultivation are Padang Pariaman, Pasaman, and Solok districts. Based on data from the Central Statistics Agency, dragon fruit production in Padang Pariaman Regency in 2015 was 111 tons with a plantation area of 7 hectares. In the city of Padang, dragon fruit plantations are located in the Lubuk Minturun area (10) (11).

The utilization of red dragon fruit in making yoghurt is a form of diversification. Yoghurt is a beverage fermented by milk by lactic acid bacteria with a characteristic sour taste. The results of milk fermentation by lactic acid bacteria can increase the nutritional content of yoghurt, especially vitamin B complex, including vitamin B1 (Tianin), vitamin B2 (Riboflavin), vitamin B3 (Niacin), vitamin B6 (Pyridoxine), folic acid, pantothenic acid and biotin (12). Lactic acid bacteria found in yoghurt have the potential to reduce LDL cholesterol and triglyceride levels because they produce organic acids such as glucuronic acid, propionic acid, folic acid and lactic acid which can act as cholesterol-lowering agents. In addition, lactic acid bacteria are probiotic bacteria in humans that can reduce LDL cholesterol and triglyceride levels (13).

The addition of fruit juice can be used to improve the quality and nutritional value of the yoghurt itself. According to research conducted by Indriasari in 2012 at Udayana University, red dragon fruit extract can improve blood lipid profile levels. The research on the quality and antioxidant activity of probiotic drinks with variations of red dragon fruit extract conducted by Oktaviani showed that there was an increase in antioxidant activity in fermented red dragon fruit. Fermentation also uses lactic acid bacteria, which can have a major effect on reducing LDL cholesterol levels (14) (15).

Based on this description, researchers are interested in researching "The Efficacy of Giving Probiotics Yoghurt Dragon Fruit Juice Against Profilpid Levels of Hypercholesterolemic Patients". This research is a continuation of the 2019 research on organoleptic quality, chemical quality, and acceptability, and the 2020 research on the shelf life of dragon fruit juice yoghurt.

Research conducted in 2019 on organoleptic quality, chemical quality and acceptability of dragon fruit yoghurt using low-fat UHT milk obtained the best treatment results in terms of taste, colour, texture and aroma (panellist acceptance) of yoghurt with the addition of 25% dragon fruit juice. Then an analysis of nutritional levels was carried out, where in 100 ml of dragon fruit juice yoghurt from the best treatment, the protein content was 1.18%. The protein content of dragon fruit juice yoghurt made in this study was lower than the protein content that had been determined by the yoghurt quality standard (SNI 2981:2009), namely the quality requirement for low-fat yoghurt with a minimum protein content of 2.7%. Analysis of the fat content of the best treatment was 0.0%. The fat content of dragon fruit juice yoghurt made in this study has met SNI 2981:2009, namely the quality requirements of nonfat yoghurt with a max level of 0.5%. The results of the mineral analysis have also met the requirements of SNI 2981:2009, namely the quality requirements of yoghurt, except for lead minerals containing 0.33 mg/kg Lead, while the determination based on SNI 2981:2009 is a maximum of 0.30 mg/kg.

The results of the examination of lactic acid bacteria (LAB) obtained 2x109 and the LAB value has met the BSN total bacteria standard (SNI 01-2981-2009) which is 107 CFU/ml, and the results of the analysis of the ash content in 100 ml of dragon fruit juice yoghurt the best treatment is 0,86%. The ash content of dragon fruit juice yoghurt made in this study has met the ash content standard that has been determined by the yoghurt quality standard (SNI 2981: 2009), namely

the quality requirement for low-fat yoghurt with a maximum content of 1%. The 2020 research is a continuation of research on the shelf life of dragon fruit juice yoghurt, which is still in the research process. Based on the results of the study, it was found that the best temperature (seen from the pH value and total LAB) for yoghurt storage was 4-5oC. Based on organoleptic quality, the best storage time for room temperature (25ºC)< days, while at 10ºC for 14 days, and 4-5ºC for 21 days.

MATERIALS AND METHODS

The design of this study was quasi-experimental with a *pre-post test* design, by comparing the levels of lipid profiles (total cholesterol, LDL, HDL, and triglycerides) before being given treatment with the given treatment. The research was conducted at the Health Polytechnic of the Indonesian Ministry of Health, Padang, in 2021. The number of respondents in this study was 30 respondents. The way of collecting data is through primary data collection, which includes: general data of respondents using questionnaires and interview methods; intake data with 3x24-hour recall; data on initial and final lipid profile levels of respondents obtained through laboratory examination by UPTD officers of the Health Laboratory of West Sumatra Province; and data on the nutritional content of dragon fruit juice yoghurt was obtained by a laboratory in Bandung. The data analysis used was univariate data analysis to see the general description of the respondents, then to see the average nutritional intake of the respondents, the levels of profiles and nutrients contained in the dragon fruit juice yoghurt.

RESULTS AND DISCUSSIONS

Respondents in this study amounted to 30 people who are employees of Poltekkes Kemenkes Padang Campus I and II. The characteristics of respondents such as age, gender, education, and nutritional status, as well as the intake of nutrients (fat, carbohydrates, fiber, and cholesterol), can be seen in the following table.

Table 1. Frequency Distribution of Respondents

Variable	Frequency		Percentage (%)	
	Treatment	Control	Treatment	Control
Age (Year)				
30 – 39	1	4	3.3	13.3
40 – 49	6	7	20	23.3
50 – 59	8	4	26.6	13.3
Education				
Senior High School	0	8	0	26.6
Diploma III	1	0	3.3	0
Bachelor	4	4	13.3	13.3
Magister	10	3	33.3	10
Occupation				
Lecturer	10	3	33.3	10
Employee Adm	5	4	16.6	13.3
Cleaning Service	0	8	0	26.6
Nutrition Status				
Normal	5	6	16.6	20
Overweight	7	5	23.3	16.6
Obese	3	4	10	13.3

Based on **Table 1**, it can be seen that half of the sample is in the age range of 40 – 59 years (83.3%), the education of the sample is more at the S2 level (43.3%), and for the type of work are mostly lecturers, it counts 43.3%. The nutritional status of the sample is more (40%) with nutritional status classified as overweight. The sample in this study was mostly female (96.6%). The average profile is the average seen in cholesterol, HDL, LDL and triglyceride levels of treatment and control respondents before being given the intervention. Based on the average initial profile of the treatment and control respondents, it can be seen that the initial cholesterol, HDL and LDL

levels of the respondents and controls were not normal. The average profile is the average seen in cholesterol, HDL, LDL and triglyceride levels of treatment and control respondents after being given the intervention.

Based on the average before and after intervention profile of both treatment and control respondents, there was a decrease in cholesterol and triglyceride levels (**Table 2**). The average changes in the levels of lipid profile before and after administration of dragon fruit juice yoghurt. The average change in the levels of lipid profiles that experienced the highest decrease was in cholesterol levels of 29.06 mg/dl, and the levels of lipid profiles that experienced the lowest decline were in HDL levels of 1.8 mg/dl. The average changes in the levels of lipid profile before and after giving milk yoghurt. The average change in the levels of lipid profile that experienced the highest decrease was in cholesterol levels of 20.9 mg/dl, and the levels of lipid profile that experienced the lowest decline were in HDL levels of 0.9 mg/dl.

Based on the **Table 3**, the average intake is the average as seen on the intake of day 1, day 8 and day 15. It can be seen that the average fat intake of respondents is 69.2 g, cholesterol 162.4 mg, carbohydrates 134.9 g, and 8.4 g of fiber.

Table 2. Lipid profile in various treatment periods during 15 days of treatment

Lipid profile	Intervention									
	Dragon Fruit Juice					Milk Yoghurt				
	Before	After	Different Mean±SD	Min	Max	Before	After	Different Mean±SD	Min	Max
Cholesterol (mg/dl)	237.4	208.4	29.06 ± -31	96	27.45	235.1	214.2	20.9 ± -42	100	31.14
HDL (mg/dl)	53.3	51.4	1.8 ± -25	24	12.94	53	52.1	0.9 ± -22	14	9.2
LDL (mg/dl)	145.8	132.4	13.3 ± -146	51	48.02	156.8	138.5	18.3 ± -43	98	32.18
Triglyceride (mg/dl)	148.47	140.8	7.6 ± -67	176	61.19	125	117.7	7.2 ± -69	184	63.93

Based on the **Table 5**, it can be seen that the nutritional values contained in 120 ml of dragon fruit juice include protein, vitamin B2, vitamin B3, vitamin B6, vitamin C, dietary fiber and vitamin B7. When viewed from the level, the most nutritional value contained in dragon fruit juice yoghurt is the nutritional value of vitamin C 8.08 mg. While the lowest nutritional value is in vitamin B2, which is 0.19 mg. The respondents of this study were 29 respondents of both genders and 1 respondent had not taken any cholesterol drugs. Most of the respondents aged between 40-59 years old, 25 respondents had master's degrees, and 12 respondents had obese nutritional status. Half of the respondents were treated by dragon fruit yoghurt and the other half were treated by milk yoghurt each 120 ml in 21 days.

The results showed the fat intake of dragon fruit yoghurt was 27% higher than the fat intake of milk yoghurt. The carbohydrate intake of dragon fruit yoghurt was 30.2% higher than the carbohydrate intake of milk yoghurt.

Table 3 . Average distribution fat intake, cholesterol, carbohydrates and fiber

Nutrition	Average Intake					
	Respondent of Treatment			Respondent of Control		
	Mean±SD	Min	Max	Mean±SD	Min	Max
Fat (g)	69.2 ± 22.2	49.9	87.4	54.48 ± 21.52	27.6	110.1
Cholesterol (mg)	162.4 ± 94.62	44.9	356.2	184.2 ± 180.24	42.3	470.8
Carbohydrate (g)	134.9 ± 58.8	65.4	194.3	175.7 ± 55.24	76.5	256.3
Fiber (g)	8.4 ± 3.26	3.4	16.9	8.5 ± 5.3	1.8	21.1

The fiber intake of dragon fruit yoghurt was 4.7% higher than the fiber intake of milk yoghurt and the cholesterol intake of dragon fruit was 13.4% higher than the cholesterol intake of milk yoghurt. The results showed that the average triglyceride level at the beginning before giving dragon fruit

yoghurt and milk yoghurt was in the normal range. Then, the average triglyceride level after the intake of dragon fruit yoghurt lowered triglyceride levels by 7.6% more than milk yoghurt (7.2%). The results of this study are also in line with the results of a study conducted by Budiatmaja (2014), where the results of his research showed that giving red dragon fruit juice at a dose of 2.86 g/kgBW for 21 days can reduce the total cholesterol level of hypercholesterolemia men.

Table 5. Nutritional value of dragon fruit juice yoghurt

Parameter	Levels
Protein	1.18
Vitamine B2	0.19
Vitamine B3	0.33
Vitamine B6	1.97
Vitamine C	8.08
Fiber	1.47
Bitamine B7	1.85

The results showed that the dragon fruit contains niacin (vitamin B3) according to the results of a study by Reni Heryani and Tuti Rahayu (2016 and 2005) showed that the decrease in cholesterol levels in rats given red dragon fruit extract was likely influenced by Niacin compounds (16). Vitamin B3 (niacin) can decrease VLDL production in the liver so that the production of total cholesterol, LDL, and triglycerides decreases. Niacin compounds aimed to help metabolism in producing energy and play a role in fat metabolism to reduce cholesterol levels, namely Low-Density Lipoprotein (LDL) and triglycerides, as well as increasing High-Density Lipoprotein (HDL) levels to reduce blood vessel and heart disease.

The results of this study are also the same as the results of a study conducted by Reni Heryani (2016) showed that the results of triglyceride levels in all white rat treatment groups decreased after obtaining red dragon fruit extract because the contained the dragon fruit-like niacin, fiber, thiamine, vitamin C and flavonoids.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the study, the following conclusions can be drawn: The average initial profile of the respondents was as follows: The total cholesterol level was 218.33 mg/dL, the HDL level was 51.11 mg/dL, the LDL level was 145.11 mg/dL, and the triglyceride level was 111.39 mg/Dl. The final average profile of respondents was as follows: Total cholesterol level 217.78 mg/dL, HDL 56.67 mg/dL, LDL 139.56 mg/dL, Triglycerides 109.22 mg/dL.

Giving yoghurt juice probiotics Dragon fruit tends to reduce the cholesterol levels of hypercholesterolemic patients. It is hoped that this research can continue with a larger number of samples, a longer intervention time, and shelf life tests, as well as testing the content of active substances in the product so that it can be used as an alternative drink in the management of hypercholesterolemic patients. Juice from dragon fruit Probiotic yoghurt has benefits for controlling the cholesterol profile of hypercholesterolemic sufferers. It is expected that yoghurt producers can process dragon fruit into probiotic yoghurt and dragon fruit juice so that dragon fruit has a higher selling value and can be consumed by people with hypercholesterolemia.

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