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Research Article

Fiber Content and Antioxidant Activity of Chiapuding from Chia Seeds and Soybean Extract with Temple Flower Extract as a Dilution for Obesite Teenagers

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Abstract:
The aim of this research was to analyze the fiber content and antioxidant activity in pudding made from chia seeds and soybean juice with butterfly pea flower extract. The type of research is experimental research, with the RAL (Completely Randomized Design) method, which is carried out by adding chia seeds to making pudding with 5 treatments, namely F0 (0%), F1 (2%), F2 (4%), F3 (6%) and F4 (8%). Fiber content analysis using the AOAC method and antioxidant activity analysis using the DPPH method were carried out at the Lampung State Polytechnic Laboratory. Data processing was carried out by ANOVA and Duncan tests using SPSS 20. The results of statistical tests on fiber content showed that there was no effect of adding chia seeds to making pudding with a p-value = 0.106 even though there was an increase in each formula. The highest fiber content in F4 (8%) is 5.86% or 5.8 gr/100 gr pudding, which can meet daily fiber needs, namely 2.7 -3.7 gr/day. The results of statistical tests on antioxidant activity show that there is an effect of adding chia seeds to make pudding with a p-value = 0.000. The highest IC50 antioxidant activity was in F4 (8%) at 6090 µg/mL, even though the IC50 value was in the weak category, the smaller the IC50 value, the stronger the antioxidant was in warding off free radicals. Based on research results, the more chia seed formula added, the higher the fiber content and the higher the IC50 antioxidant activity.
Keywords: Butterfly Flower, Chiapuding, Chia Seeds, Soybean Extract

1. INTRODUCTION

Overweight (obesity) or a condition where a person's weight exceeds normal body weight is a serious problem throughout the world. Obesity measurement uses the Body Mass Index (BMI). Individuals who have a BMI exceeding 30 are considered obese while individuals who have a BMI equal to or more than 25.0-29.9 are considered overweight (Haththotuwa et al., 2020; Kivimäki et al., 2022; Ramadhania et al., 2024). Current technological developments and the industrial world force the millennial generation to choose and sort food. Food consumption patterns that are currently developing tend towards food patterns that are high in fat and low in fiber. This habit generally occurs in people who live in urban areas who tend to choose to consume ready-to-eat and practical foods (Situmorang et al., 2021).

Dietary fiber is a group of carbohydrates that have a very complex chemical structure and are part of edible plants. Based on their chemical, physical and functional characteristics, in general, fibers are grouped into two large groups, namely soluble and insoluble in water.

The number of Indonesian people who are obese shows an increase, in 1999 it was only 15% - 20% but in 2002 the incidence of obesity increased to 22% - 24%, so around 48-53 million Indonesians are obese. The problem of obesity is experienced by several groups in society, including toddlers, school-age children, teenagers, adults and the elderly. According to the Indonesian Ministry of Health in Basic Health Research (2010), in Indonesia there has been an increase in the prevalence of obesity, namely from 12.2% in 2007 to 14.0% in 2010.

The majority of the Indonesian population has low fiber consumption, namely 93.5% (Riskesdas, 2013). Based on Basic Health Research (Riskesdas) in 2018, the proportion of fiber consumption of less than 5 portions per day among people aged ≥ 5 years in Indonesia reached 95.5%. The percentage of less fiber consumption increased from 2013 to 2018, namely 93.5% to 95.5%. The Indonesian population consumes 15 grams of fiber/day, even though good fiber consumption is around 25 grams/day. The importance of fiber consumption for the body and low

fiber consumption in Indonesia causes a lot of obesity. Dietary fiber intake is known to be beneficial in controlling obesity, managing diabetes, reducing cholesterol levels and lowering blood pressure.

Adolescence is a transition period from childhood to adulthood, where teenagers are looking for their identity so they are quite unstable and easily influenced by the surrounding environment, one of which is the fashion and trends that are currently developing. One of the nutritional problems faced by teenagers in Indonesia is being overweight. Results of According to Basic Health Research (Riskesdas), 9.5% of Indonesian teenagers between the ages of 15 and 18 had a nutritional status that was either fat or overweight in 2018. Teenage obesity is brought on by a number of variables, such as environmental, genetic, psychological, and other causes. anatomy. According to Basic Health Research (Riskesdas), the incidence of overweight adolescents in Indonesia between the ages of 16 and 18 has risen from 1.4% in 2013 to 7.3% in 2018.

One food ingredient that contains high fiber is chia seeds. Many people are not familiar with chia seeds. Chia seeds contain 486 kcal of energy, 16.54 g protein, 30.74 g fat, 42.12 g carbohydrates, 34.4 g fiber. Additionally, 17.83 percent of omega 3 fatty acids, or linolenic acid, are found in chia seeds. Black and white chia seeds are the two different varieties of chia seeds. Most people think that black and white chia seeds are the same because of their slight variations. Black chia seeds have a comparable nutritional value; they contain 32.6% fiber and 16.9% protein. It is reported that the protein content of white chia seeds is 16.5%, while the fiber level is 32.4%. The morphology of the seeds is the only distinction; white seeds are bigger, thicker, and wider than black seeds. It is important to note that between 5% and 8% of White chia seeds are planted simultaneously with Black chia seeds during cultivation. Only white chia seeds can be produced by cultivating white chia seeds exclusively (Hrnčič et al., 2018). Because chia seeds don't induce allergies or have any negative consequences, its use as a food ingredient is said to be safe. Chia seeds and goods derived from them therefore provide a promising source for development. Chia seeds are rich in dietary fiber, high-value protein, and antioxidants. They also contain 17.83% omega 3 fatty acids, or α-linolenic acid.

The body naturally defends itself against attacks by free radicals, which mostly come from inflammation and regular cell metabolism. The body requires extra antioxidants from the outside to guard against free radical attacks since the body's natural defenses against free radicals can be weakened by stress, radiation, cigarette smoke, and environmental pollution, all of which can increase the quantity of free radicals. The body's amount of adipose tissue increases in obesity. Adipokine alterations brought on by obesity's increased adipose mass result in a reduction in insulin sensitivity. Lipid metabolism will be impacted by decreased insulin sensitivity, and obese patients will have hyperlipidemia. Triglyceride lipolysis in adipose tissue will increase with decreased insulin sensitivity (Ahmed et al., 2021; Heinonen et al., 2020; Kawai et al., 2021). This causes obesity to produce an excessive amount of free fatty acids, which in turn causes an increase in the formation of tiny, dense, easily oxidized LDL. Reactive oxygen species (ROS) are produced when LDL oxidizes, and because there is a lot of oxidized LDL in hyperlipidemia, there are a lot of ROS produced. Antioxidative enzymes and substances with antioxidant activity can lower and regulate the amount of reactive oxygen species (ROS) in the environment. Intracellular cells can maintain low ROS levels by engaging in antioxidant activity. The antioxidant defense system of the body will always combat ROS and free radicals. Free radical damage to cellular components can be delayed, slowed down, or avoided by antioxidants.

Chia seeds have the effect of reducing weight in obese sufferers, as well as reducing the risk of cardiovascular disease, inflammation, central nervous system disorders and diabetes (Rivero-Salgado et al., 2024). Chia seeds contain quite a lot of antioxidants so they can inhibit free radicals and are high in omega 3 ALA (Alpha-linolenic Acid). Because their antioxidant content is quite high, chia seeds have benefits such as reducing triglyceride and total cholesterol levels, which can reduce blood pressure and cardiovascular disease. Apart from that, it can also act as an anti-inflammatory, cardioprotective and hepatoprotective, anti-diabetic, protection against arthritis, autoimmune diseases and cancer. Flavonoids are one type of antioxidant found in chia seeds. Due to their antioxidant properties, flavonoid chemicals help strengthen one's protection against illnesses brought on by free radicals. Additionally, it is known that flavonoid chemicals lower the risk of chronic illnesses like cancer, diabetes, and heart disease.

When creating functional food products, chia seeds can be utilized as a natural ingredient with possible health benefits (Rabail et al., 2021). This plant originates from Central America, especially Mexico and Guatemala. The advantage of chia seeds compared to other seeds apart from their higher nutritional content is that chia seeds form a constant gum (gel) in water for 2 hours. When compared to basil seeds, the gel stability of chia seeds is twice as

long (Agarwal et al., 2023). This difference in gel stability may be due to the gum content in chia seeds and basil seeds. Chia seeds contain 5–6 percent gum while basil seeds contain 2 percent gum (Khursheed et al., 2023). Chia seeds are very easy to consume, this type of grain can be processed with food ingredients such as cereal, oatmeal, cakes, eggs and can also be mixed into drinks such as juice, smoothies, and can also be eaten just like that or processed into the main ingredient in food. Intermezzo.

In Indonesia, a wide range of social groups frequently consume snacks. Snack foods are popular among many segments of Indonesian society for a number of reasons, including low production costs, ease of preparation, and extended shelf life. Nonetheless, the macronutrients (carbohydrates, protein, and fat) and micronutrients (calcium, iron, and potassium) in snacks still contribute very little to daily nutritional needs because most people are mainly concerned with how nice a snack tastes. Nutritional issues result from an imbalance in dietary requirements; undernutrition and overnutrition are serious issues since they can lead to specific diseases. Since the nutrients from snacks are meant to complement those from the main meal, it is important that they be healthful and nourishing. As a result, we need snack products that are not only tasty but also nutritious and healthful. Snack food consumption can make up anywhere from 10% to 20% of daily meal consumption. Snack food's energy yield adds 17.36% energy, 12.4% protein, 21.1% fat, and 15.1% carbohydrates to daily consumption.

One snack is pudding. Pudding is a type of dessert that is popular with people of all ages because of its sweet taste and soft texture. Pudding is made from gelatin powder, liquid ingredients (water, milk and fruit juice), sweetener (sugar or syrup), other ingredients (fruit, chocolate, etc.) and is served as a cold dessert. So far the puddings made do not have specific nutritional content, puddings made from chia seeds have the potential to be an alternative high-fiber snack for teenagers who are overweight. Foods that contain high fiber can slow down the energy absorption process for longer, because fiber can increase chewing intensity, slow down the eating process, and inhibit the rate of food digestion. So, the energy that enters the body is more efficient and does not turn into fat. Foods high in fiber can also help in losing weight because fiber can increase fat excretion.

Milk pudding is a type of pudding made from fresh milk or other types of milk and gel-forming ingredients, through several process stages, namely mixing, heating, stirring, packaging and cooling. According to the Food and Drug Supervisory Agency (2019), milk pudding is a soft solid dessert made from fresh milk or milk products or mixtures thereof which are added with starch or gelling ingredients with or without the addition of other food ingredients.

Most of the pudding products currently on the market use cow's milk as the main ingredient, which contains more fat. The use of cow's milk in pudding can be replaced with soy milk, because the fat content per 100 g in soy milk is lower, namely 2.50 g compared to cow's milk, 3.50 g, and the protein content per 100 grams in soy milk is higher, namely 3 .50 g while cow's milk is 3.20 g (Directorate of Nutrition, Ministry of Health of the Republic of Indonesia, 1996) Soy milk has various advantages, such as being easy to process, cheap, high nutritional value, and does not contain lactose so it can be consumed by people with lactose intolerance or who are allergic to cow's milk. Soy milk can be used as a substitute for cow's milk because its protein quality is almost the same as cow's milk. Soybean juice is also known as a healthy drink, because it does not contain cholesterol but contains phytochemicals, namely compounds in food that can be beneficial for health. Soybean juice has phytoestrogens and isoflavones as its phytochemical constituents. People who are lactose intolerant that is, who lack the enzyme lactase in their bodies can drink soybean juice since it does not contain lactose. For this reason, soybean juice works well in place of cow's milk.

Pudding made from chia seeds and soybean juice will have an unattractive color so natural coloring needs to be added. Adding coloring to a food product is a very natural thing, even now the use of coloring is a necessity. If food coloring is added to a food product, it will look more attractive so that it can attract consumers to buy, and can also increase consumers' appetite. However, what is a shame nowadays is that traders more often use synthetic dyes to color their products, this is because synthetic dyes have a wide variety of colors, are cheaper and more practical than natural dyes.

We must be careful about the use of synthetic dyes, because it will slowly lead to a decline in people's health conditions (development of tumors, cancer, respiratory and skin problems, etc.) due to continuous consumption of synthetic dyes and without proper monitoring. Food producers in general still do not understand the dangers of the synthetic dyes used, they only think about making a profit. To prevent the increasing use of synthetic dyes, efforts that can be made are to make natural dyes. One of the natural pigments that can be used as a natural dye is anthocyanin found in butterfly pea flowers.

The anthocyanin concentration in butterfly pea

blooms gives them their blue hue. Preparations of animal blood cells can be stained with crude extracts from butterfly pea blossoms. After examining the advantages, characteristics, and safety of telang flowers which grow easily in Indonesia it is possible to draw the conclusion that they are suitable to use as a natural food coloring. Plants with butterfly pea flowers are good for your health. The most economical natural food coloring is 10% butterfly pea flower. The maceration extraction method is the one that should be utilized to extract anthocyanins from butterfly pea blossoms. This method, which is among the most popular and straightforward ones, can prevent harm to the substances included in butterfly pea blossoms.

The method for extracting butterfly pea flowers used by the author in the research was maceration or soaking 10 fresh butterfly pea flowers in 250 mL of hot water (100 °C) for 30 minutes. The content of anthocyanin compounds in telang flowers is quite high, namely 22.74 mg/100 g. Anthocyanin compounds are one of the pigments that can be found in food. Anthocyanins have anti-oxidative properties and can provide a red-blue color.

Based on studies published in publications by Indis et al (2023) With respect to the organoleptic examination and approximate content of chocolate pudding including black chia (Salvia hispanica l.) at concentrations of 2%, 4%, 6%, 8%, and 0% control, the findings of the analysis of the crude fiber of the black chia seeds examined in this investigation were 14.24%. The addition of 40% butterfly pea flower extract was found to be the best treatment for making pudding, with an antioxidant value of 65.50%, in a different journal titled The Effect of Adding Butterfly Pea Flower Extract (Clitoria ternatea L) on the Physicochemical and Organoleptic Properties of Pudding by Duwi Ariani Idrus (2023).

The research conducted was to examine the antioxidant activity of Chia Seed using this method, based on previous research by Fatimah Sari and Vonna Aulianshah entitled Antioxidant Activity of Water Infused Chia Seed (Salvia Hispanica L) Using the DPPH (2,2-diphenyl-1 – picrylhydrazil) Method. DPPH. This study is an experimental one. The sample used is chia seeds that have been processed into infused water. The DPPH (2,2-diphenyl-1-picrylhydrazil) method will be used to evaluate the water for antioxidant activity, with vitamin C serving as a reference. Infused water was tested at five distinct concentrations: 2, 4, 6, 8, and 10 ppm. Samples of each concentration will be reacted with the DPPH compound which is a free radical, then the absorbance value will be measured using UV-Vis Spectrophotometry at a wavelength of 517nm. Based on these results, the antioxidant activity of Infused Water Chia Seed with an IC50 value of 11.31 ppm is categorized as strong and vitamin C produces an IC50 value of 6.65 ppm which is categorized as very strong. So it can be concluded that chia seed infused water is proven to have high antioxidant activity to ward off free radical compounds.

Based on trial error carried out by researchers on January 9 2024 with the formula for adding chia seeds of 0%, 2%, 4%, 6% and 8%, the results of the observations obtained from each formula were visible physical differences in the texture of the pudding. The more chia seed formula you add, the denser the texture of the pudding, this is because after soaking the chia seeds in water, they will form chia gum which has a smooth texture on the surface and is a little rough when chewed. To observe the color there is no difference due to the addition of butterfly pea flower extract and Use the same amount of soybean essence in each formula. Six participants were asked to participate in organoleptic tests (color, aroma, and texture) at the researcher's home. The results indicated that F1 (2%) was the most preferred color, F3 (6%), F2 (4%) was the most preferred taste, and F2 (4%), the most preferred texture, for the chiapuding made from chia seeds and soybean juice with the addition of butterfly pea flower extract. According to the above description, the author is interested in researching the production of chiapuding, which is manufactured from soybean juice and chia seeds with the addition of butterfly pea flower extract. The fiber content and antioxidant activity will then be tested

2. MATERIAL AND METHOD

This is an experimental study using the Completely Randomized Design method. Five treatments, F0 (0%), F1 (2%), F2 (4%), F3 (6%) and F4 (8%) are added to pudding before it is finished. AOAC and DPPH methods are used to analyze fiber content and antioxidant activity, respectively. The Lampung State Polytechnic Laboratory was the site of the study. The study was conducted between November 2023 and January 2024, a period of two months. Using SPSS 20, the ANOVA and Duncan tests were used to process the data

3. RESULT AND DISCUSSION

3.1 Results

Table 1. Results of Average Crude Fiber Content

	Treatment				
	F0 (Control)	**F1 (2%)**	**F2 (4%)**	**F3 (6%)**	**F4 (8%)**
Fiber (%)	1.36	2.69	3.40	3.98	5.86

Based on table 1, it can be seen that the average results of the analysis of crude fiber content in pudding from each treatment have different contents. The results of the analysis of the crude fiber content. of the pudding were the highest in F4 (8%) at 5.86% and the lowest in F0 (control) at 1.36%

Results of Antioxidant Activity Analysis (IC50)

Table 2. Antioxidant Activity Analysis Results (IC50)

IC50 Antioxidant Activity (µg/mL)	Treatment				
	F0 (Control)	**F1 (2%)**	**F2 (4%)**	**F3 (6%)**	**F4 (8%)**
	14,177	12,303	10,518	8.102	6.090

Based on table 2, it can be seen that there are differences in antioxidant activity produced between formulations. The highest score was F0 (0%) and the lowest was F4 (8%), however, the results of the IC50 antioxidant activity analysis were the strongest in F4 (8%), because the lower the antioxidant activity value, the stronger the IC50 antioxidant activity.

Data Normality Test

To ascertain the sort of data analysis to be employed based on the normalcy of the data, a data normalcy test must be performed prior to doing bivariate analysis. Using the Shapiro-Wilk method and the SPSS software, the normalcy test was run. Because it is a reliable and valid method for calculating data distribution for small samples, the Shapiro-Wilk test is employed.

Table 3. Normality Test Data

Component	N	Shapiro Wilk (P)
Crude Fiber Content	5	0.692
Antioxidant	5	0.893

Description: Shapiro Wilk test

Based on the table above, the results show that each formulation has a normal distribution (p>0.05), so further tests were carried out using the One Way Anova test.

To find out whether there is a difference in the average levels of crude fiber and antioxidants (IC50) in each treatment, it is necessary to carry out an Analysis of Variance (ANOVA) test, with the following results:

Bivariate Analysis

Table 4. One Way Anova Test Data for each component in the modification of the pudding formula

Component	**Results of Average Crude Fiber and Antioxidant Content Pudding Formula**					***p-value (p<0.05)***
	F0 Mean±SD	**F1 Mean±SD**	**F2 Mean±SD**	**F3 Mean±SD**	**F4 Mean±SD**	
Fiber (%)	1.36 ± 0.50	2.69 ± 0.57	3.40 ± 0.32	3.98 ± 0.45	5.86 ± 2.69	0.106
Antioxidant (µg/mL)	14177±648.6	12303±432.7	10518±681	8102±39.4	6090±29	0,000

Note: One Way Anova Test

Based on table 4, the results of the One Way Anova test show that there is no real difference in the average crude fiber between formulations with a value of p = 0.106. From these results, Duncan's test was not carried out for crude fiber content. In terms of antioxidant activity, there is a significant difference in the average antioxidant activity. with p value = 0.000. To find out which groups were significantly different, One Way Anova analysis on antioxidant activity was followed by Duncan's test. Duncan's test results can be seen in table 5.

Table 5. Duncan's Test Data for Differences in Average Levels of Crude Fiber and Antioxidants (IC50) in Each Treatment

Component	Average Results of Pudding Formula Antioxidant Activity					*p-value (p<0.05)*
	F0	F1	F2	F3	F4	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
Antioxidants n (µg/mL)	14177±648.6 a	12303±432.7 b	10518±681 c	8102±39.4 d	6090±29 e	0,000

Note: a, b = similar letter notation means there is no significant difference at the Duncan's Test level

Based on table 5, the results of Duncan's test for crude fiber content in pudding show that F0 crude fiber is not significantly different from the crude fiber content in F1, F2, F3 and F4. The crude fiber content of F1 was not significantly different from the crude fiber content of F0, F2, F3 and F4. The crude fiber content of F2 was not significantly different from the crude fiber content of F0, F1, F3 and F4. The crude fiber content of F3 was not significantly different from the crude fiber content of F0, F1, F2 and F4. The crude fiber content of F4 was not significantly different from the crude fiber content of F0, F1, F2 and F3. The results of Duncan's Multiple Range test showed that the antioxidant activity of IC50 F0 was significantly different from the antioxidant activity of IC50 F1, F2, F3 and F4. The antioxidant activity of IC50 F1 was significantly different from the antioxidant activity of IC50 F0, F2, F3 and F4. The antioxidant activity of IC50 F2 is significantly different from the antioxidant activity of IC50 F0, F1, F3 and F4. The antioxidant activity of IC50 F2 is significantly different from the antioxidant activity of IC50 F0, F1, F3 and F4. The antioxidant activity of IC50 F3 is significantly different from the antioxidant activity of IC50 F0, F1, F2 and F4. The antioxidant activity of IC50 F4 is significantly different from the antioxidant activity of IC50 F0, F1, F2 and F3.

3.2 Discussion

This research used two main ingredients, namely chia seeds and soybean juice with the addition of butterfly pea flower extract mixed into the pudding mixture. Making soybean juice using raw materials of 1 kg of Anjasmoro variety soybeans obtained from the Fitrinop supermarket. From 1 kg of soybeans that have been cleaned, soaked for 8-24 hours then blended with the addition of 2 L of water until smooth then filtered with a filter cloth and heated to a temperature of 89.5 degrees Celsius and obtained 2 L of soybean juice which is ready to be used. Meanwhile, 250 ml of butterfly pea flower extract was obtained from 10 pieces of fresh butterfly pea flower which were soaked in boiling water at a temperature of 100oC, while the chia seeds used were organic Mexican black chia seeds which were obtained online through the Bysia shop marketplace in the Surabaya area.

Analysis of Crude Fiber Content

Table 1 indicates that the four formulas with crude fiber content without the addition of chia seeds (F0) produced an increase in crude fiber content. However, Table 4 demonstrates that there is no difference in fiber content in each treatment (p-value=0.106), indicating that the addition of chia seeds to F1(2%), F2(4%), F3(6%), and F4(8%) has no effect on the fiber content in chiapuding.

The results of analysis of crude fiber content in puddings made from chia seeds and soybean juice with the addition of butterfly pea flower extract showed an increase in crude fiber content in chia seed puddings F1 (2%), F2 (4%), F3 (6%) and F4 (8 %). Chia seeds as much as 2%, 4%, 6% and 8% in every 100 grams of soybean juice weight contribute crude fiber of 2.69%, 3.40%, 3.98% and 5.86% respectively. The highest average crude fiber content with the addition of chia seeds was in the F4 (8%) treatment at 5.86%, while the lowest fiber content was in the F1 (2%) treatment at 2.69%. It is known that pudding with the addition of chia seeds has a higher crude fiber content than pudding made with soybean juice alone without the addition of chia seeds. This is in line with previous research by Nadhifah Al Indis et al (2023) that the more chia seeds added, the higher the crude fiber content obtained.

It can be concluded that the more chia seeds added, the higher the fiber content in the pudding. This is caused by the high fiber content in chia seeds of 34.4 gr/100 gr. The required fiber intake for boys aged 10 - 18 years is 28 - 37 g/day, while for girls aged 10 -18 years it is 27 - 29 g/day. According to BPOM (2019) the recommended serving size for pudding is 100-200 grams. As a snack, the required fiber is 10% of daily fiber requirements, namely 2.7 – 3.7 g/day . A product can be said to be a source of dietary fiber if it contains 1.5 grams of fiber per 100 kcal in liquid form or contains 3 grams of fiber per 100 grams in solid form.

Based on table 1, the results of the analysis of crude fiber content still use percent units. If you change the percent calculation to grams, the results of the fiber content in the pudding in each 1 cup of each formula provide a contribution of F0 (0%) fiber, namely 1.37

grams, in F1 pudding (2%) is 3.84 gr, F2 pudding (4%) is 4.93 gr, F3 pudding (6%) is 5.85 gr and F4 pudding is 8.7 gr. F4 chia seed pudding (8%) has the highest fiber content, namely 8.7g. Then, if you change the percent calculation into grams of fiber content in pudding in every 100 grams, each formula provides a contribution of F0 (0%) fiber, which is 0.97 grams, for F1 (2%) pudding it is 2.68 grams, for F2 pudding (4%) is 3.4 gr, F3 pudding (6%) is 3.97 gr and F4 pudding is 5.8 gr. F4 chia seed pudding (8%) has the highest fiber content, namely 5.8 gr/100 gr.

Based on BPOM, 2016, a product can be said to be a source of dietary fiber if it contains 3 grams of fiber per 100 grams in solid form. From each formula it can be concluded that the pudding is made from chia seeds and soybean juice with the addition of butterfly pea flower extract in F2 (4%) , F3(6%) and F4 (8%) are included as sources of dietary fiber.

According to Hardiansyah and Supariasa (2017) the need for fiber intake in obese sufferers is around 20 g/day. So the amount of fiber needed based on portions for snacks is 15 percent of 20 g/day, around 3 g. The role of fiber has been explained in the previous discussion, one of its functions is that it can control body weight. Fiber can reduce weight because fiber consists of a water solution which also has the function of delaying gastric emptying time so that you feel full longer.

Fiber is an important food component that should be included in your daily diet. Fiber is known to have many benefits for the body, especially in preventing several diseases. Fiber is defined as the edible part of a plant or a carbohydrate analogue that is resistant to digestion and absorption in the small intestine with complete or partial fermentation in the large intestine. The benefits of high fiber for body health are controlling body weight or overweight, controlling diabetes, preventing gastrointestinal disorders, preventing colon cancer, reducing cholesterol levels and cardiovascular disease.

Crude fiber is the residue of food or agricultural products after being treated with boiling acid or alkali, and consists of cellulose, with a small amount of lignin and pentose (Hermayanti, 2006). Crude fiber is the part of food that cannot be hydrolyzed by chemicals used to determine crude fiber content, namely sulfuric acid (H2SO 1.25%) and sodium hydroxide (NaOH 1.25%) (Piliang et al., 2002) According to Sundari et al. . (2015), food ingredients when cooked using heat will cause the nutrient levels in the food to decrease compared to the raw ingredients. The amount of nutritional content of a food that decreases more or less due to the cooking process depends on the length of the cooking process, cooking temperature, and the type of food used. Using heat in boiling can reduce the nutrients in the pudding.

Foods that contain high fiber can slow down the energy absorption process for longer, because fiber can increase chewing intensity, slow down the eating process, and inhibit the rate of food digestion. So, the energy that enters the body is more efficient and does not turn into fat. Foods high in fiber can also help in losing weight because fiber can increase fat excretion

Antioxidant Activity Analysis (IC50)

Based on table 2, it can be seen that there are differences in the antioxidant activity produced by each formulation, which means that there is an influence of the addition of chia seeds on the IC50 antioxidant activity. The highest score was F0 (0%) and the lowest was F4 (8%) however, the results of the IC50 antioxidant activity analysis were the strongest at F4 (%), because the lower the antioxidant activity value, the stronger the IC50 antioxidant activity. Based on Table 4, it shows that there is an influence on antioxidant activity when adding chia seeds to make pudding with a p-value = 0.000. The addition of chia seeds in making pudding provided an increase in the IC50 antioxidant activity in each formula, so a further test was carried out, namely the Duncan Test.

Based on table 5, the results of Duncan's test for crude fiber content in pudding show that F0 crude fiber is not significantly different from the crude fiber content in F1, F2, F3 and F4. The crude fiber content of F1 was not significantly different from the crude fiber content of F0, F2, F3 and F4. The crude fiber content of F2 was not significantly different from the crude fiber content of F0, F1, F3 and F4. The crude fiber content of F3 was not significantly different from the crude fiber content of F0, F1, F2 and F4. The crude fiber content of F4 was not significantly different from the crude fiber content of F0, F1, F2 and F3. The results of Duncan's Multiple Range test showed that the antioxidant activity of IC50 F0 was significantly different from the antioxidant activity of IC50 F1, F2, F3 and F4. The antioxidant activity of IC50 F1 was significantly different from the antioxidant activity of IC50 F0, F2, F3 and F4. The antioxidant activity of IC50 F2 is significantly different from the antioxidant activity of IC50 F0, F1, F3 and F4. The antioxidant activity of IC50 F2 is significantly different from the antioxidant activity of IC50 F0, F1, F3 and F4. The antioxidant activity of IC50 F3 is significantly different from the antioxidant activity of IC50 F0, F1, F2 and F4. The antioxidant activity of IC50 F4 is significantly different from the antioxidant activity of

IC50 F0, F1, F2 and F3.

Antioxidant activity is a compound that has an important role in inhibiting oxidative reactions in the body which can cause various diseases. Increased oxidative stress can occur in several diseases such as kidney failure, obesity and cancer. Increased oxidative stress occurs in the body and can reduce the body's defense system so that antioxidants are needed. In this study, the antioxidant test was carried out using the DPPH method. DPPH is a free radical that is stable at room temperature. The interaction of antioxidants with DPPH, either by transferring electrons or hydrogen radicals to DPPH, will neutralize the free radical character of DPPH. The parameter used to indicate antioxidant activity is the efficient concentration value, Efficient Concentration/EC50 or Inhibition Concentration/IC50 (Febrianti et al., 2021). The IC50 value states the food's ability to ward off 50% of radical compounds. The lower the IC50 value, the higher the ingredient's ability to act as an antioxidant.

Measurement of antioxidant activity with the DPPH method uses spectrophotometric principles. The dark purple DPPH compound (in methanol) was detected at a visible light wavelength of around 517 nm. A compound can be said to have antioxidant activity if the compound is able to donate hydrogen atoms to bind with DPPH to form reduced DPPH, indicated by the progressive loss of the purple color (becoming pale yellow). Antioxidants will donate protons or hydrogen to DPPH and then new radicals will be formed which are stable or unreactive (1,1-diphenyl-2- picrylhid razin). Parameters for interpreting test results using the DPPH method include IC50 (inhibition concentration), namely the concentration of the sample solution needed to inhibit 50% of DPPH free radicals (Andayani 2008). IC50 (inhibition concentration), namely the concentration of the sample solution needed to inhibit 50% of DPPH free radicals. The lower the IC50 value, the stronger the antioxidant is in warding off free radicals or it can be said to have stronger antioxidant activity.

The level of antioxidant strength of the test compounds using the DPPH method can be classified based on the IC50 value, which can be seen in Table 2.3. The very strong intensity is at a value of <50 µg/mL and the weak intensity is at a value of >150 µg/mL. Referring to Table 2.3, the results of laboratory tests on antioxidant activity in chiapuding products made from chia seeds and soybean juice with the addition of butterfly pea flower extract can be categorized as having a weak level of antioxidant strength because it is at a value of >150 µg/mL. However, the results for each formula increased from F0 (0%) to F4 (8%). It can be concluded that the IC50 antioxidant activity analysis is the strongest at F4 (%), because the lower the antioxidant activity value, the stronger the IC50 antioxidant activity. Bioactive compounds in food that have anti-obesity effects include polyphenols, unsaturated fatty acids, probiotics, chlorophyll, caffeine, catechins, gallic acid, ascorbic acid, quercetin, flavonoids, anthocidanins and carotenoids. This compound was found to modulate physiological and molecular pathways involved in energy metabolism, adiposity and obesity. They can reduce appetite, increase fat oxidation, increase energy expenditure and reduce the absorption of substrates, especially flavonoids, anthocyanins and carotenoids. Experimental studies show that this compound may help prevent obesity.

One of the antioxidants contained in chia seeds is flavonoids. Flavonoid compounds have antioxidant activity which can increase self-defense from diseases caused by free radicals. Flavonoid compounds are also known to reduce the risk of chronic diseases such as heart disease, diabetes and cancer.

The antioxidant content found in telang flowers is anthocyanin, anthocyanin is included in the flavonoid family, is a water-soluble pigment that is responsible for most of the red, blue and purple colors in fruits, vegetables and other plant tissues or products.

The role of anthocyanins in obesity as derived from clinical trials still controversial. Several interesting reviews have been published in recent years on this topic, and all of them conclude that further interventional studies are needed to assess the preventive effects of anthocyanin-containing foods on obesity, diabetes, and metabolic syndrome due to the difficulty of determining optimal dosage. dosage and to identify the ideal food matrix for best anthocyanin supplementation. Observational studies are more likely to show an antiobesity role for this group of polyphenols. In a study analyzing food frequency questionnaires of approximately 124,000 participants from three different groups, increased consumption of several subclasses of flavonoids, including anthocyanins, was associated with reduced body weight in men and women, aged 27–65 years, over a 24-year follow-up period. For example, in four years, increasing daily BW consumption by one and a half cups resulted in a weight loss of approximately 1.03 kg, less than 0.5 kg/year, a small but significant reduction that could potentially be associated with improved health (Bertoia et al., 2016).

4. CONCLUSION

The results of statistical tests show that there is an influence on antioxidant activity when adding chia seeds to make pudding with a p-value = 0.000. The addition of chia seeds in making pudding provides an

increase in the IC50 antioxidant activity in each formula even though it is in the weak category, because the smaller the antioxidant score, the stronger the IC50 antioxidant activity. Based on research, the highest IC50 antioxidant activity in F4(8%) was 6090.6 µg/mL.

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